Investigating the Language Needs of Undergraduate Science Students in Libya

By

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Abstract

Although English for Specific Purposes (ESP) approach is widely applied in science to many non-native speakers around the world, higher education institutions in Libya are striving to remain competitive in on-going changes in the science field. There is an ever increasing demand for communication in English in study and in work places, and some institutions have taken steps to develop newer academic programs as a means to meet students' needs. However, few studies have been carried out to customise ESP courses to suit the Libyan scientific environment.

The primary focus of this study is to explore the language needs of undergraduate science students in Libya. The Needs Analysis Framework was used to investigate the extent of English use among computer science, chemistry and physics undergraduates. For this purpose, multiple-instruments were used including questionnaires, semi-structured interviews, classroom observations and teaching materials. The questionnaires were completed by 127 science students while the semi-structured interviews were conducted with 7 faculty members. The classroom observations were conducted with three classes namely Computer Science, Chemistry and ESP, and teaching materials were collected from each of these subjects.

The study reveals that English language is generally needed in the science settings. Moreover, it plays a significant role in computer science in particular, as most of its discourses are conducted in English. However, it plays only a limited role in the teaching of Chemistry and Physics. The study suggests that collaboration between science disciplines and English teachers are needed in terms of the ESP programme if such programmes are to be successful.

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DECLARATION OF AUTHORSHIP

I, Abdelhafied S. M. Abuklaish declare that the thesis entitled

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and the work presented in it are my own and has been generated by me as the result of my own original research. I confirm that:

- This work was done wholly or mainly while in candidature for a research degree at this University;
- Where any part of this thesis has previously been submitted for a degree or any other qualification at this University or any other institution, this has been clearly stated;
- Where I have consulted the published work of others, this is always clearly attributed;
- Where I have quoted from the work of others, the source is always given. With the exception of such quotations, this thesis is entirely my own work;
- I have acknowledged all main sources of help;
- Where the thesis is based on work done by myself jointly with others, I have made clear exactly what was done by others and what I have contributed myself;
- None of this work has been published before submission.

Signed: ……..

Date: …….

DEDICATION

I dedicate my achievement to all my family members for their constant help, support and motivation throughout this research, especially my wife and four dearest children who sacrificed a lot.

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Abbreviations Used

ALESCO = Arab League Educational, Cultural and Scientific Organization
ASSA = Assistant Secretary of Scientific Affairs
Att = Attitudes
BA = Bachelor of Arts degree
CLT = Communicative Language Teaching
CNA = Critical need analysis
CS = Computer science
CSL1 = Lecturer of computer science
CSL2 = Lecturer of computer science
CH = Chemistry
Chall = Challenges
CHL = Lecturer of chemistry
EAP = English for academic purposes
EFL = English as a foreign language
EGAP = English for General Academic Purposes
EGBP = English for General Business Purposes
EGP = English for General Purposes
ELT = English language teaching
EL1 = Lecturer of English
EL2 = Lecturer of English
EOP = English for Occupational Purposes
ESP = English for specific purposes
EST = English for Science and Technology
EVP = English for Vocational Purposes
GE = General English
GRE = Graduate Record Examination
GPCE = General People's Committee for Education
IMRD = Introduction-methods-results discussion
L1 = First language
LComp = Language competence
LD = Libyan Dinars

LETUP = Libyan English Teaching in Universities Project

LNA = Learning Needs Analysis

LSA = learning situation analysis

MA = Mathematics

MA = Master of Arts

NH = Natural History

NNS = Non-native speaker

PSA = Present situation analysis

PH = Physics

PhD = Doctor of Philosophy

PHL = Lecturer of physics

R = Researcher

ST = Students

TOEFL = Test of English as a foreign language

TSA = Target situation analysis

UN = United Nations

Transcription conventions

(..) = indicates a section of dialogue not transcribed
(xxx) = reference to a person

Chapter One
Introduction

1.1. Introduction

There is no doubt that English has become more than simply another language that one can learn or choose to ignore. English for Specific Purposes (ESP) courses in particular, have figured notably in the literature of language teaching and have played a vital role in professional activities since the 1960s. These courses have become one of the most important aspects of English as a Foreign Language (EFL) teaching, where learners' needs are considered as the priority. They have also become central to science at a global level, and are instrumental to explore. This growth is reflected in the increasing demand for English courses, which are aimed at specific disciplines, e.g. English for science and technology, and English for business **(**Upton 2012; Donesch-Jezo 2012; Bhatia et al. 2011; Paltridge and Starfield 2011; Hyland 2009; Swales 2004; Dudley-Evans and St John 1998; Hutchinson and Waters 1987; McDonough 1984).

For science students, English is learnt not only *as a subject* but also *for service* (Hutchinson and Waters 1987). In other words, English is not only learnt for the purpose of learning, but for specific purposes, i.e. to perform professional activities such as writing lab reports or business letters (Basturkmen 2006). The type of English needed is related to the learners' future role(s) and the language skills or linguistic knowledge that the learner needs in order to successfully function in the study/work place. This trend in ESP has led to an awareness of students' reasons for learning a language and emphasised the need for teaching highly specialised texts in various domains. This is the principle of ESP teaching, and the focus of this study.

My interest in this area of English Language Teaching (ELT) began as a result of my science students, who often seemed to be uninterested and lacked motivation to learn the language. Some of them said "We need something related to our specialist subject, something that helps us with our study". Others said, "We need teachers to help us with terminology. Grammar is difficult and boring". Part of this is true; providing students with what they require almost always motivates them to learn. The issue, therefore, is not about understanding language structures or vocabulary (because students are well aware

of the importance of vocabulary for studying a foreign language); instead it is about the type of English language needed in science subjects.

To answer this question, a Needs Analysis (NA) approach has been adopted (Long 2005a; Graves 2000; Dudley-Evans 2001; Dudley-Evans and St John 1998; Hutchinson and Waters 1987). This approach is seen by researchers as the logical starting point for any language programme which needs to respond to the learners and their needs (e.g. Munby1978; Brindley1989; Berwick 1989; Hutchinson and Waters 1987; West 1994; Jordan 1997). This is because NA allows the learners' needs to be determined. It also established learners' goals and backgrounds, their language proficiencies, their reasons for taking the course, and the activities for which the learner or group of learners require a language and allows the course designer to arrange needs according to certain priorities (Hutchinson and Waters 1987 and Hyland 2006).

Researchers such as Paltridge and Starfield (2012), Belcher et al. (2011), Basturkmen (2010), Chostelidou (2010), Bacha and Bahous (2008), Hyland (2006), Abu-Rizaizah (2005), Graves (2000), Dudley-Evans and St John (1998), Jordan (1997) and West (1994) have highlighted the vital role that NA plays as a systematic and on-going process of gathering information about learners' needs and preferences. They have noted that there is a correlation between the place of study/work and the needs of learners in terms of language skills practiced, terminology used, syllabus design and materials preparation. Furthermore, they observed that the type of language used by each student is influenced by his/her studying requirements. Some educational studies (e.g. Rahman 2012; Jabeen and Mahmood 2011; Al-Tamimi and Shuib 2010; Chostelidou 2010; Kaur 2007; Bosher and Smalkoski 2002; Basturkmen and Al Huneidi 1996; Uvin 1996) have also applied NA and emphasised that learning English for specific purposes plays an important role in students', workers' and administrators' success in their fields of study/work. They have studied the language/ communication needs of students and employees and have showed how language can best equip learners with the skills required in professional life. Clapham (2001) argues that it might be difficult to know exactly what learners have studied before and also difficult, if not impossible, to know what interests and previous knowledge they might have outside their subject disciplines. She writes: "It is difficult to find texts which have suitably specific content in an intended subject area, and the suitability of such texts cannot always be known in advance". The community targeted in

this study is an example of this difficulty, as it encompasses many fields, such as computing, chemistry, physics, etc., and themes such as networking, programming, etc. This means that making early decisions as to what texts are appropriate to a particular community is difficult. Clapham (2001) suggests that genre rather than topic may be a more useful measurement for text selection. However, needs analysis is still an important tool for collecting and analysing learners' needs, and should be seen as a dynamic and on-going process. This means that it should not be carried out once, but there should be a continuous process of questioning and revision to check the original results, evaluate the effectiveness of the course and revise objectives.

Despite there being a clear need, little attention has been given to ESP and NA by researchers and language teaching professionals in Libya as well as in the Arab world (Abuklaish 2004; Ghenghesh et al. 2011; Kandil 2009). Consequently, students at Sebha University rarely have input in their language teaching content. This thesis, therefore, puts forward a framework for a NA approach as the basis for investigating the English language needs of the science community. It targets both science students and practitioners at Sebha University. It stems from a practical desire as a teacher to be more certain that students' "wants, necessities, and lacks" are the top priority (Hutchinson and Waters 1987). This is similar to the work of Brumfit (1979), who claims that "language teaching is not packaged for learners, it is made by them. Language is whole people."

1.2. Background and development of the study

Since the 1950s, English has grown to become one of the most important second languages in Libya. The reason for this is that English has become the language of international commercial transactions. Moreover, technology is basically a western product, and the United States of America and the United Kingdom are two of the leading countries in this field. The international exchange of information between countries, such as science and medical development, business, environment and other fields is mostly conducted in English. In addition, the English language is the means of scientific discourse where the most advanced discoveries and inventions in science are being made in Western universities. This means that, an individual wishes to succeed in a scientific field; he/she will probably have to spend time studying in English.

In Libyan higher institutions are striving to stay ahead of the competition in the face of on-going changes and increased demand for communication in English at study/workplaces. Regardless of the fact that English has been taught at all levels (primary, secondary and university) for more than 10 years, what university students really need to learn in order to cope with academic study/work environment is still unclear. ESP programmes at university level are being asked to offer English language programmes that specifically meet the demands of science initiatives. For teachers this creates challenges, since they must develop and teach courses in areas in which they may or may not have prior experience or knowledge.

From the researcher's experience of teaching at Sebha University, English for science purposes seems to be far from satisfactory in terms of the customisation of ESP characteristics (Dudley-Evans and St John 1998; Hutchinson and Waters 1987). The ESP programme has not been given proper consideration, either with regard to teaching and learning pedagogy, or student needs (Abuklaish 2004). This experience of the science context for ESP has encouraged me to work for a better understanding of the situation. The assumption is that carrying out a proper NA can provide a better understanding of the English used and the 'real world' of the target students. Many problems in L2 classes are the result of teachers not paying attention to learners' interests and failing to see them as an essential source of information. Students can offer valuable data to the expert. Firstly, experts can obtain information about students' current ability in their L2, their field knowledge in L1 and L2, their motivation, the methods of learning that they have experienced, etc. Secondly, they can begin to understand what learners want to achieve. These findings can guide practitioners to develop and determine the route of ESP courses.

1.3. Rationale for the study

The necessity for a better understanding of students needs has been emphasised in ESP (Cheng 2011; Basturkmen 2006; Long 2005a; Peacock 2001; Hutchinson and Waters 1987), English for Academic Purposes (Jordan 1997) and in English for General Purpose courses (Nunan 1988; Long and Crookes 1992). Such recognition has led to an awareness of students' requirements for learning a language, which is a step towards motivating students to learn (Basturkmen 2006). According to Gardner and MacIntyre (1993:2), a student who is motivated to learn is "one, who wants to achieve a particular goal, devotes considerable effort to achieve this goal, and experiences satisfaction in the activities

associated with achieving this goal". In this regard, researchers agree that NA is seen as the logical starting point for a language teaching programme, which is responsive to the learners and learning needs (Hyland 2006; Dudley-Evans 2001; Graves 2000; Jordan 1997; West 1994; Robinson 1991; Brindley 1989; Berwick 1989; Hutchinson and Waters 1987; Richterich 1979; Munby 1978). NA can also be used to develop goals, objectives and course content; and it can provide data for reviewing and evaluating an existing language programme (Richards 1984:5).

The current study aims to provide empirical evidence of the English language needs of undergraduate science students in Libya. It draws on the assumption that appropriate NA is the logical starting point for a language teaching program which is responsive to the learners and learning needs (Massouleh 2012; Basturkmen 2010; Hyland 2009, 2006; Long 2005a; Richards 2001; Graves 2000; Dudley-Evans 2001; Jordan 1997; Brindley1989; Berwick 1989; Hutchinson and Waters 1987; Richterich and Chancerel 1980; Munby1978). These aims are formulated into the following research questions (RQs):

1. To what extent is English needed in the science setting?
    - What is the science community's present situation (PS)?
        - What is the science students' present situation?
        - What do the science students learn in the ESP course?
    - What is the science community's target situation (TS)?
        - Why and where is the language needed?
        - What type of genres are used in science classes?
        - What type of registers are used in science classes?

1.4. Significance of the Study

This study would be significant in different ways to enrich development and research in this area in the country, similar contexts and more globally. It is significant within its own setting because it is the first time that both the stakeholders and students of Sebha University have been involved in a discussion concerning students' language needs. It is hoped that their perceptions will help to highlight the science community's language needs. It is also significant in terms of its potential impact on the process of syllabus

design for ESP programmes in science colleges. It is hoped that the findings of the study will be used for the improvement of the language teaching in science settings (e.g. establishing the purpose of the ESP as perceived by the stakeholders and learners), which can be used as the basis for designing appropriate courses that enable students to deal with the language demands of their fields of study and/or work.

The study may have significance for the NA approach in ELT in general, and ESP in particular, as it provides a methodological framework for analysing students' academic needs for the purpose of establishing learning objectives and suggesting content and methodology for ESP programmes. The methodology used in this study may also be applicable to further studies in similar contexts around the world. It contributes to the literature of NA by making the data and findings of this study available for prospective researchers. The study notes that despite the long history of NA, a considerable amount of research and many publications, there has not been a single book focusing on NA since Munby (1978). It also supports other researchers' views of the significant role that NA plays in ELT (see Cheng 2011; Long 2005a; Jordan 1997; Robinson 1991; Hutchinson and Waters 1987).

1.5. Organisation of the study

This thesis is divided into eight chapters. The introductory chapter establishes the background of the present study, the context, its purposes and significance as well as the research questions. Chapter two addresses the context of the study, presenting background information about the country and the nature of the educational system. Then it provides detailed information about teaching English at secondary and university levels, in general and at Sebha University in particular. Finally, it addresses the challenges facing students in Libya and at Sebha University.

Chapter three provides a literature review which is divided into two parts: English for Specific Purposes (ESP) and needs analysis (NA). First a general view of ESP and a brief discussion of ESP materials and methodology, and ESP materials evaluation are presented. Secondly, a discussion of the importance as well as the development of NA is provided. Then theoretical arguments are made about methods of conducting NA where the focus is on the present and target situation analysis applied in this study. The chapter

then presents the methods of NA data collection followed by examples of research studies in NA. Finally, the relation of NA to the current study is discussed.

Chapter four focuses on methodology, presents the rationale for the selected research approaches and attempts to investigate the language needs of the target students. It begins with a justification for the chosen approach for the thesis (mixed method) followed by its limitations. The chapter then moves on to discuss the field-work, beginning with the presentation of the research context, participants and the researcher's role. It then turns to present and discuss the research tools (questionnaires, interviews, observations and teaching materials) used in the course of the fieldwork. It shows the ways in which the data was collected, followed by the procedures for how this data was analysed. It ends with a brief discussion of the ethical issues and risks encountered during this study as well as the general limitations of the methods adopted in the thesis.

The demonstration of the study data findings is next. Chapter five presents and analyses the questionnaire results, whereas chapter six presents and analyses the qualitative data findings (interviews, observations and teaching materials) in detail. Chapter seven brings all of the quantitative and qualitative data findings together by means of triangulation. It is assumed that such a presentation will be coherent and clear for both the researcher and the reader.

Finally, chapter eight provides a detailed discussion of the study implications of the ESP approach and pedagogical improvements in Libya. Next, the recommendations and limitations of the study, and the implications for further research are presented. Finally conclusions of the study are drawn.

Chapter Two
Context of the study

2.1. Introduction

This chapter aims to provide a context for this study by examining English language teaching in Libya in general and then focusing on Sebha University. A brief introduction to the country and its education system will be presented first. It is worth mentioning that simultaneously with the writing of this thesis; a political change was taking place in Libya, the so called "*Arab Spring".* This has meant that the information in this chapter may change considerably in the near future. Although the education system will not be directly affected, since, for example, the education policy and curricula remain the same – it is hoped that this change will open doors and allow opportunities for change in education. Some potential opportunities for education could be piloting a new curriculum, introducing new approaches to education or providing new teacher training programmes. It is hoped that an irreversible change will occur, which will give rise to better opportunities for education to play a role in the development of the country.

The chapter then examines recent developments in teaching and learning the English language, first in general, and then at Sebha University. Finally, the challenges for English language teaching and learning will be discussed, first in Libya in general and then at Sebha University. Such information should lead to a fuller understanding of the present and target situation, which should, in turn, highlight the purposes of the current study.

2.2. An overview of Libya

Libya is an Arab country located on the North African coast of the Mediterranean Sea. Arabic is the official language and the major ethnic group has been largely assimilated into the Arab culture, with the exception of the minority of Berber (5% of the population) living in the western mountains of Libya who speak their own language among themselves. However, Italian and English are also spoken in the country. Islam is the only religion practiced in the country, and the currency is the Libyan dinar which equals approximately 2 British pounds.

The country became fully independent on December 24, 1951, after an occupation lasting about 40 years. It is worth mentioning that during part of Colonel Gaddafi's time in power (between 1980 and 1992) the country was virtually isolated from the rest of the world as a result of economic sanctions imposed by the Western countries and the United Nations which did not end until 1999. These sanctions had a significant impact, weakening all Libyan sectors, e.g. economy, education, etc. for many years (US department of State 2010). Furthermore, the government of Libya banned the teaching of English in schools and universities across the country, and English teachers were ordered to give up teaching English and asked to teach other subjects such as history (Embark 2011). In conjunction with the existing youth movements in the Arab region; the *Arab Spring*, mentioned earlier, finally ended Gaddafi's regime after more than 40 years.

2.3. Education in Libya

According to Hamdy (2007) and Metz (1987), all Libyans were guaranteed the right to free education at all levels after the independence in 1951, and in 1987, university students have being received substantial stipends. This marked a new era in Libyan education. Primary and secondary schools and universities were established all over the country after this date. The proportion of female students increased from 3.3% in 1960 to 43.2% in 1990 (Wikipedia 2010), and then to 70% in 2001 (Hanley 2001). Moreover, the literacy rate among Libyans over the age of ten increased to 91% for men and 71% for women. At independence, the rate did not exceed 20%; by the 1977, the rate had risen to 51% overall (Metz 1987). Such an improvement in education reflects the country's investment in education, as part of a scheme which aims to cope with development and meet the challenges of globalisation. Thousands of students were sent abroad, mostly to Western countries, to complete higher studies. In this regard, in 1978, more than 3,000 students were studying in the US alone. However, the number of students had sharply dropped as a result of sanctions imposed in 1986, which restricted travel to the US; for example, there were only 33 students studying in the US in 2002 (Clark 2004). Nevertheless, the number of students increased sharply when English was re-introduced into schools in 1990, reaching 72,000 scholarships between 1991 and 2009, where Western countries, such as the US, Britain and Canada were the first choice for Libyan students, followed by France, Germany and Italy as well as China, Japan, Egypt and Jordan.

The Libyan education system begins at the age of six. On completion of secondary education (ages of 16 – 18), students can apply to a higher education institution. The university colleges require four years of full-time study in various fields, such as chemistry, computing or maths, leading to a Bachelor's Degree, except for medicine, which requires seven years of study. Higher technical and vocational institutions provide three years of full-time training in areas such as engineering and construction (El-Hawat 2003).

With regard to the staff, nearly all language teachers at secondary schools are Libyans who hold a BA in English from one of the English language institutions in Libya. 50% of university lecturers are Libyans (apart from a few foreigners, e.g. those from India and Egypt) who hold MA or PhD degrees, except medicine, where most of the staff is foreigners (from India, Egypt and Iraq). Arabic is the language of delivery in most disciplines except medicine and some fields of science and technology, in which English language is integrated with Arabic. It is worth mentioning that in May 1998, tutors of scientific subjects were given the choice of integrating English into their teaching by The Arab League Educational, Cultural and Scientific Organisation. This shift was proposed after a number of calls by university stakeholders "who argued that Arabic was no longer able to keep pace with the fast evolving terminology in science and technology" (Asker 2011:15).

It is worth mentioning that the secondary school system has been changed twice since 1992. In this year, the *Specialised Secondary Schooling System* was introduced, alongside the existing general secondary system. The new system required four years of full-time study and was designed to enable students to specialise in a particular area, for example physics, English or maths (Asker 2001). However, the duration of the new system was reduced from four to three years in 2004, and to what extent these aims have been achieved is unclear. Moreover, it is not possible to give this topic sufficient attention in this thesis, so only a few interesting themes relevant to the current study are highlighted. According to Alhmali (2007) there is a general satisfaction amongst students regarding the education system. However, he notes that some middle and high school teachers are unqualified in terms of pedagogy and subject knowledge. The teachers' role "is largely that of transmitting information in an efficient and effective manner to their students, and has little insight in the role of their subjects in the development of young people" (p.195).

He adds that the system seems to have an inadequate grasp of the purpose of school education. Elements such as applying ideas, creativity, and criticality were absent, because learning is based on the reception of information through lectures, books and memorisation (Alhmali 2007:195).

Although the Libyan government fully supports and finances the education system at all levels, there have been serious concerns among Libyan educationalists about the quality of the education provided (Asker 2011; Alhamali 2007; Ghanem 2006). According to Alhamali (2007:78), "the educational programmes suffer from limited curricula, a lack of qualified teachers (especially Libyan teachers), and a strong tendency to learn by rote rather than by reasoning, a characteristic of Arab education in general". The overall picture is a system in which the quality of teaching and training provided for teachers at institutions is of a low standard and does not meet the teaching demands of the current curriculum at middle and high schools. The result is that new middle and high school curricula are above the knowledge proficiency of the teachers. Furthermore, the schooling systems have been changed four times within 10 years, and there have been many unplanned strategies, which have had an enormous impact on teachers as well as students (Hamdy 2007).

2.3.1. The development of English language in Libya

English is the only obligatory foreign language taught in public schools and higher institutions in Libya. This dates back to the mid-1940s, following the end of World War II, when the northern part of the county was under British governance. It has been used as a foreign language and a medium of instruction in some disciplines, e.g. engineering and science (Swales 1978) as well as a language of communication in most areas, e.g. the petroleum sector, air control, international organisations (Sawani 2009). Historically, it can be said that English has gone through three stages. Firstly, during the 1970s and 1980s, "English teaching was very successful because there was a good syllabus which was taught mostly by native English speaker teachers" (Dabia 2012:11). In addition, after graduation those trainee teachers were regularly sent abroad to be fully trained in the English language. These teachers are still well-known by many people; because of the good reputation they established within the academic field and within society as well (Elabbar 2011). English continued to be taught from primary school (age 10) until the completion of secondary education (ages 16 -18). This continued until the Cultural

Revolution in 1973, where English was pulled back to preparatory school (ages 13 - 15). This is to say that before joining colleges, students should have been exposed to English for at least eight years.

Secondly, between 1987 and 1993, English language was withdrawn completely from the education system, as a result of the American air raid on Tripoli and Benghazi and the sanctions which followed this crisis (see 2.2). As a result of this withdrawal students and teachers have suffered. Students, on the one hand, (new and previous pupils and students) had no English language classes at all for more than six years, and those who entered higher education during that period came with hardly any knowledge of English. Some English teachers, on the other hand, lost their jobs and others took on alternative positions, such as teaching history or geography. According to Asker (2011) and Orafi (2008), approximately 80% of the English teachers who were teaching before the suspension did not return to the profession as they had taken other jobs.

The third stage was when the United Nations (UN) embargo was suspended at the beginning of the 1990s (Embark 2011; Orafi 2008). The results are that English has regained its status in Libya as a foreign language and a medium of instruction in some disciplines, e.g. medicine, as well as being the main language of communication within the petroleum sector. This has also encouraged foreign companies to seek local offices in Libya, which has created a need for English speaking staff. Development in the tourism sector has also created the need for local agents and guides able to communicate with tourists. However, the reintroduction of English language teaching was not systematic and gradual, but was instead unplanned and sudden. For example, all university students were forced to study English at university level without even a basic knowledge of English, because they had not studied it when they were in secondary and intermediate levels of education.

In response to such changes, the General People's Committee for Education (GPCE) reviewed its English language teaching policy, which resulted in the introduction of English to primary pupils (age 10), beginning from the academic year 2006/07, and new language textbooks for elementary, preparatory and secondary schools. However, the level of these new textbooks, especially those designed for secondary schools, is more difficult, which has left not only pupils, but also English language teachers struggling to cope with the English content. This is, on the one hand, due to the low standards of

pupils' achievement. On the other hand, the existing English teachers are not qualified enough to teach the higher level of these new syllabi, a view which has been also expressed by the Libyan Minister for Higher Education (Orafi and Borg 2009; Alhmali 2007; Porter and Yergin 2006)

With reference to this situation, a number of summer training courses have been organised for current English teachers to improve their English language skills, in order to cope with new requirements of the new courses. English language centres have also opened in different parts of the country in collaboration with the British Council, the American ACCESS Micro-scholarships (U.S. Government 2007) and others. In addition, the country is working with other organisations and universities to develop English language skills. For example, in 2006, the Libyan English Teaching in Universities Project (LETUP) in partnership with British Council in Libya ran a project which focused on nine Libyan universities where English skills were low and there was a shortage of language teachers with internationally-recognised teaching qualifications. It aimed to offer high-quality advice and collaboration in the development of English language educational policy, and helped scholarship students to acquire sufficient language skills to take part in full-time Master programmes in the UK and elsewhere. By 2009, the LETUP teams delivered over 30,000 teaching hours to over 3,000 postgraduate students and over 4,000 hours of training sessions to teaching assistants. Furthermore, by end of 2009 and 2010 the LETUP and the U.S. State Department's Middle East Partnership Initiative also collaborated in improving English language teachers' programmes in the country (U.S. Department of State 2010; British Council 2009).

2.3.2. Secondary and university English language in Libya

English (see 2.3.1) is taught in the early stages of primary school. However, our focus will be on secondary schools (from this stage students can join universities) and universities. Nearly all language teachers in secondary schools are Libyans who all hold Bachelor of Arts degrees (BA) in English, and are assumed to be well-prepared and trained to teach in secondary schools. However, these language teachers, according to some researchers (e.g. Orafi and Borg 2009; Ali 2008; Saleh 2002), come with insufficient qualifications, regardless of the fact that they have graduated from education colleges and have been exposed to recent pedagogic repertoires. It was found that common practices used by teachers in secondary schools included the use of traditional

methods, to enable learners to read and translate literature written in the target language, and to further learners' general intellectual development, where they learn grammatical rules and then apply those rules by translating sentences between the target language and their native language. In addition, teacher-centred approaches, where activity in the class is centred on the teacher, were very common. Furthermore, speaking and listening skills seem to have been dropped from English programmes, regardless of the fact that they are both covered in the new curriculum (Orafi and Borg 2009; Ali 2008; Saleh 2002).

In terms of curriculum, the previous English language curriculum for Libyan secondary schools which was applied before 2004 "was based on traditional educational philosophy which underpins the subject and teacher-centred view focusing on the memorisation of isolated vocabulary, application of grammatical structures and on translating and understanding reading texts" (Mabrouk 1997, cited in Elmabruk 2008). Furthermore, researchers argue that the curricula in Arab countries seem to encourage submission, obedience, subordination and compliance, rather than free critical thinking. They also add that methodology used in the Arab world is traditional and new methods are usually ignored (Naeem 2007).

The new curriculum is "embodied" in a series of course books in which different levels and specialisations are structured in a similar way: "each unit has sections dedicated to reading, vocabulary and grammar, functional use of language, listening, speaking and writing" (Orafi and Borg 2009:245). This curriculum also integrates cultural aspects of English language that require the application of new pedagogical approaches. Such a shift has created problems within the teaching environment (Dabia 2012; Asker 2011; Orafi and Borg 2009; Alhmali 2007; Gadour 2006; Saleh 2002). Poorly prepared and under qualified teachers have brought negative aspects to the implementation of this new programme. Functional language use, listening and speaking tasks have been completely ignored by many current school teachers. This might be due to factors such as, e.g. students' inadequate language proficiency or poor facilities within schools (Orafi and Borg 2009). This might also relate to Libyan teachers being accustomed to using old methodologies based on teacher-centred learning, memorisation of vocabulary and language structures and translation (Gadour 2006). In this regard, Saleh (2002) reported that all observed classes were clearly teacher-centred and not communication based. There was a lack of interaction in English and regular use of translation in these classes.

Alhmali (2007) also found that teachers were seen as suppliers of information, which has to be recorded and reproduced accurately in examination" by preparatory and secondary students (Alhmali 2007:69). In connection with examinations, Alhmali (2007) and Orafi and Borg (2009) argue that by only examining comprehension reading skills and grammar knowledge, other skills have been neglected in the English classroom, particularly speaking and listening.

However, others have blamed students for not applying the new methods. Orafi and Borg (2009) reporting on English language teachers (teaching final year secondary students in the Eastern part of Libya) note that English language teachers could not implement the communicative practices of the new English curriculum because of the students' low level of English which obstruct their participation in classroom activities. Students' lack of English vocabulary also seems to lead to unwillingness to work in pairs or groups. As Orafi and Borg (2009:249) note, "students are very weak in English … How can these students do the speaking activities when they do not have vocabulary in English. I have to do these activities by myself", the teachers commented.

In respect of teaching English language at universities, it can be said that since the 1950s, English has grown to become the only compulsory foreign language delivered to all disciplines; arts, science, medicine and technology. Until 1998, students at university level were only exposed to English during English classes, because Libyan universities adopted frameworks developed by Arab experts at *The Arab League Educational, Cultural and Scientific Organization* (ALESCO), in which all scientific curricula were adopted to be entirely taught in Arabic. Then, in May 1998, universities stated that tutors of scientific subjects had the choice to integrate English into their teaching, which would not have happened unless calls had been made by university professors and educationalists. The reason for these demands is that most subjects in medicine and computing cannot be taught in Arabic since there are few references in Arabic. There has also been a disagreement about the equivalent of many scientific terminologies among the Arabic Language Academy members.

According to Sawani (2009), there is no fixed curriculum for teaching English at university level, and the responsibility for preparing general English materials to be taught in the other faculties, such as medicine, science and engineering is given to the head of the English department at any university. At some universities, the English

department is responsible for creating course outlines for their English tutors who are then free to choose whatever curriculum they like. Moreover, these materials are selected without investigation or collaboration between the English tutor and relevant departments. Ghenghesh, et al. (2011) reported that NA has not received adequate attention in the Arab world, and the needs of learners are seldom or never analysed but rather perceived for them. In addition, university-level English classes comprise a heterogeneous and large number of students, which sometimes exceeds one hundred (Lagga, et al. 2004; Abuklaish 2004).

Such a situation results in a curriculum with no standardisation, even between teachers in the same department. In this regard, Triki, et al. (2008) conducted a study to develop and link the outputs of the technical and vocational education and training in English with the needs of the Libyan manufacturing industry. They found that the majority of participants claimed that the existing course was not relevant to the needs of their industry. They also reported that there was a lack of co-ordination between course design in higher education institutions and the various sectors of industry. Abuklaish (2004) also indicated that regardless of some successes in developing English courses at Sebha University, ESP has not been given enough consideration. Syllabi and materials have been offered without any research. This situation seems to be common. El-Haddad (1984:19) reports that EGP courses in the Maghreb Arab countries "cannot cope with specialities such as science and technology" and dissatisfaction with these courses has been voiced by those specialists, because of the absence of research.

In terms of university staff, since 2006, a large number of Libyan English tutors have been replaced by foreigners because most of the Libyan lecturers who were in charge of teaching these courses were offered scholarships to study abroad. Most of the foreigners who are working in the field are Indians, Egyptians and Iraqis and a few are English. Such a shortage of Libyan lecturers has had negative impact on many disciplines. According to Harba (2010), for instance, there is considerable dissatisfaction with the outcome of teaching English, as this job has been given to those who are not qualified and some do not have even minimal teaching qualifications. These teachers were only assigned to their jobs because English classes would not be possible without them.

To summarise, one can conclude that a number of differences have been noticed between school and university in terms of language teaching. School curricula are designed by the

Committee of Higher Education; whilst university syllabi are to some extent arranged by individuals. Similarly, with regard to teaching methods; school teachers are restricted to teachers' guides, whilst university lecturers are left to make their own decisions. In other words, school students are used to following a nationwide system of learning in which subjects are linked and complement each other, and this is not be provided at many universities. Finally, school classes are small in comparison to university classes (Elabbar 2011; Gadour 2006; El-Hawat 2003).

2.3.3 Students' language proficiencies and perceptions

In looking at the literature, few research works were found related to the Libyan students' English language proficiencies. It appears that our students' levels of English are various. Researchers (Orafi and Borg 2009; Abuklaish 2004) agree that both secondary and university level students encounter problems dealing with the target language, and have indicated that EFL students lack language competence. Abuklaish (2004) reported that most students at a science institution in Libya who were learning in the medium of English encountered serious problems in communicating freely, writing and even dealing with general and technical vocabulary. This might be due to all or one of the findings of Gadour (2006). He stated that the Libyan students moving from school to university encounter several learning difficulties, which include teaching and learning management at university, which is completely different to the school system (see 2.3.3), learning and teaching methodologies and a large group of heterogeneous students.

In another context, Al-Tamimi and Shuib (2010) found that Jordanian petroleum students completed their studies without any benefits from the English language course taken at the Faculty of Petroleum and Engineering. A lack of ability in English means that most petroleum graduates are rejected when applying for work with oil companies.

In terms of students' attitudes, it can be said that the pragmatic value of learning English (e.g. study, work and even leisure) have recently been realised by students. Interestingly, Alhmali (2007) who examined the perceptions of about 2,000 Libyan school students towards four subjects in their curriculum (Arabic, English, Sciences, Mathematics), found that English language was favoured over other subjects. Turki (2004) also reported that secondary school students see English as an international language that is important for travelling abroad, accessing foreign media and using technology. However, they do not

seem to be motivated by international cultural factors such as music or movies (Mahjobi 2007).

Despite mentioning such motivation factors, Turki (2004) also discovered that secondary school students showed low levels of enthusiasm to invest effort in learning English. Similarly and in the same year, Abuklaish (2004) observed that undergraduate science students showed little interest in ESP classes, which he suggested was related to their irrelevant content, in terms of materials and genres. It could also be related to the use of traditional teaching methods such as "lecturer-centred" teaching and being "spoon-fed", which seem to be accepted as normal in the country (Orafi and Borg 2009). Another reason might be the structure of authority within the classroom, where students are used to being quiet and respectfully listening to the teacher, particularly females who prefer being silent and shy away from any loud or practical activities (Sawani 2009).

In contrast, Alhmali (2007) reported that school students want to start learning English at an early age, and that they clearly consider English as a key to their careers and to further study, especially in science. Dabia (2012: 213) also supports such a positive view and indicates that trainee teachers were critical and reflective in their teaching training programme at secondary schools in Libya, "especially when they work collaboratively", which might suggest that Libyan students are not all being "spoon-fed".

In conclusion, one can argue that such negative views of teachers and students language proficiency in Libya might be changed, gradually, and opportunities for rehabilitating education, in general, will arise in the months and years to come. As a result of the enormous investments in education, especially the number of students being sent abroad, especially to English-speaking countries, I am very optimistic about the future, and believe that the partnership and collaboration with the British Council, with its wealth of knowledge and expertise in setting up and running high-quality English language programmes, will improve and develop language teaching and learning in the country (see 2.3.1).

2.3.4. English language teaching at Sebha University

Sebha University is one of the top universities in Libya, which has been classified as a first Libyan University academically in 2012. It is located in the south of Libya about 900

km from the Libya coastline, with a climate that is mostly dry and hot, especially in summer. The University consists of seventeen faculties, which are located in different cities in the south of the country. About 22,000 students study at the University. The University provides most of the facilities that teachers, staff and students need, such as libraries and laboratories. However, two important resources are not available; computers and Internet access. Computers, for instance, are only provided to the computer science students or staff, and Internet access can only be found in some faculties.

In terms of English language courses at Sebha University in particular, and Libyan universities in general, there is little information available, and most of the information provided here has come from the researcher himself, as an 'insider'. At Sebha University, English is the medium of instruction in some disciplines such as medicine, but is not used for general communication. English is taught in terms of English for General Purposes (EGP) rather than ESP, and considered as a supplementary, but obligatory course. The goal of such courses is to provide students with the language skills and strategies needed to meet requirements of their academic courses. In some colleges, students are required to read some content-course materials in English, e.g. medicine, computing. However, the aims of the ESP courses have not been clarified in most institutions. There is also an absence of properly qualified experts to develop these courses, and many significant challenges have arisen which have held back the process of developing pedagogic approaches in the classroom or teaching materials that match students' needs.

English courses are subdivided into three levels (A, B and C). These courses are given once a week for two hours, mostly in the afternoon and each lasts a total of twelve weeks (or 36 hours per semester). It is assumed that each model should have a different format and focus. However, these courses have not been designed using the fundamental base queries of ESP "*what, why, who, how"* (Dudley-Evans and St John (1998:121). The groups are fairly large and heterogeneous in academic level and discipline, and females outnumber males in most science classes. Students who take this course must first complete and pass course A to take courses B and then C. Course A must be taken in the first or second semester, and courses B and C can be taken during any of the following semesters, accordingly.

With regard to textbooks and teaching methods, there are no textbooks and no teaching suggestions are given to the EFL lecturers. Most of the teaching materials are adopted

from other texts, and are grammar and reading comprehension focused. Lecturers have the right to choose and adapt materials to suit their students. Two textbooks entitled English for Science and English for Medicine were published for science and medical students in the late 1990s, but these are no longer used, because they were not designed properly, according to an English professor at Sebha University. He added: - "We had offered suggestions before these two books were published, but they were not taken into account."

English departments are in charge of all ESP courses at university level, but few specialists are available in this field because of the shortage of English language teachers in general and in ESP in particular. Most of the English language lecturers who teach at Sebha University are Libyan and hold an MA in English Language (Applied Linguistics, Translation or Literature) and a few hold a PhD.

2.3.5. Challenges of English Language in Libya

Despite all the achievements mentioned earlier (2.3.1), Libyan higher education in general still faces some challenges. It is reported that the education system does not seem to deliver the skills necessary for the rapidly growing new sectors of the economy, and the investment in this sector does not follow clear policy choices. It has also been noticed that ESP has not been given sufficient attention by institutes in Libya since it was established in the 1960's. In other words, it is still in theoretical phase, and no major decisions have been made yet. Course content, learner's needs and teaching methodology, for instance, have been given little attention. This is supported by the fact that curriculum developers have given no particular attention to ESP and have not provided specifications for the course goals or content. However, English lecturers in Libya could achieve much, if they were given the opportunity to develop or design ESP courses.

Ibrahim Greiby, president of the newly formed Libyan Student Association at Michigan State University, U.S., reported that Libyan students face a language barrier in America. He suggested that "Libyan schools need to emphasise teaching English for students to pass the TOEFL and the Graduate Record Examination (GRE)-requirements for foreign students who plan to study at American universities… some students go back because there are challenges with the TOEFL and the GRE because our system in Libya is not

strong in English" (Brotot 2010). The following are the major challenges concerning English teaching in Libya.

1) Lack of fundamental standards in curriculum design,

There is no clear syllabus for English courses in most faculties, and goals of these courses are not known to the practitioners or the students. Most English courses, if not all, have been designed without proper research. They are designed according to individual lecturers' experiences and backgrounds.

2) Challenges over the content of the intermediate education level,

It has been reported that the new English text books designed for elementary, primary and secondary schools are inadequate. They are even difficult for teachers, because there is an imbalance between the new courses and English ability of the teachers. The fact of the matter is that the current teachers are not well-qualified and students' language proficiency is low which poses serious challenges for both (Ghanem 2006; Lagga, et al. 2004).

3) Methodology,

English teachers restrict themselves to traditional teaching methods and do not take into account new ideas or approaches. The educational process is also still suffering from a shortage of equipment in some institutions (Orafi and Borg 2009; Lagga, et al. 2004). According to UNESCO (1996), the communicative approach to English language learning has not yet reached Libya, oral skills are not tested, and schools lack access to educational media (e.g. tape recorders and language labs).

4) Language competence,

Students' English language levels are very low between beginner and pre-intermediate (Orafi and Borg 2009; Orafi 2008; Abuklaish 2004). This was also stated in a letter from the Minister for Higher Education sent to all deans of universities on 26 December 2007, and has also been reported by researchers

5) Attitudes,

Decision-makers at many faculties have not devoted any attention to English courses, as these are treated as supplementary to students' main area of study. Students share the decision-makers' views.

6) Class size,

The number of students in each teaching group is very high. It was found that students from more than four subjects were often gathered in one classroom, and that the number of students sometimes exceeded 70.

7) Motivation.

For English teachers at public schools, a low salary seems to be the factor which causes a decrease in motivation. For example, a preparatory school teacher with about 15 years of experience may earn up to 300 Libyan Dinars. Even though this salary was increased to about 450 LD in 2011, it is still insufficient, and has seriously discouraged graduates from pursuing teaching as a lifelong career (Mahjobi 2007; Mabrouk 1997).

For students, it can be said that most university students consider English as a course that they are required to pass, rather than a valuable tool for their future study or careers. They only study English for the sake of obtaining a degree. The reasoning behind this is that English is seen as an auxiliary subject, and is not used in the students' daily life. The teaching environment also affects this (e.g. use of mother tongue, few opportunities to practice English, large classes with students of mixed ability and subjects, timetabling, hours of teaching and isolated culture). Finally, methods of teaching also have an impact on the way English language is perceived (see 2.3.2).

2.4. Summary and conclusion

Based on the study aims and the issues mentioned in chapter one, this chapter has presented a brief historical overview of Libya and its educational context. It has focused particularly on English language teaching in schools and universities in the country. The handling and development of teaching the target language have been discussed with an emphasis on factors currently hampering the improvement of language teaching,

especially at universities. In the light of the obstacles that have limited the speed of development of teaching and learning the target language in Libya (see 2.3.4 and 2.3.5), one can indicate that there have been problems and deficiencies in the teaching of English as a foreign language in the country, with higher education English programmes and curricula lacking relevance and failing to develop needs that meet the study and market purposes. This could partly be attributed to the inadequate preparation of teachers and ESP programmes in terms of pedagogic repertoire, and the lack of a proper teaching environment and facilities available at universities.

The consequence of the above-mentioned situation (2.3.2 and 2.3.5) will be low achievement for students learning the target language and teachers presenting this language, which has been evidenced by a number of researchers (Elabbar 2011; Harba 2010; Orafi and Borg 2009; Sawani 2009; Triki et al. 2008; Ghanem 2006; Gadour 2006; Lagga, et al. 2004; Abuklaish 2004; El-Hawat 2003). Therefore, the current study aims to investigate English language needs at Sebha University. A needs analysis approach (NA) has been chosen for this purpose (Basturkmen 20010, 1998; Long 2005a; Graves 2000; Dudley-Evans 2001; Dudley-Evans and St John 1998; Hutchinson and Waters 1987), and evidenced by many researchers around the globe, such as those in Tunis, Jordan, Oman, Saudi Arabia, Finland, Malaysia, Brazil, Thailand and China. Throughout this study, present situation analysis and target situation analysis have been used to determine the specific needs of the target students (Rasekh et al. 2011; Ghenghesh et al. 2011; Huhta 2010; Chostelidou 2010; Kaur 2007; Vandermeeren 2005; Alharby 2005; Purpura and Graziano-King 2004; Al-Busaidi 2003; West 1997; Basturkmen and Al-Huneidi 1996; Zughoul and Hussein 1985)

Having explained the context in which NA will be used to investigate the specific language needs of science students; the following chapter will present and discuss this theoretical approach (NA), and its association with the ESP approach as well as its relevance to the current study.

Chapter Three
English for Specific Purposes (ESP) and Need Analysis (NA)

3.1. Introduction

The main purpose of this chapter is to view and discuss the theoretical framework of the Needs Analysis (NA) approach applied to the present study. To understand the area of investigation of this study, it is first necessary to provide a brief over-view and discussion of the characteristics of English for Specific Purposes (ESP). Therefore, the chapter will first briefly view and define the ESP approach, and then highlight issues concerning the development of this approach in relation to ESP materials and methodology. The importance of quality assessment will also be stressed and examined (Upton 2012; Paltridge and Starfield 2012; Hyland 2009; Belcher 2006; Long 2005a; Hutchinson and Waters 1987; Dudley-Evans and St John 1998).

The chapter will then discuss the NA approach applied to investigate the English language needs of science students. Section 3.3 begins with a brief history and definition of NA which is followed by a presentation of the advantages of applying NA, how such an approach is considered as a "corner stone of ESP" (Dudley-Evans and St. John 1998) and appropriate methods of obtaining wider input into an ESP language programme (Ghanbari and Rasekh 2012; Hyland 2009; Belcher 2006; Long 2005a; Richards 2001; Benesch 1996). It will then present and detail NA approaches, which include Critical Needs Analysis (CAN), Means Analysis, Deficiency Analysis, the Language Audits Analysis, Learning Needs Analysis (LNA), Present Situation Analysis (PSA) and Target Situation Analysis (TSA), where the appropriate approaches to the current study will be addressed in detail. The chapter will then move on to discuss methods of NA, which is followed by the presentation of a number of empirical-studies of NA. Finally, a discussion of NA approaches applied in this study (PSA and TSA) will be highlighted, and a conclusion will be drawn.

3.2. English for specific purposes (ESP)

3.2.1. Overview of ESP

As discussed in 1.1, learning English as a foreign language has occupied a special position in the globe, and includes "*an ever-diversifying and expanding range of purposes"* (Belcher 2006), where ESP has played vital role in English language teaching since the1960's, and has become an umbrella term covering a wide range of interests and approaches to student-centred learning. ESP is defined as *"an approach"* to language learning, *"not a product"* (Hutchinson and Waters 1987:19); it has begun to emerge as a significant factor in the study of the target language, where attention is focused on the ways it is actually used in real communication within communities, rather than simply focusing on teaching vocabulary and language rules in isolation (Hutchinson and Waters 1987; Widdowson 1978). One significant discovery, according to Hutchinson and Waters (1987:7-8), was in the ways that spoken and written English vary. A simple explanation for this idea is that "if language varies from one situation of use to another, it should be possible to determine the features of specific situations and then make these features the basis of the learners' course…Tell me what you need English for and I will tell you the English that you need" (Hutchinson and Waters 1987:7-8). In other words, this approach aims to teach English needed for specific situation that mainly relate to academic or occupational contexts. Teaching repertoires are negotiated and developed to fit learners' goals as well as those of stakeholders (Upton 2012; Donesch-Jezo 2012; Bhatia et al. 2011; Paltridge and Starfield 2012; Hyland 2009, Belcher 2009; Long 2005b; Hutchinson and Waters 1987). To make this point clearer, Dudley-Evans and St John's (1998:4) description of ESP, "*Absolute Characteristics and Variable Characteristics"* also helps to clarify to a certain degree what an ESP course constitutes. There has been considerable amount of on-going debate about exactly what ESP means (Belcher 2006; Dudley-Evans and St John 1998). Nevertheless, it is an acknowledged fact that any ESP course should focus on practical outcomes (Dudley-Evans and St John 1998:1).

Such views of ESP seem to correspond to three key areas: the learners, the nature of language to be taught and used and the settings. These factors are closely related to each other. They view ESP as the teaching of specific English (specialised discourse) to learners (always adults), who will use it in a particular setting (laboratory, hospital, factory, etc.) in order to achieve a useful goal or purpose (communicate effectively),

which in turn will allow them to accomplish additional personal goals (Littlewood 2001). In addition, its concept has moved further; from viewing language not only as a set of grammatical rules and functions; that is, using language to communicate with people, but also as set of learning and learners' needs. In other words, ESP is always concerned with the society in which the language is functioning. Furthermore, language use is diverse, and there are particular "carrier-content" needs in different contexts, which mean that language teaching would not be sufficient if it only covered generic language contents and skills without considering target language varieties and specific learners' needs (Hyland 2009; Long 2005a; Gatehouse 2001; Hutchinson and Waters 1987).

With reference to the *absolute characteristics* of ESP, Dudley- Evans (2001:131) states that "the key defining feature of ESP is that its teaching and materials are founded on the results of needs analysis". This means that ESP is associated with NA where all decisions related to those characteristics are based on NA. The learners are usually adults with knowledge and experience in their particular fields, and their levels of English tend to be intermediate or advanced. They are also more able to define why they are learning English (Kennedy and Bolitho1984). Thus, the agreement regarding needs between learners at adult level and teachers is well matched since their purposes are more clearly defined. Another feature of ESP learners is that they might share similar learning styles if they come from the same environment (Hyland 2009; Pallapu 2007; Gatehouse 2001: Dudley-Evans and St John 1998). Science context, for example, Rogers (2000:7) found that "scientists usually have enquiring minds", which means that they have particular skills such as prediction, solving problems, researching and explaining things, and they benefit from both co-operation and competition among each other.

Another characteristic of ESP is the teachers; ESP teachers do not only teach, but they also act as course designers, materials providers, researchers, coordinators and evaluators. In addition, they do not only need knowledge of ESP, but also knowledge of English for General Purposes (EGP) and an understanding of the related target field in order to get a dynamic and interactive classroom. ESP is also distinguished from EGP, and even within ESP. According to researchers who work in this area (Dudley- Evans 2001, 1991; Blue 2000; Dudley- Evans and St John 1998; Robinson 1991; Hutchinson and Waters 1987; Carter 1983), ESP is divided into three to five main types: English for Academic Purposes (EAP), English for Occupational Purposes (EOP), English for Vocational

Purposes (EVP), English for General Business Purposes (EGBP) and English for Science and Technology (EST). Each of these branches could be sub-branched, and again each can apply to specific context and could determine type of users, users' needs and material. Such divisions reveal the content areas to be included in the curriculum. In other words, language practitioners should specify the content in the syllabus.

The EST branch which is the area of investigation in this study, for instance, concerns science and technology, and is perhaps too broad. Even the notion "English for Science" is too wide if the students' needs at the level of undergraduate studies, for example, are to be taken fully into account, as each discipline has unique features. Therefore, it is necessary to refer to English for Computer Science, English for Chemistry for example, and even then besides each branch might be sub-branched; English for Computer Science might be branched into English for Network Design. Such divisions illustrate the differences between various situations, which should be reflected in the level, and content of programmes. A chemist, for example, might need the focus to be on writing reports or describing an experiment. Material selection and pedagogic repertoires are also one of the major considerations in the process of ESP programmes, and all these factors should be selected carefully, and must reflect the target needs of learners (Donesch-Jezo 2012; Kaur 2007; Belcher 2006; Hyland 2006; Dudley-Evans and St John 1998; Gatehouse 2001; Johns 1997a; Jordan 1997).

Such specific classifications of language learning aim to help course designers to make course relevant to learner in terms of sources and learning/teaching repertoires. All in all, the idea behind ESP is to understand the needs and purposes of the learners, so practitioners can prioritise specific language competencies accordingly, and then prepare learners to be effective participants in discourse within the community to which they belong or are expected to join (Swales 1990). Within this community, a number of communication events need to be examined and understood as they are required for the selection of the materials for an ESP programme, which is guided by the results of a NA.

The key aim is to establish a better understanding of two elements; learning and learners needs (see 3.3). This is also needed because ESP programmes have become popular and widely used in recent years, mainly due to the growing need to use English internationally in all fields, and the desire of learners to become proficient in the English language in specific domains, e.g. English for Nurses, English for Chemists (Ahmad 2009). This

growth of the ESP movement, according to Hutchinson and Waters (1987) is due to three reasons; the demands of a brave new world, a revolution in linguistics and a new focus on the learner. The first reason, according to Hutchinson and Waters (1987:6), is the end of the Second World War in 1945, which brought with it an "... age of enormous and unprecedented expansion in scientific, technical and economic activity on an international scale… for various reasons, most notably the economic power of the United States in the post-war world, the role fell to English". The second reason is the Oil Crisis of the early 1970s resulted in Western money and knowledge flowing into the oil-rich countries, where the language of this knowledge became English. Another reason is that in the late 1960s and the early 1970s pioneers in linguistics attempted to focus on the ways in which language is used in real communication. Hutchinson and Waters (1987:7) state that: "one significant discovery was in the ways that spoken and written English vary. In other words, given the particular context in which English is used, the variant of English will change. This idea was taken one step farther. If language varies in different situations, then tailoring language instruction to meet the needs of learners in specific contexts is also possible".

The final reason for the growth of the ESP movement is related to psychology; in other words, ESP focuses on the learners' needs, which look at the ways in which learners acquire language and the differences in the ways language is acquired, rather than simply focusing on the method of language delivery. Consequently, in many parts of the world, many educational institutions and businesses provide ESP courses to help learners function effectively in their academic studies and professional work. The syllabuses and materials design for these courses are built on the learner's needs and wishes and institutions' demands (see Hyland 2009 -2006; Flowerdew and Peacock 2001; Mackay and Mountford 1978). Libya (see 2.3) and other Arabic countries are also affected by this development, where English language is considered as a medium of instruction in different subjects, as well as a lingua franca (e.g. Libya: Asker 2011,Tunis: Harrabi 2010, Jordan: Bataineh 2007; Zughoul 2003, Saudi Arabia: Alharby 2005 and Egypt: Abo Mosallem 1984).

3.2.2. The development of ESP

Since the 1960s, or even before that, there is no doubt that ESP has developed rapidly. This can be seen as the result of two separate reasons: - one economic, the other

educational (3.2.1); in which ESP approaches have been developed involving not only changes in method but also changing ideas of what is to be included in language and its description (Johns 2013; Bhatia et al. 2011; Hyland 2006; Dudley-Evans and St John 1998; West 1997; Swales 1971, 1994; Robinson 1991; DeMarco 1986; Hutchinson and Waters 1987). One of the earliest studies carried out in ESP focused on the elements of sentences (vocabulary and grammar) or "frequency analysis" (Robinson 1991: 23), or *register analysis*, which goes back to the 16th century (Belcher 2006; Swales 1994; Robinson 1991; DeMarco 1986; Hutchinson and Waters 1987; Strevens 1977). Halliday et al. (1964) define it in terms of three parameters: field (referring to language activities such as linguistics, politics or business), mode (referring to medium and the channel selected for communication during the event, e.g. speech, writing), and tenor (referring to how people relate to one another within this situated event, e.g. teacher/student, boss/ employees).

Strevens (1977) notes that Special-Purpose Language Teaching (SP-LT) can be found in two forms: - the traveller's language course and "German for Science Students". He reported that the Second World War created the need for specialist language courses where students only needed a very limited competence in a language in order to fulfil restricted tasks, such as in the Royal Air Force where a pilot was trained in listening skills and with a very limited amount of lexical input. At this time, the development of ESP was influenced by the dominance of United States global economics after the Second World War, meaning that many countries around the world needed to communicate in English, especially in the areas of science and technology. Consequently, a large percentage of journals and scientific published were to be found only in the English language. Education also played a role in the development of ESP, where learners were starting to be considered as more central to the educational process. In other words, learning English has been developed through making the language instruction more student-centred, by identifying specific language needs and designing course materials to meet those needs. Strevens (1977:152) also noted that "... the existence of a major 'tide' in educational thought, in all countries and affecting all subjects. The movement referred to is the global trend towards learner-centred education." This trend in focus-shift was achieved through the constellation of lexical and grammatical features that describes particular uses of language (Martin1992). These particular features can be described in terms of the lexical and grammatical features found in that tasks/texts type, which are different between

contexts, and choosing them is related to the functional purposes that are formulated by speakers/writers, in responding to the demands of various tasks/texts which have also different features. This led people to believe that it was possible to predict what a register would match in these situations or subject-matter from the occurrences of grammar and lexicon.

Analysing and identifying such registers, e.g. the frequency of certain grammatical forms or vocabulary of "restricted" areas of English (Strevens 1977), aims to "establish the statistical contours of different registers" (West 1997:36), which could be achieved through corporate analysis of texts taken from specific disciplines. These statistical descriptions help to create materials that are more authentic representations of what students would actually encounter in the real world. The main motive behind this, according to Hutchinson and Waters (1987:10) "was the pedagogic one of making the ESP course more relevant to learners' needs as the aim was to produce a syllabus which gave high priority to language forms students would meet in the science studies and in turn would give low priority to forms they would not meet."

It can be said that one goal of register analysis merged with contrastive analysis, is that one can predict dissimilarities. Dudley-Evans and St John (1998) and Hutchinson and Waters (1992) point out that there are simply certain grammatical and lexical forms which are applied more often in each discipline. According to Eggins and Martin (1997:231-232), the first step in register and genre analysis is to describe the lexical and grammatical structures which compose the texts under investigation, where there are three key areas of differences between texts. The first area is "the degree of formality of the language used" (focuses the reader's attention on particular grammar structures and vocabulary which are characteristic of formal or informal texts). The second area is "the amount of attitude/evaluation expressed by the text-producer" (the expression of attitude which should be understood such as personal feelings, emotions or opinions). The third area is "the background knowledge drawn on in the texts" (relating to the background knowledge of the writer, e.g. formal texts "use of terms which have specialised technical meanings within academia", and "refer to scholars without biographical details being presented", whereas, informal texts use of "everyday vocabulary" rather than "technical lexis" and indirect references to other texts). Therefore, language teachers can focus on grammatical differences such as the higher rate of occurrence of passive voice

constructions, or the higher frequency of noun compounds in scientific English texts, and they should give more attention to these differences and offer enough practice in manipulating them.

Researchers in EFL (Rababah 2005; Cobb and Horst 2001; Lam 2000; Arden-Close 1993; Farrell 1990) suggest that both technical and sub-technical words should be considered, because EFL learners encounter problems with both of them, but to different degrees. Moreover, Dudley-Evans and St John (1998) argued that the sub-technical should be given priority because these types of words occurrence more frequently in scientific discourse, but with different meanings, to some extent (e.g. Windows in computer science). Cobb and Horst (2001), for instance, claim that the main problem that Omani undergraduate students have is lack of vocabulary; not only *technical vocabulary*, but also *high frequency words* and *academic vocabulary*.

Although language practitioners are still interested in the language of specialised disciplines, there has been a tendency to look beyond the sentence to paragraphs and complete texts to see how the specialist disciplines use writing, which has raised some criticism towards register analysis (Dudley-Evans and St John 1998). First, this approach looked at language features in isolation, and limited its focus to the structural and lexical features of the discrete sentence. Therefore, it failed to recognise the communicative value of discourse above sentence level (West 1997), and did not help students make the semantic and pragmatic connection that comprehension entails. Secondly, it was rather descriptive, and no explanations were provided for why words occurred or why a certain structures was preferred (Nelson 2000).

This criticism of register analysis has led to *Discourse/Rhetorical Analysis approach* in which the focus is on how sentences are combined in discourse to produce real meaning. In other words, it sought to redress the limitations of isolated frequency studies; instead of analysing sentences as independent units, as in the case of register analysis, discourse analysis concerns the text as one unit, which is linked together to communicate a single idea. Furthermore, it reflects not only language in its textual and social context but also in its psychological context. This includes studying the concept of *coherence* "the quality of being meaningful and unified" and *cohesion* "links between sentences and between clauses" (Cook 1989:4,14) and how meaning is tied together, e.g. through formal grammatical devices. Pedagogically, this approach assumes that texts of different

disciplines differ in their rhetorical features, for example, business texts differ rhetorically from medical texts. It is suggested that grammatical features that are found in specific contexts, such as an academic textbook or business letter, might differ from that used in general context (Dudley-Evans 2000).

Such considerations provide a new shift from the examination of language in isolation to analyses that takes into account organisational and cultural factors that influence how the text is used; written or spoken. This trend is relevant to language teaching, since learners have to learn how to produce and comprehend a particular discourse: written/spoken, as it encourages "students to think in terms of use of language for a purpose, rather than in terms of practicing correct usage" (Coffey 1984:4). Sullivan and Girginer (2002), for example, undertook a discourse analysis to improve the knowledge of the ESP instructor, and applied this knowledge to the development of new materials at the Civil Aviation School in Turkey. The results indicated that along with the restricted language used by the civil aviation community there were also variations in local use.

This led to the proposal for more communicative properties of language use in ESP that should relate to learners needs. These proposals see language teaching as a process of analysing the communicative needs of learners in order to determine what learners need to do with the language "target situation" (Hutchinson and Waters 1987). According to Hutchinson and Waters (1987), a target situation is one in which learners will use the specific language they are acquiring (This movement will be returned to in more detail later when discussing the NA approach to ESP). Munby's (1978) approach "Communicative Syllabus Design" is an example of the analysis of communicative settings, which is useful for specifying valid "target situations" (Jordan 1997; West 1994). This approach has not only directed practitioners' attention to analysing and teaching the language of interaction, but also has encouraged a methodology which relies less on mechanical teacher-centred practice and more on the simulation of real-world exchanges (Swan 1985). Despite the value of this approach, it has been increasingly criticised. It does not, for example, include the learners' voice, as it just gathers data about the learners, not from learners themselves, and it is impractical, inflexible, complex and time-consuming (Jordan 1997; West 1994; Swan 1985).

With the development of communicative approaches to language teaching and learning, language as communication is now being seen as an aspect of other subjects. Therefore, a

necessary part of learning any subject is learning how its contents are expressed linguistically. In other words, "how language is utilised to give expression to certain reasoning processes, how it is used to define, classify, generalise, to make hypotheses, draw conclusions and so on" (Allen and Widdowson 1978:59). This concept has been advocated in *Genre Analysis Approach* (Bhatia et al. 2011; Massouleh 2012; Johns 2009; Huttner et al. 2009; Hyland 2006, 2003; Swales 2004; Bhatis 2008, 2004, 1993; Flowerdew 2000; Johns 1997b; West 1997; Martin 1989). According to (Swales 1990:58), genre "comprises a class of communicative events, the members of which share some set of communicative purposes". The fundamental view behind this definition of genre is that linguistic features are connected to social context and function, and aim to offer learners "an explicit understanding of how target texts are structured and why they are written the way they are" (Hyland 2007:151).

This approach has brought changes to the way language is conceived, where scholars have attempted to take this further by focusing more on tools that will allow them to study the complex contextual, social and political aspects of language communications between people and between people and texts, instead of simply relying on the analysis of language and texts out of context. This detailed analysis of genre, not only leads to better understanding of the complexities of language use in a particular community but also the pragmatic strategies that are necessary for effective communication in specific contexts and for specific purposes.

The idea behind this approach is that texts used in particular specialist environments (e.g. business: letter) have particular characteristics that distinguish them from other texts (Dudley-Evans 2000). This means that each part-genre (chapter or section) of the whole genre (science report or business letter) will be recognisable by its particular functions, content and organisation. Therefore, learners need to firstly understand the function(s) of each part-genre, and secondly that content and structure are functionally related Meanwhile, Bhatia (2004) claims that "Language is power, and the power of language is the 'power of genre'. Power of genre is not only to construct, use, interpret and exploit genres, but also to innovate novel generic forms" (p. 189). Along the same lines, Bhatia et al. (2011) maintain that genre should be the aim of all forms of acquisition of academic or professional expertise in any ESP context in terms of "*discursive competence*", "*disciplinary knowledge*" and "*professional practice*" perspectives. Yet, a characteristic

of the register of texts (forms and vocabulary) discussed earlier is that they should not be considered as separated from genres in which they occur, because linguistic variances are part of what constitutes genre.

The advantages of this approach can provide explicit understanding of how target texts are structured, and why they are written in the way that they are (purpose and function). It is also assumed to enable the course writer to analyse large amounts of text that, in turn, help them to ground their courses in the texts that students will have to handle in their target contexts. ESL learners can benefit from this as they will be exposed to different text types, which are authentic. In addition, by exposing students to the target community texts, they are encouraged to make the relevant connection between the use of language, and the purpose of communication (Bhatia 2002). Therefore, learners must fully master such genres in order to use them creatively. Teachers also can benefit from genre analysis as it can provide them with a more central role in preparing the learners to learn by "model the target genre, construct the text together with students and students will then construct a text individually" (Hyland 2007). By applying these genres in the sequences in which they occur in target contexts, teachers not only help learners to develop an understanding of context, but also to understand the ways in which texts can be used for specific purposes. This kind of analysis can be conducted through textbooks analysis, teaching hand-outs, terminology and texts written for particular learners. The collection of this information: sentence patterns, lexis, phrases, expressions relevant to the topic can then be used in the design of lesson plans.

Although the genre approach is largely viewed positively; many concerns regarding research, practice, and dialogue have been expressed. Kay and Dudley-Evans (1998) provide a number of learners' worries (see p.310-11). For example, they report that some participants stated that the approach appears to be focused on teaching *writing*, and that ignores oral fluency, which could lead to limitations with regard to communicative language teaching. Such concerns and others should be considered when this approach is employed (See Kay and Dudley-Evans 1998, for suggestions).

The final movement in ESP is a *Learning-Centred approach*, which focuses on the skills and strategies that learners need in order to acquire a L2, rather than those of others involved in the educational process, such as teachers and administrators (West 1997; Hutchinson and Waters 1987). This approach involves putting learner's needs first, and

focusing on each learner's needs, learning styles, interests and abilities, and in placing the teacher as a facilitator of learning. The concern which led to the development of this movement was that other approaches were "based on descriptions of language *use*" (Hutchinson and Waters 1987:14), whilst it was suggested that more consideration should be given to the methods learners employ to learn. This movement aims to focus not only on the language itself, (e.g. forms of language) but also on the "thinking processes that underline language use"; i.e. the strategies that learners use to deal with learning the language. This is a step towards improving the quality of student learning through a focus on their learning styles. Such emphasis on learning has enabled students to take a self-directed alternative to learning, which is the opposite of the teacher-centred approach where teachers are the primary source of knowledge.This method involves a teacher using a variety of different methods and providing students with a learning environment that encourages critical reflection and knowledge construction through social communication with other students in the learning-community setting (Palloff and Pratt, 1999). Furthermore, this approach takes into consideration the fact that different learners learn in different ways, which is noticed during pair or group work activities.

Integration of such an approach can strengthen student motivation, promote peer communication, increase student engagement with the content, and build student-teacher relationships and responsibility for one's own learning. Therefore, practitioners must take into consideration all learning needs (e.g. why learners want to learn, how learners learn, who they are, what resources are available, and other factors), not just language needs (see Hutchinson and Waters 1987: 63). It may be that such an approach would be most suitable for transferring learners from the starting point to the target situation.

To sum up, it can be seen that research in ESP has been developed from a 1960s' product-oriented based approach to a process-oriented based approach. Studies have "moved from prioritising 'words and structures', to prioritising 'texts and purposes', to prioritising 'learners and genres', but are now more concerned with 'contexts and interactions". One idea that has not been changed is the fundamental aim of ESP: to help language learners attain access to the language they want and need in order to become successful members of the academic, professional or occupational community of which they seek to be a part (Upton 2012; Anthony 2011). To conclude, and based on the above discussion of theoretical assumptions and practical implementations of discourse and linguistic

analysis, the current study maintains that both discourse and linguistic analysis of the target communities are key components of the NA data collection. It aims to investigate the language needs of the target communities.

3.2.3. ESP materials and methodology

Generally, teaching material is anything which "is used to teach language learners (…) anything which is deliberately used to increase the learner's knowledge and/or experience of the language" (Tomlinson 1998:2). According to Hutchinson and Waters (1987:107 - 8) good materials include interesting texts, enjoyable activities that engage the learners' thinking capacities, opportunities for learners to use their existing knowledge and skills, and content, which both learners and teachers can cope with. These materials should also provide a clear and coherent unit structure, which will guide teachers and learners through various activities in such a way as to maximise the chances of learning.

For many ESP programs, the preparation of appropriate teaching materials is one of the most time-consuming activities, where the NA approach, again, plays a significant role in building up this material. Such an association between NA and course preparation "design" has shifted the focus of ELT from language-centeredness to learner-centeredness. This means that materials are student-centred (Nababan1993), and the best course of action is to find as much prepared material as possible that genuinely meets students' needs (e.g. their level and age, their linguistic back ground and educational culture). In other words, this should focus on two factors: the specialist fields in which the language will be used, and the types of learners who will be learning the language.

Dudley-Evans and St John (1998) also provide some characteristics of ESP materials which:

- should present real language, and need to maximise exposure to the language, e.g. by providing additional materials;
- need to be reliable and most involve learners in thinking about and using the language. The activities need to stimulate cognitive not mechanical processes;
- should challenge learners and offer new ideas and information whilst being grounded in the learners' experience and knowledge; to encourage fun and creativity;
- materials should be completed and well laid out."

Dudley-Evans and St John (1998:171-72)

Teaching materials must be relevant, interesting, motivating for the learners and must meet their target situation, since irrelevant materials can affect the purpose of these materials (if they are, e.g. unrelated-d to their subject or linguistically difficult). In addition, the materials should present materials for language practice, ease interaction between students, and promote learner autonomy (Richards and Rodgers 2002:30), because they are used "as a source of language, as a learning support, for motivation and stimulation, and for reference" in classrooms (Dudley-Evans and St John 1998:170).

But how can such materials be selected / adapted? Many researchers have written about methods for choosing or developing materials which are relevant to students' needs. In developing materials for ESP, it is suggested by many researchers that authentic materials should be used, because they can provide students with up-to -date knowledge, and represent what students would actually encounter in the real world (Nunan 2004; McGrath 2002; Peacock 1997; Jordan 1997; Widdowson 1987). Widdowson (1987) argues that authentic texts and sources are not important for classroom materials, as long as the learning processes which learners activate are authentic. In other words, authenticity of process is more important than authenticity of product. According to Ellis and Johnson (1994), this can be done after analysing the needs of the learners and setting objectives for the course. The selection should consider all the learners needs; if they are to be productive (Dudley-Evans and St John 1998; Ellis and Johnson 1994; Hutchinson and Waters 1987), because:

> - Material "determines what kind of language the learners will be exposed to and, as a consequence, the substance of what they will learn in terms of vocabulary, structures, and functions";
> - Material "has implications for the methods and techniques by which the learners will learn"; and
> - "the subject of or content of the materials is an essential component of the package from the point of view of relevance and motivation".
>
> Ellis and Johnson (1994: 115)

Likewise, Lewis and Hill (1993:52-3) argue that the items that are interesting for teachers do not necessarily interest students; teachers should consider student interests when choosing materials. They suggested that course designers should take into account the following points when selecting materials:

- Will the materials be useful to the students?
- Do they stimulate the students' curiosity?
- Are the materials relevant to the students and their needs?
  - Are they fun?
- Will the students find the tasks and activities worthwhile?

This means that ESP teachers tend to analyse and produce their own instructional material rather than relying on commercial material, which is due largely to the fact that ESP classes are convened to deal with the specific needs of the students (Basturkmen 2006; Hutchinson and Waters 1987). In reality, however, only a small number of ESP practitioners have the experience or time to realise the multiple roles of ESP teachers (course designer, selector, evaluator), and they are being burdened with heavy teaching loads and teach group of mixed ability students. Moreover, novice ESP teachers "are not experts in the target field of the learners, and sometimes struggle to comprehend materials that they require learners to master" (Bhatia et al. 2011). Researchers (e.g. Terauchi et al. 2010, cited in Bhatia et al. 2011) show that what commonly happens in ESP classes is that practitioners rely heavily on published ESP textbooks, which might pose serious problems. This is because textbooks are rarely written with a particular group in mind. Evaluation also becomes a matter of testing learners' understanding of such textbook material (Bhatia et al. 2011; Anthony 2011). Wong and Chio (1995), for example, encountered difficulties when they tried to select their materials for their EAP/ESP courses, and found that "ready-made language teaching materials are not always suitable for their particular subject areas or disciplines" in terms of level of English, methodology, class size and the duration of courses.

It is, therefore, argued that stakeholders should carefully study and understand the target ESP community needs and use the suggestions that have been mentioned above and others (e.g. Swales 1980; Jordan 1997; Dudley-Evans and St John 1998) as guidelines for selecting community teaching/learning material and for determining the language skills/components to be included. In addition, it is argued that researchers should use their own criteria for selecting materials, as they can full any gaps in the information and choose to ignore irrelevant information.

There is also a growing body of concern about adopting specificity in ESP, while few hold such extreme views. Dudley- Evans and St John (1998) argue that focus on highly

specialised content could increase the difficulties faced by both teachers and students, even if it offers more efficient, motivating, and justifiable ways to teach. Huckin (2003: 8) also makes a similar point for ESP teachers, "Despite all the research of technical discourse that's been done over the years by LSP scholars, it seldom happens, especially in mixed classes, that the LSP teacher has the disciplinary knowledge needed to provide reliably accurate instruction in the technical varieties of language". More recently, Anthony (2011) argues that a high level of specificity is often impractical.

This debate has led to the proposal for 'wide-angled' approaches to ESP rather than 'narrow-angled' approaches that focus on 'core elements' of language that cross subject specialisation boundaries (Swales 1990; Jordan 1997). In her wide-angled study of needs analysis of immigrant workers in the USA, Garcia (2002) discovered that while the workers mainly needed language to function successfully in their workplace, they had other goals and interests that extended beyond this, e.g. learning to use computers. Another example is cited by Gatehouse (2001) – hotel waiters. Hotel waiters are often expected to use English to a limited extent, but sometimes, they need a greater command of the language. Although, there are clearly certain types of courses that focus on relatively narrow use of language, e.g. air traffic controllers. Belcher (2006:139) sees such arguments as a 'nonissue' and stresses that the teaching approach should really be dictated by or based on what the learners needs. She also maintains that knowledge of specialist discourse is important as it empowers learners, and helps them to develop the skills and strategies that they need to become analysts of their specialist discourse. Hussin (2002:27) also supports the idea that materials "produced for purposes other than to teach language", such as phone messages and written documents can function as language teaching tools. Kaur (2007) also found that some students were mainly happy with a narrow focus as they felt no time was wasted during their course.

Meanwhile, teachers have the responsibility to develop their subject-knowledge and make their students engage with specialist language. It is not assumed that an ESP teacher should become a teacher of subject-matter but he/she must know something about the subject matter of the ESP materials. More specifically, Hutchinson and Waters (1987:163) outline that the ESP teachers are required to have:

- "a positive attitude towards the ESP content;
- a knowledge of the fundamental principles of the subject area;

- an awareness of how much they probably already know."

Evidence for this trend has been experienced by Anthony (2011) within Asian contexts; he argues that teachers who lack the tools and resources to investigate target disciplines begin to feel inadequate in the classroom and rely on published ESP textbooks.

ESP methodology is also another important issue in ESP. ESP courses are needs-driven, and make use of the underlying methodology and activities of the discipline they serve (Dudley-Evans and St John 1998). However, there is no specific methodology for ESP, thus the methods that are applied for ELT are the same as those that can be applied to ESP; the same classroom activities and techniques that are acquired in EGP teaching can be usefully employed in ESP classrooms (Hutchinson and Waters 1987). It can be seen that an ESP course is needs driven, and that its main objective is to meet the specific needs of the learners (Dudley-Evans and St John 1998; Hutchinson and Waters 1987). This indicates, therefore, that there is no fixed methodology for ESP that is applicable for all communities and situations, but rather each community and situation has particular demands which will require certain methodology. Similarly, Dudley-Evans (2001) argues that "the use of a distinctive methodology is … a variable characteristic of ESP" because learners have not yet begun their academic or professional work and have poor subject knowledge. Thus, methods of teaching ESP courses will be similar to those of general English, which means that teachers for Specific Purposes have a lot in common with teachers of general foreign language. In both cases, it is necessary for teachers to consider linguistic development and teaching theories, and to develop their pedagogical repertoire.

Nevertheless, it is believed that ESP has sometimes moved away from the established trends in ELT, and has always been associated with NA and preparing learners to communicate effectively in the tasks prescribed by their field of study or work situation. Therefore, the choice of teaching methods and techniques depends primarily on the students' linguistic demands and those of the situation (Donesch-Jezo 2012), where ESP teachers have a vital role in setting goals (goals define general learning outcomes and concepts, i.e. what you want learners to learn) expressed in broad terms (e.g., clear communication, problem-solving skills, etc.) and activities; acting as a course organiser, creating a learning environment, and acting as an evaluator. They need to decide what kind of methodology and classroom activities are most suitable for the language learners with respect to their needs: present or future. The teacher can, then, design an ESP

syllabus grounding it on the theoretical framework of a teaching method, for instance, Communicative Language Teaching (CLT), etc. or on a combination of several methods, depending on the language learners' needs. The communicative approach to ELT is a good first choice as it is recognised not only as the dominant approach, but also the most appropriate teaching theory for ESP courses. This is because ESP has much enriched the communicative movement. According to Hutchinson and Waters (1984) ESP and CLT are often thought to be closely related. Furthermore, CLT is learner-centred and emphasises communication and real-world situations (Richards 2006; Richards and Rogers 2002; Rost 2001). "It implies teaching language as a skill and as a means of communication, in communicative contexts based on authentic materials by modelling communicative situations from the real world in the classroom" (Kyiv 2003).

Cannon and Newble (2000:16) argue that to improve the teaching-learning process, teachers should shift from behaviourist and translation theories to cognitive and communicative ones. They should work with the students not just on language skills but simultaneously with learning skills and strategies (Dudley-Evans and St. John 1998). For example, activities should be created that attract students' attention and involve them in real communication. Harmer (2001:154 - 6) suggests six techniques that should be applied to implement new language points and activities: "demonstration, explanation, discovery, accurate reproduction, immediate creativity, and check questions." Likewise, Dornyei (2001) also provides a number of techniques that make learning stimulating and enjoyable: making tasks challenging, make task content attractive by adopting it to the students' natural interests or by including new, funny elements; personalising learning tasks, and selecting tasks that produce tangible finished products (see also Richards 2007).

However, no assumption is made here that the whole approach should be relied upon; it should be pointed out that practitioners have to be careful not to use typical CLT techniques which are often childish, e.g. jigsaws, if the target students are adults. Therefore, the ESP practitioners should also take into account other teaching methodologies besides CLT, e.g. Content-based or Task-based Instruction (CBI) and Task-based Learning (TBL) approaches. CBI, for example, has been used in ESP classrooms, where most of the teaching materials are directly related to the students' main area of study or profession. According to researchers (Brinton 2003; Richards and

Rodgers 2001; Widdowson 1978), the focus of classroom activities is not on the language itself, but rather on learners acquiring skills and/or knowledge through the use of the target language (in this case English) as the language of instruction. If for example, students are taught how to design computers, and English is used as the language of instruction, then the students will increase their language communicative skills whilst simultaneously learning the skill of designing a computer programme. TBL also attempts to provide learners with a natural context for language use. The focus here is on developing communicative activities required for English language learning, performing tasks using the target language and then using this language in other way for learning tasks (Nunan 2004; Skehan 2003; Willis 1996). The students in a chemistry class may be required, for instance, to come up with a strategy for writing a report or to present results about a particular experiment. The conclusion one can draw is that exposure to a variety of language teaching approaches is necessary because teachers would be able to provide the most appropriate one for the target students.

Another issue in ESP teaching practice is that teachers, firstly, are generally given the freedom to teach courses in the manner that they feel will allow them to achieve the goals of the course, and so they need to be skilled enough to provide the right ESP teaching repertoire. There is a need to ensure that all teachers understand that the success of any ESP programme is always based on cooperation between all stakeholders. Secondly, there is the issue of assessment (see 3.2.4), where most ESP teachers are inexperienced in dealing with learner assessment and course evaluation. Nevertheless, the institution should take a central role in helping teachers, and should invite them to workshops in which the goals of courses and assessment procedures are explained and discussed. This is because assessment guides learners' approaches to study, provides them with feedback on their progress, judges their performance and guarantees academic standards.

Teachers also need to consider the classroom learning environment, in terms of talk-time, class size and organisation. As a teacher, you may be the only English speaking person available to students; therefore, talk-time should be appropriate (Dudley-Evans 1984). Teachers must also give the students adequate opportunities to engage in activities, should listen to what they are saying and offer feedback. Students must also be self-confident in order to communicate, and teachers have the responsibility to help build such

confidence, because some students might have good language skills, but might not feel confident about speaking in front of the rest of the class.

Class sizes should also be controlled as "foreign languages cannot be taught in large classes" (Wood et al.1974: 533). There is some consensus among researchers that "smaller classes do lead to a more positive attitude toward the subject matter of the course" (Schimin 2000) and have a positive impact on the motivation of both the teacher and the learner (Finn et al. 2003). Furthermore, teachers, in small classrooms, are more likely to be able to devote time to given individual attention to all students, and to be able to practice a variety of teaching methods, and other active-learning approaches (Dudley-Evans 1984). However, students in large classes generally have limited opportunities to practice the target language whether this is through oral interaction or reading activities. Large classes also restrict the mobility of the students and the lecturer from using collaborative activities held in class (Locastro 2001).

3.2.4. Evaluation of ESP materials

Materials evaluation is an important part of materials selection as well as the materials development process, and it is important to understand whether materials are furthering the purpose of a particular programme. In this regard, Hutchinson and Waters (1987:96) describe evaluation "as a matter of judging the fitness of something for a particular purpose". Along the same lines, Cunningsworth (1995) states that careful selection should be made, and that the selection should closely reflect the aims, methods, and values of the teaching programme, i.e. the more information the evaluator can gather about the nature of textbooks, learners and situations, the better will be the choice (Hutchinson and Waters1987). One of the purposes of evaluation is that through this process, teachers become familiar with the content of available textbooks and recognise the weaknesses and strengths of each, and whether or not such textbooks or materials are consistent with the needs and interests of the learners they are intended to serve. Another purpose is suggested by Cunningsworth (1995). She argues that evaluation can be considered as a means of conducting action research, in which the teacher is able to evaluate the usefulness, strengths and weaknesses of teaching materials applied. One of the methods which can help in achieving the above-mentioned goal is maintaining systematic materials and on-going evaluation procedures, which ensure that materials are consistent with the programmes' needs and interests (Nunan 1991).

Putting this in practice, a number of researchers have discussed and suggested different methods of evaluating materials which include questionnaires, observation, interviews, checklists and others. However, it is important to recognise that there is no one perfect method of evaluating materials. Robinson (1991) and Hedge (2000), for example, proposed three types of materials evaluation: preliminary, summative and formative. Preliminary evaluation takes place before an ESP course begins, and involves selecting the appropriate available materials. Summative evaluation normally takes place at the end of a course, and formative evaluation is normally throughout the course, and usually examines the materials, not the students. Cunningsworth (1995) and Ellis (1997) have also suggested three types of materials evaluation: *predictive* or *pre-use* evaluation, in which the future or potential performance of a textbook is examined, *in-use* evaluation, which is intended to examine the textbook or materials currently being used, and r*etrospective* or *post-use* of evaluation, which is concerned with how to improve the given textbook for subsequent use. Robinson (1991) stresses that observing past learners who are now working may be an effective means to understanding the extent to which the ESP course has fully prepared the learners for the workplace. After the observation is completed, the course designer is then able to re-organise the course materials for the following year.

Breen and Candlin (1987), provide further guidance to assist teachers in selecting materials. Firstly, they ask four initial questions about the usefulness of materials:

1- What are the aims and content of the materials:
2- What do they require the learners to do?
3- What do they require the teacher to do?
4- What function do they have as a classroom resource"

Breen and Candlin (1987:13)

Secondly, they suggest practical criteria for evaluating the teaching materials in ways which are sensitive to classroom language learning:

1- The learners' needs and interests.
2- The learners' approaches to language learning and the teaching/learning process in the classroom.

Breen and Candlin (1987:18)

Hutchinson and Waters (1987) divide the process of materials evaluation into four steps: defining criteria, subjective analysis, objective analysis, and matching. They suggest that teachers can set their own criteria which make it easier for them to compare different sets of materials. There are also other criteria for internal and external evaluation which are worth mentioning: external evaluation, internal evaluation and overall evaluation (McDonough and Shaw 2003), formative and summative type (Dudley-Evans and St John 1998), and a predictive evaluation and a retrospective evaluation (Ellis 1997).

In summary, it can be argued that one can agree with Sheldon's (1987) idea that there are no universally applicable evaluation criteria, but that those which have been designed and suggested by researchers could be used as a guide for evaluation materials. The evaluation also depends upon the nature of the programme and on the timescales and resources involved. Look, for example, at Alderson and Scott's (1992: 25-58) and Sheldon's (1988: 237-47) studies, it can be seen that they have different aims. Alderson and Scott's study identified the effects of a particular approach to second language education and used this to inform decisions on its future nature, whereas Sheldon's work evaluated ELT textbooks and materials in general and then used this to find better methods to help practitioners in choosing textbooks and teaching materials. I am not advocating using two or three criteria at the same time, but finding the appropriate one, as each criterion has a different purpose, and each teacher has a different interest. As Cunningsworth (1995:5) notes, "it is important to limit the number of criteria used, the number of questions asked, to manageable proportions. Otherwise, there is a risk of being swamped in a sea of detail." However, "two heads are better than one" when making decisions (McGrath 2002: 52). It is argued that practitioners should select criteria that allow them to locate the materials that will best suit the learners and their learning needs.

3.3. Needs analysis approach (NA)

3.3.1. Overview of NA

Needs Analysis (NA) was first introduced in the 1920s by Michael West when he taught Indian civil servants, and the idea of the analysis of the learners' needs was proposed by Richterich (1972). This idea was then developed to include Target Situation Analysis (TSA), which was first appeared alongside the functional/ notional work of Wilkins (1976), and was followed by Munby's (1978) Communicative Syllabus Design. It has been argued by numerous researchers that NA is the "cornerstone" in identifying the

course objectives, and the learners' communicative and linguistic needs (see Basturkmen 2010; Hyland 2006; Long 2005a; Hamp-Lyons 2001; Dudley-Evans and St John 1998; Jordan 1997; West 1994; Robinson 1991; Brindley 1989; Hutchinson and Waters 1987; Richterich 1980). The features of discourse and types of texts needed by learners are determined by NA investigation, and these are, in turn, integrated into ESP courses (Basturkmen 2010).

One area that has a higher regard for NA is ESP (Jasso-Aguilar 2005; West 1994). According to Hutchinson and Waters (1987: 55-54), NA tends to be associated with ESP, but it can also be important for EGP; they argue that "any language course should be based on NA (p. 53). Furthermore, most of the goals of ESP classes that are related to the learners' purposes are determined through the process of NA, which distinguishes ESP from non-ESP purposes. It has been suggested that the NA process can determine why a particular group of learners need to use the target language, and can identify their needs. These needs can then be arranged in order of priority (Richards et al. 1992). If the reasons behind such needs are known, then these can be used to design the content of the language course. With such a systematic process, this content: the texts, skills, linguistic forms, and genres that a particular group of learners need can all be determined.

Accordingly, the current study aims to build a NA procedure to investigate the language needs of science students. The investigation is based on the assumption that learners are the key factor in course design, but it also considers other aspects.

3.3.2. Definition of needs analysis

The definition of NA seems to be a controversial point, which is due to the combination of its terms: *needs* and *analysis*. The definition of *needs* differs depending on the purpose of analysis, but all take the learner as a focus of analysis, which is described as "*objective* and *subjective"* (Brindley 1989:65), "*perceived* and *felt"* (Berwick 1989:55), "*necessities*, *wants* and *lacks"* (Hutchinson and Waters (1987). *Objective needs* are the target situation in which learners' real world communicative requirements are identified so that courses could be designed reflecting these and preparing learners for their intended use of the target language. These include communicative competence "e.g. study or business", lack of skills, linguistic sub-skills, relevant content, and so on. They can also be examined through *discourse* and *genre* analysis. To make this concept more complex, objective

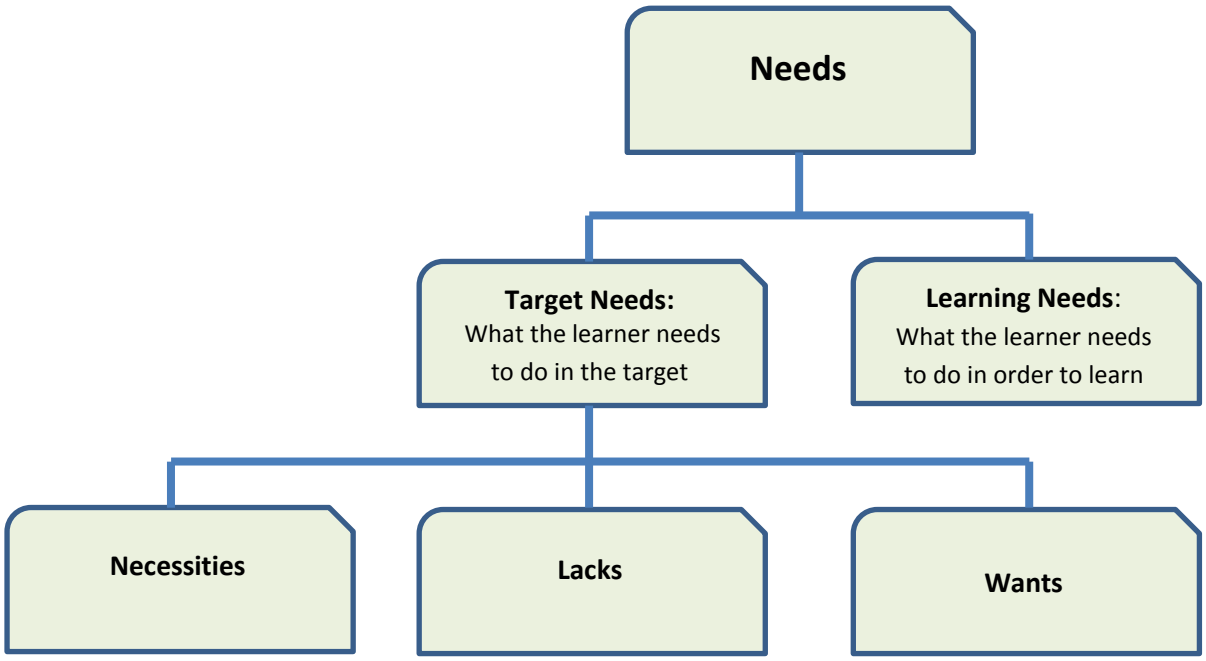
needs are more than the target situation analysis. They also derive from the needs of the place of study or work, the professional field and the social situation. While the *subjective needs* are the present situation which are more likely derived from the learners themselves and influence the teaching methodology of the syllabus, e.g. biographical information, learner preferences: why the learner has undertaken to learn a foreign language, and the classroom tasks and activities which the learner prefers (Nunan 1988: 18).

According to West (1994) *needs* cover what learners will be required to do with the foreign language in the target situation and how learners might best master the language during the period of learning. This description is similar to that of Kaur (2010) and Hutchinson and Waters (1987). Hutchinson and Waters (1987: 55-58), for instance, distinguish between "*target needs*" and "*learning needs*" which is later followed by the three types of the target needs abovementioned "*necessities*, *wants* and *lacks"*(see Figure 3.1). Target needs, according to them, are "what the learner needs to do in the target situation", and the learning needs are "what the learner needs to do in order to learn" (Hutchinson and Waters (1987:54). Once identified, these needs can be taken into account in the programme's goals and objectives which, in turn can be used as the basis for the selection of materials selected, teaching activities and tests development and evaluation strategies.

All on all, it can be said that the rationale of *needs* is that learners learn a foreign language for different purposes, and that they require it to do different things. It is crucial to understand these purposes, as they are considered the starting point for an ESP program (3.2.1, 3.2.3.). An undergraduate student, for example learning a foreign language for academic purpose will need different language skills from a hotel waiter. Alderson (1980) proposes that there are four types of needs: Firstly, *formal needs*, which refer to the requirements to meet the institution's regulations and pass examinations. Secondly, an *actual* or *obligation need*, which refers to what a learner, has to do with the target language once (s) he has learned it. Thirdly, *hypothetical future needs*, which refer to the requirement to become a better professional. Finally, a *want* refers to what a learner feels that they want to achieve or to learn. Therefore, in order to design an effective language course for a learner to achieve their purpose, it is essential to know why a learner decides to study a language and under what conditions (s) he is going to use it.

This is, beyond *analysis*, this is the process in which these particular needs are measured, which in turn, lead to an appropriate action.

Figure 3.1: Target Needs and Learning Needs



Researchers have described and looked at NA from different perspectives that serve their purposes and interests, with careful thought regarding their learners' needs. In broad terms, it can be described as identification of "what learners will be required to do with the foreign language in the target situation and how learners might best master the target language during the period of training" (West 1994: 1). Grave (2000:98) updates the vision of NA, and defines it as "a systematic and on-going process of gathering information about students' need and preferences, interpreting the information, and then making course decisions based on the interpretation in order to meet the needs" (see also Dudley-Evans and St John 1998:125) .

From an educational perspective, Brown (2004:102) argues that "needs analysis is the systematic collection and analysis of all subjective and objective information necessary to define and validate defensible curriculum purposes that satisfy the language learning requirements of students within the context of the particular institutions that influence the learning and teaching situation". This perspective is similar to that of other scholars (e.g. Grave 2000; Robison 1991; Brindley 1989) who emphasise the importance of *learner*

needs and *learning needs* as well as the specific content in designing a successful curriculum.

More recently, Hyland (2006) sees NA as the processes that are involved in gathering data which serves as the basis for determining the needs of learners or groups of learners and which can then be arranged according to priorities. This includes a focus on the future of the learners, or what should be done, rather than on what has already been done These kinds of needs include "learners' goals and background, their language preferences, and the situations they will need to communicate in, which "can involve what learners know, do not know or want to know, and can be collected and analysed in a variety of ways" (Hyland 2006:73). Furthermore, this process cannot only be a one-off exercise, but should be on-going and continually refined, as teaching and learning develop.

For the current study, NA is seen as a systematic method that investigates the community's purposes; (here a science context); for learning the target language which is in turn used as a base for generating the appropriate learning repertoires (e.g. content, pedagogic methods) needed to achieve their purposes. It is suggested that the collection and application of information relating to science students' needs (Strevens 1988; Johns and Dudley-Evans 1991; Robinson 1991; Jordan 1997; Grave 2000; Benesch 2001; Hyland 2006), would establish the:

1- Target situation analysis: tasks, activities and skills for which science students will be using English.
2- Present situation analysis: what science students know and do not know in relation to the demands of the TSA.

These two approaches will be discussed in detail later (3.3.4.6 -7). To sum up, one can say that the factual definition of the abovementioned approach is that the differentiation between what students can do with the language and what they should be able to do cannot be seen from one perspective. Braine (2001) argues that disagreement amongst linguists about the specific definition of NA is common, however they all agree that external factors have influenced the definition, e.g. staffing, time, cultural attitudes. In conclusion, it can be said that whatever definition is taken by practitioners, all community members and learners (because their needs determine learning needs) should be a part of the planning process.

3.3.3. Necessity for needs analysis (NA)

The fact of the matter is that learners and stakeholders have different needs, and that there are different social and cultural factors which should all be considered carefully, individually and systematically. Analysts must collect information from various sources, due to the multiplicity and diversity of needs, situations and contexts. Such vision is seen as being conducted through NA by a number of researchers and is used as the base for designing any ESP course (Bhatia, et al. 2011; Belcher 2009; Purpura and Graziano-King 2004; Graves 2000; Dudley-Evans and St. John 1998; Benesch 1996; Johns 1991; Hutchison and Waters 1987). That is to say that "no medical intervention would be described before a thorough diagnosis of what ails the patient, so no language teaching programme should be designed without a thorough needs analysis" (Long 2005a:1). In most instances, the content of any ESP course should only be determined after a comprehensive and on-going NA (Benesch 1996), if an ESP programme is designed which will be of the greatest benefit to learners (Wright 2001).

What makes NA so popular and unique in the field ESP is that it provides a means of obtaining wider input into the content, design and implementation of a language programme that can be used in developing goals, objectives and content. It helps practitioners to separate learners' and learning needs into order of priority (Richards 2001; Basturkmen 1998; Robinson 1991; Nunan 1988; Hutchinson and Waters 1987; Munby 1978). Furthermore, during a programme, NA can be used to assure that learners and programme goals are being adequately met, and allows for necessary programme changes. At the end of the course, it can also be utilised for evaluating progress and planning future programmes. The abovementioned factors show how essential NA is in investigating learners and learning needs. This includes not only "target needs", what learners need to do in the target situation, i.e. language use and "learning needs"; what learners need to do in order to learn, i.e. language learning, but also learners' subjective needs, such as their interests, wishes, expectations and preferences (Hutchinson and Waters 1987; Nunan 1988).

Several studies in the literature have also discussed the importance of NA as a factor in designing and developing ESP courses (Rahman 2012; Jabeen and Mahmood 2011; Kaur 2007; Purpura and Graziano-King 2004; Xenodohidis 2002). For example, Basturkmen (1998) investigated the English language needs of the undergraduates in the College of

Petroleum and Engineering at Kuwait University, and argued that NA is a useful tool for collecting data about students' expectations. Uvin (1996) shows the importance of the learners' involvement in the process of syllabus design. However, in spite of the comprehensive needs analysis that he conducted, he did not succeed at first, because he realised that the course had been designed without students' participation. Soon after the course had begun, Uvin discovered that he had only considered the work related needs of the learners and forgotten the learners' voice and the cultural aspects of working in an American nursing home. The results were that the content was too narrow and the teaching methods did not match students' expectations and abilities. He also discovered that many of the learners demonstrated resistance and inconsistent attendance.

Richards (2001) also deals with NA from the point of curriculum development. He argues that information gathered from students, teachers, administrators, and employers in the planning process helps to identify general and specific language needs and aids the development of the content of a language programme. He also explains that this approach assures a flexible and responsive curriculum, rather than a fixed one, which provides information to the practitioners and learner about what the learner brings to the course, what has been accomplished, and what the learner wants and needs to know next. He states that NA in language teaching can be used for a number of different purposes:

- "To find out what language skills a learner needs in order to perform a particular role, such as sales manager, tour guide or university student,
- To help determine if an existing course adequately addresses the needs of potential students,
- To determine which students from a group are most in need of training in particular language skills,
- To identify a change of direction that people in a reference group feel is important,
- To identify a gap between what students are able to do and what they need to be able to do, and
- To collect information about a particular problem that learners are experiencing."

(Richards 2001:52)

With all these characteristics of NA in mind, this approach is applied in this study, and tries to stress the vital role that it plays in defining learners' needs. Our decisions are based on the rationale of both ESP and NA perspectives. ESP is understood to be about

preparing students to use the target language within academic or professional environments. Moreover, a key characteristic of ESP course design is that the syllabus is grounded on an analysis of the needs of the students, which is always investigated through NA. This means that language is learnt not for the purpose of gaining a general education, but in order to gain success within the target community. In addition, the syllabus in the ESP programme is based on students' needs, which can be obtained through NA. Such a syllabus is more likely to be motivating for students, because it is produced according to their needs. In order to gain a better understanding of learners' needs, a number of approaches have been suggested for this purpose.

3.3.4. Needs analysis approaches

The important work of Munby (1978) has led researchers, especially in ESP to propose various NA taxonomies and suggest various ways in which students' needs may be analysed (e.g. Benesch 1996; West 1994; Robinson 1991; Berwick 1989; Brindley 1989; Hutchinson and Waters 1987). For the current study, critical needs analysis, means analysis, deficiency analysis, learning situation analysis (LSA), present situation analysis (PSA) and target situation analysis (TSA) approaches to NA are presented. Each of these approaches offers expanded focus of comprehension rather than replaces prior ones. However, the focus will be on PSA and TSA because they are the most appropriate for the current study RQs.

3.3.4.1. Critical needs analysis (CNA)

Critical needs analysis (CNA) has been developed by Benesch (1996). It examines target situations of particular learners or groups of learners, and then endeavours to address future learning conflicts by examining the academic contexts in which the learners' needs are situated. CNA "seeks areas where greater equality might be achieved" (p. 736), and encourages institution's classes in EAP to be agents for social change by involving the students in a fight against "efforts to diminish their opportunity to pursue a degree" (p. 735). It reflects on the target situation as a site of possible reform, which "takes into account the hierarchical nature of social institutions, and treats inequality, both inside and outside the institution, as a central concern" (Benesch 1996: 723). It is also a recursive component of a transformative curriculum that includes on-going syllabus negotiation and materials creation, based on needs that emerge through students' experiences.

Benesch goes further and has distinguished between NA and CNA. She believes that it is necessary to go beyond the descriptive approach to NA and to consider CNA. Her argument is that NA (…) "is mainly descriptive", and is used to establish the initial factors in the curriculum development process, such as pre-determined syllabuses and materials. She adds that NA has not taken into account social issues affecting students' academic lives, such as budget cuts, and those that may affect their future professional lives, such as deteriorating job opportunities. She also suggests that NA should include an investigation of "who sets the goals, why they were formulated, whose interests are served by them, and whether they should be challenged" (Benesch 2001:43).

Nevertheless, this study has ruled this approach out, regardless of the high degree of criticality that it provides. The reasons for this are, firstly that this approach is rather narrow in the way that it works with other departments and secondly, because of the limited duration of the study, it would be impossible to carry out such a process (e.g. interviews with decision-makers, collaborative involvement of subject tutors). In addition, the researcher's role, here, is not to pass judgment or to act as a decision-maker, but to act as a researcher. Finally, Benesch's discussion of CNA is detailed and useful, but seems to focus on the situation in the US to the disregard of others. For example, some features of CNA do not need to be investigated, for example education funding, as it is free in Libya (see 2. 3). Disappointingly, she fails to take her research work out of the US, and "also seems to be unaware that the idea of negotiating a syllabus is becoming increasingly widespread in postgraduate education and in any outcomes based academic institutions such as Zayed University in the United Arab Emirates or the University of Glamorgan in Wales" (Stephenson and Cook 2002).

3.3.4.2. Means analysis

This type of analysis aims to find out information about the classroom environment in which the course will be conducted (Swales 1989). It first appeared in the late 1970s and early 1980s (Allwright and Allwright 1977). It is mainly concerned with the contextual variables of the learning/teaching environment, rather than with the language and the learner in particular (Jordan 1997). The major factors considered are: the classroom culture and the management infrastructure and culture. It is argued that what "might work well in one situation, may not work in another" (Dudley-Evans and St. John 1998: 124), even though different situations might share some language needs (e.g. hotel staff around

the world will all need a certain degree of language ability). However, the conditions in which learning takes place and where and how learners apply the language are not the same. In this regard, Swales (1989. cited in West 1994) suggests five factors related to this approach that specialists should consider: classroom culture, EAP staff, pilot target situation analysis, status of service operations and study of change agents.

Such considerations of the classroom environment, as noted in chapter 3, are essential to ESP courses, but have not been examined in this study. This is because the features of the constraints that are required for this study have been covered by other methods (class observation). In addition, means analysis is time consuming (observing both tutors and students for extended period of time where access might be difficult) if conducted properly, and could not be achieved within the duration of this study.

3.3.4.3. Deficiency analysis

This approach identifies the gap between what the target students know at the present and what they are required to know by the end of the course. In other words, it covers the point from PSA to TSA and it always keeps the learning needs in mind. West (1994) reported in Allwright (1982) that deficiency analysis provides information about what target situation needs learners lack or feel that they lack. Another concept of deficiency is finding out whether learners are required to do something in the target language which they cannot do in their mother tongue. For example, teaching students to do something in English which he/she can already do in Spanish is a very different problem from teaching him/her something in English which he/she cannot do in Spanish (Alderson 1980:135).

This approach seems to be formed of a combination of both PSA and TSA, which can then form the basis of the language syllabus, as it provides data about the gap between PSA and TSA concerning further linguistic knowledge, mastery of EGP, language skills, and learning strategies (Jordan 1997). The current study will not endeavour to evaluate science students' language deficiency, as PSA was developed to cover this, therefore, this approach is ruled out.

3.3.4.4. The language audits analysis

This term was coined by Pilbeam in 1979 and used in language training for business and industry to set out: the target for learning needs and to bridge the training gap between

present performance and the required performance in the target language, which was all based on an analysis of staff needs. It aims to discover the strong and weak points of a company; in terms of the communication process carried out in a foreign language (Robinson 1991; Nelson 2000; West 1994). Therefore, tasks or activities that people perform in their jobs, e.g. formal meetings, making presentations, should be investigated and then the level of language performance required by these tasks must be ascertained (Robinson 1991).

Long (2005a) reported in Coleman (1988) that "language audits take institutions as the unit of analysis and that they are usually conducted through a quantified general survey" which include; target situation analysis, a profile of existing language abilities and a recommendation concerning the amount and form of language training. Such an approach requires a full investigation of the target situation, which involves identifying the situation in which the language is used, together with the specific tasks that are carried out. The second consideration is *the goal;* the establishment of the level of employee competence required for the successful completion of the tasks identified (job specifications). The third consideration is *the starting point; the determination* of the current levels of competence of the employees, and the design of the training programme that will take the employees from their current levels of competence to the levels of competence established the goal. Finally a full report of the programme should be presented to the organisation or sponsor.

In summary, one can conclude that the language audits analysis appears to be more suitable if conducted within an organisation, but that it can also be carried out in an ESP context. However, the approach was excluded from this study as some aspects of investigations are not covered in this approach (e.g. attitudes, styles of learning and so on).

3.3.4.5. Learning needs analysis

Learning needs analysis aims to explore the learners' favoured learning styles. It tries to establish strategies to discover how the students wish to learn, rather than what they need to learn (West 1998). This includes the process of learning and motivation in order to help them to improve their learning (Jordan 1997). Ideally, it is conducted with a group of learners before a course takes place to determine what their expectations are, and to

consider the most suitable methodologies to adopt as well as what type of course is needed. Allwright (1982) makes a distinction between *needs* (skills which are seen as relevant to them), *lacks* (the gap between the learners' present competence and their desired competence) and *wants* (those needs on which learners place a high priority in the limited time available.

Language researchers (e.g. Gilakjani et al. 2012; Brown 1996; Grasha 1996; Felder and Silverman 1988; Reid 1987; Witkin et al. 1977) have studied and classified learning styles in numerous ways. Some researchers have looked at cognitive styles and distinguished between field-independent and field-dependent learners. Field-independent students are confident in their learning abilities and are not easily influenced by others. They prefer learner-centred methods and do not like group work very much. In other words, they tend to rely less on the teacher or other learners for support. Conversely, field-dependent students prefer focusing on the whole picture and do not care so much about the details. They prefer teacher-centred classroom situations, good hand-outs, and clear deadlines and instructions for activities. Furthermore, these students often work well in teams as they tend to be better at interpersonal relationships.

Other researchers have identified different perceptual learning styles: the visual, the kinaesthetic, and the auditory. Visual learning is associated with images and techniques. These learners prefer visual representations of presented material- pictures, diagrams and charts. They may think that they learn best from visual displays. Kinaesthetic learners are those who learn through experiencing or doing things, and like movement. They tend to lose attention if there is little or no external stimulation or movement. When reading, for example, they like to scan the material first, and then focus in on the details. They usually use coloured highlighters and take notes by drawing pictures, diagrams, or doodling. Auditory learners learn through listening and depend on hearing and speaking as a main way of learning. They enjoy conversations and the chance for interactions with others. Still others such *active learners* who learn by trying things out and/or working with others, *reflective learners* are those who like to think about language and how to convey their message accurately or *theorist learners* who learn most effectively when dealing with theories and like a clear and definite purpose for work.

Such identification of the learners' learning strategies and styles are valuable for language teaching and learning as well. This is highlighted within the field of ESP by a number of

researchers (Grenfell 2007; Dudley-Evans and St John 1998; Jordan 1997; Hutchinson and Waters 1987). West (1994:11) reported on what Strevens (1988) noticed; Strevens found that "previous school learning experience influences both proficiency and learning style". In Greece, for example, Griva and Tsakiridou (2006) conducted a survey study of 301 university students to discover the range and types of learning strategies applied in reading, listening, writing, and speaking for academic purposes by the students. They found that a "number of students use some cognitive strategies less frequently and often select those that are inappropriate either for a particular type of text, for a certain situation or a task". They also highlighted that students with lower level of language competence chose less productive strategies, e.g. translating, frequent dictionary use, word-by-word reading and translating. Furthermore, they reported that switching to their mother tongue was frequently used, which is also preferred in other contexts (e.g. Italy: Cianflone 2009 and Jordan: Khassawneh 2011).

However, those with adequate language proficiency preferred more complicated strategies, such as synonym words, identifying clues from the context to understand the unknown words (Griva and Tsakiridou 2006; Griffiths 2003). The researchers aimed to help students' reflect "on their own learning, to develop their knowledge of, and ability to apply learning strategies, to assess their own progress, and to apply their language skills beyond the classroom". They concluded that language classrooms should have a double focus; teaching both content and an awareness of language processes.

Such information about students' learning strategies is appropriate to learning needs as they are relevant in the process of structuring a course. It is suggested, for example, that students' engagement in an on-going dialogue about how to learn could give a sense of empowerment during the learning experience, which in turn, would lead to high achievement and self-confidence level. Furthermore, it is claimed that information about the students' favourite learning styles is essential for teaching using English academic texts (Nunan 1995:3, cited in Griffiths 2004). Students, for example, who use their own learning styles and strategies generally cope better with any problems that they might face and have an increased sense of ownership and involvement in classroom activities when learning the target language (Grenfell 2007). In this regard, Hutchinson and Waters (1987) suggest a framework designed to helps analysing the learning needs of students which consists of four questions (see p.62-63 for more details):

1. Why are the learners taking the course?
2. How do the learners learn?
3. What resources are available?
4. Who are the learners?

Therefore, it can be argued that the investigation of the students' preferred styles and strategies conducted in the present study will give a clear picture of students' conception of learning and guide the researcher to what areas require focus. For example, learning factors such as language level, cultural background, motivation, age, task requirements, etc. should be kept in mind when designing the ESP course. It also is advisable that NA should be carried out to identify learners' *objectives* and *subjective* needs before the beginning of the course, as they may give suggestions for "strategies (cognitive, metacognitive and communication) that teachers should select and develop" (Martinez 1996:111). However, these two elements of needs (objectives and subjectives) are also covered in PSA and TSA.

3.3.4.6. Present situation analysis (PSA)

Present situation analysis (PSA) was proposed by Richterich and Chancerel (1980). It is considered as one of two main approaches of NA; TSA and PSA (Jordan 1997) are seen as two sides of the same coin (Basturkmen 2010). It attempts to identify what the learners are like at the beginning of the course, e.g. their strengths and weaknesses, their skills, perceptions, and familiarity with the subject (Hyland 2006; Robinson 1991). In other words, it refers to the term "means needs" which enable learners to learn and pursue their language goals as the course progresses and "ends needs", or those associated with target goals (Brindley 1989). In this regard, Richterich and Chancerel (1980) suggest three basic sources of information for this approach: *learners themselves, the teaching establishment, and the user-institution*, which can be collected from various sources: students, teachers and the place of study or work (Jordan 1997).

Considering that there are multiple sources of data, it is proposed that detailed guidelines and techniques regarding the kind of information be included. Information can include; the students' level of ability; their views on language teaching and learning, and their attitudes towards learning and using English. In connection to this, Hutchinson and Waters (1987) provide a framework that can be used to analyse learners' PS:

Table 3.1 Hutchinson and Waters (1987) Model of PSA

- *Who are the learners*?	- *How do the learners learn?*
Age / sex / nationality	Learning background
Subject knowledge	Concept of teaching and learning
English background	Methodology
Teaching styles used to	- *What resources are available?*
Interests	Teachers' competences
Sociocultural background	Teachers' attitudes to ESP
Attitudes to English	Knowledge of & attitude to subject content
- *Why are the learners taking the course?*	Materials, aids
Compulsory or optional	Opportunities for out-of-class activities
Concept of teaching and learning	- *When & where the ESP course take place?*
Apparent need or not	Pleasant, dull, noisy, cold, etc.
Academic or personal goals	Time of day; every day/once a week.
Promotion and attitude	F/P-time; concurrent with need or pre-need

Such a comprehensive profile about learners; (science students in the present context), would be enough to understand learners at the PSA which is the starting point for any ESP course design or development. The students' reasons for taking the course, their language proficiency, interests, attitudes, motivation, styles, etc., all contribute significantly to determining the study needs of the learners. Knowing the students' proficiency in English, for example, can determine what kind of materials and activities should be provided for their language level, which is assumed to be different as this study is dealing with multiple disciplines; computer science, chemistry and physics.

Knowing the students' subject knowledge is also another important issue which, in turn, helps to determine the appropriate materials. These materials should focus on two factors: "the specific areas in which the language will be used and the types of learners who will be learning the language" (Nababan 1993:3). In other words, they should be appropriate to the learners' level and age, linguistic background and educational culture, and should be related to a real world context (Wharton 2004; Nababan 1993). Allwright (1981) also states that materials should teach students to learn and give teachers rationales for how to plan and carry out their practice. Students' interests, in terms of materials and activities, would also be varied; what computer science students' activities practice is not the same as those required by chemistry or physics students. Nevertheless, a common core of activities might exist.

Consequently, this model, as has been previously mentioned, is essential for ESP courses. Studies in this area indicate that it is necessary to know about learners' needs such as their objectives, language attitudes, expectations from the course and learning habits, which in

turn can help with the design and development of an efficient curriculum (Jabeen and Mahmood 2011; Kaur 2007). According to Jabeen and Mahmood (2011), for example, this approach shows some interesting background about students of Zoology, such as "students' preference for speaking skill, their liking for the British English … their eagerness to learn the grammar of the target language…current proficiency level in English". This information was, in turn, used by the ESP practitioners to design courses and develop material for undergraduate students of Zoology at G.C. University in Pakistan.

Lepetit and Cichocki (2002) also place an emphasis on the importance of learners' subjective needs. They argue practitioners to understand students' perceptions of language and their needs in the area of foreign language learning as well as their degree of motivation. Another example is Rahman (2012) who applied PSA, TSA and LSA to investigate the difficulties encountered by the computer science students in reading computer science programme texts. It has been suggested that the findings of this study were beneficial to both students and practitioners. Students, on the one hand, can understand their strengths and weaknesses in English language skills, particularly in reading skills. Practitioners, on the other hand, can use these findings to make informed decisions on the students' English needs within the computer science discipline and to develop syllabuses and course materials.

Above all, it can be said that PSA pursues all the subjective information needed about the target learners, such as age, gender, language abilities, attitudes, styles of learning, and so on. Therefore, it is necessary for the current study to employ an approach in which the subjective information required to answer the RQs can be obtained. In this study, the framework (see Table 3.1) suggested by Hutchinson and Waters (1987) will be used as a guide to understand the present situation of the target students. It is assumed that sufficient details of the target students' present situation can be gained (Hyland 2006; Basturkmen 2006; Hamp-Lyons 2001; Jordan 1997; West 1994), which will help to answer the study RQs.

3.3.4.7. Target situation analysis (TSA)

Target Situation Analysis is a form of NA, which was first developed by the pioneer in this area, Munby (1978). Based on his model (Communication Needs Processor), TSA

provides a comprehensive data profile about the students, and establishes what the learner needs to know in order to function effectively in the target situation. Dudley-Evans and St. John (1998:124) and Basturkmen (2010:19) refer to this process as tasks and activities for which learners are/will be using English; what the learners should ideally know and what they should be able to do.

Likewise, Hyland (2006) also claims that TSA investigates the learners' future roles and the linguistic skills and knowledge that they need to perform efficiently in their disciplines. TSA, therefore, investigates communication needs rather than learning needs. This involves analysis of mainly objective and product-oriented data, such as identifying the contexts of language use, observing the language events in these contexts, and collecting target genre.

However, researchers like McDonough (1984), Nelson (2000) and Jordan (1997) argue that whilst Munby's approach assembled and classified target situations in which learners would probably need to operate, and the list has great theoretical value, it is time consuming and could not easily be operated in practice. Nevertheless, Munby's work has played an important role in the process of designing language courses, whether for English for Specific Purposes (ESP) or English General Purposes (EGP).

Other pioneers in the TSA are Hutchinson and Waters (1987), who classified TSA into three types: *Lacks, Wants* and *Necessities* (see also 3.3.2). *Lacks* presents the gap between TSA and PSA (Jordan 1997; and Blue 2000), i.e. "what the learner needs to know to operate in the target situation and the learner's present language proficiency" (Basturkmen 2010:18). *Wants* are what learners desire to learn or achieve from course, which is based on the learners' point of view (e.g. what their needs are; what kind of knowledge/skills they may lack. N*ecessities* are what a learner needs to know in order to be able to function successfully in a target situation. These can be identified by observing the kinds of situations in which they will need to function, and then analysing the type of language used in these situations (Hutchinson and Waters 1987:55-57).

Hutchinson and Waters (1987) also provide a comprehensive TSA framework, which includes a list of questions to be used in order to identify learners' "real world" communicative requirements (see table 3.2). Such information can be obtained from people working or studying in the field, ex-students and documents relevant to the field,

employers, colleagues and ESP research (Dudley-Evans and St John 1998; Hutchinson and Waters 1987; Robinson 1991; Richterich and Chancerel 1980). Consequently, the results are then used to prepare the intended learners' group for the purpose of the target language which can be later presented in a form of a syllabus (Jordan 1997).

The work of Hutchinson and Waters (1987) has played an important role in developing ESP courses, and has been acknowledged and employed by numerous researchers. Furthermore, it is well-known that NA is one of the most appropriate methods of collecting and defining the learners' needs. For this study, the TSA seeks to answer:

- Why is the language needed?
- Why is it important for the students to perform these tasks in English?
- What tasks do the students need to be able to do in the target situation?
- Why do students want or need to learn these skills?

Table 3.2: Hutchison and Waters (1987:59 - 60) Model of TSA.

Why is the language needed?
- for study; - for work; - for training; - for a combination of these; - for some other purpose, e.g. status, examination, promotion.
How will the language be used?
- medium: speaking, writing, reading, etc.; -channel: e.g. telephone, face to face; - types of text or discourse: e.g. academic texts, lectures, informal conversations, technical manuals, catalogues.
What will the content areas be?
- subjects: e.g. medicine, biology, architecture, shipping, commerce, engineering; -level: e.g. technicians, craftsman, postgraduate, secondary school.
Who will the learners use the language with?
- native speakers or non-native; - level of knowledge of receiver: e.g. expert, layman, student; -relationship: e.g. colleague, teacher, customer, superior, subordinate.
Where will the language be used?
- physical setting: e.g. office, lecture theatre, hotel, workshop, library; - human context: e.g. alone, meetings, demonstrations, on the telephone; - linguistic context: e.g. in own country, abroad.
When will the language be used? - concurrently with the ESP course or subsequently; - frequently, seldom, in small amounts, in large chunks.

Such an approach is employed as it establishes the students' language requirements in the academic situation for which they are preparing. It also helps to specify the objectives and content of teaching and learning. By conducting an effective TSA and consulting the right stakeholders (e.g. subject teachers, supervisors and teaching materials) an initial listing of the target goals can be obtained. Data obtained from such sources should provide researchers with a number of language functions that occur frequently in certain contexts in which, for instance, science students are expected to operate. It is also expected that the data will identify common lexical items and grammatical structures and the particular ways in which learners use these in science. In addition, getting access to the authentic science materials (e.g. lectures, written articles) will reveal some of the communicative activities in which they need to engage.

This approach is necessary in this study in order to answer one of the research questions. It is useful as it provides reliable and relevant information about the target situation of learners. For example, in order to teach how to write a chemistry report, ESP practitioners need to investigate real chemistry reports. Alharby (2005), for example employed the TSA approach to carry out a NA study to investigate the English language target communicative needs of medical students in Saudi Arabia. The results from his questionnaire study reveal that English language is used extensively in the medical field, and is considered to be the main tool of communication in the careers of health professionals. However, dentists and physicians were more exposed to English than pharmacists and applied medical specialists. The results also revealed that the receptive skills were perceived as more important than the productive skills. Finally, the results indicated that the English courses for health professionals were insufficient in relating the English language use to their medical needs.

However, this is not 100% proof of the validity of the TSA approach investigations. The reason for this is that functions, for example, are much more difficult to specify. There is also a danger of learners only knowing the restrict language used in their target situation which might not enable them to function outside that narrow context (Mackay and Mountford 1978). Furthermore, the predictability of language needs is a controversial issue; some researchers have argued that language needs can be predicted (e.g. Munby 1978; Swales 1990; Bhatia 1993; Blue 2000), but others disagree. O'Neil (1977:8) in his

article “The limits of functional/notional syllabuses”, for example, shows the difficulty of predicting the exact language that learners might need in a given situation.

3.3.5. Methods of NA data collection and conducting

In the context under investigation, Hutchinson and Waters (1987) outline various ways in which relevant information can be gathered from learners. It is anticipated that questionnaires, classroom observation, interviews and the collection of students’ work samples will provide valuable and sufficient information. In addition to this, Brown (1995) classified procedures and techniques for gathering NA information dividing them into six categories: existing information, tests, observation, interviews, meetings and questionnaires. The most popular ones are questionnaires and structured interviews (involving the recording of opinions and attitudes), observation, the analysis of authentic spoken and written texts, informal consultations with the faculty members and assessment results. Peck (1991:370) suggests that observation and intuition may be more productive tools than assigning questionnaires or essays as means to understand a student’s social needs, emotional needs, and learning style. Similarly, Jordan (1997) lists fourteen different methods for gathering needs data which include: student self-assessment, class progress tests, previous research, advance documentation, language tests at home, and language tests on entry, learner diaries, case studies, final tests, evaluation/feedback, follow-up investigation, surveys, structured interviews and observation.

Nevertheless, it is important to bear in mind that there is no single method of data gathering for the purposes of NA and that a combination or adaptation of methods to suit one’s own teaching situation might be more instructive and helpful. Cowling (2007), for example has highlighted the value of triangulation to develop ESP teaching materials, as it can validate the materials developed by ESP practitioners. Basturkmen (2010), Jasso-Aguilar (1999) and Long (2005a) have all used mixed methods to consider the language needs of the learners, which is also advised by other researchers (e.g. Ary et al. 2009; Creswell and Plano Clark 2007; Smith 2006).

To undertake NA, therefore, these questions should be determined:

1. Who will conduct the study?
2. What kind of information needs to be collected?
3. How will the information be collected?

With regard to the first question, researchers argue that data can be collected either by insiders (teachers themselves or educational counsellors); or outsiders. The insiders, on the one hand, are familiar with much in the PSA, if not the TSA. On the other hand, outsiders may have the advantage that they can bring a fresh pair of eyes to a situation, provide a different view on teaching and learning, and may be able to make an impartial assessment of what is required. However, they do not know the situation and the environment; they might miss or misinterpret data (Robinson 1991; Dudley-Evans and St. John 1998).

The second question considers the kind of information that needs to be collected. In many circumstances, needs are hard to predict; nevertheless, a researcher must decide what aims or hopes of particular community need to be understood. For example, the area to be focused on, kinds of English, skills, what the learners want and need to know to function in those contexts, what they expect to gain from the course, etc. The third question considers the method of data collection. Information can be collected by a number of techniques, as previously mentioned: interviews, questionnaires, observations, tests, class discussion, report studies and work samples.

Finally, the timing of this collection and then its processing and analysis should be considered before NA is carried out. NA should be completed before any course or series of courses starts, so that a course outline, materials and other sources can be created before teaching begins. Initial questionnaires and interviews can be completed with the learners; as consultations with other teachers and professionals in the field. Then, when needs are clear, learning aims can be defined in terms of the specific purposes for which the language will be needed, whether it is reading scientific papers or communicating with technicians. Other researchers (Nunan 1988; Robinson 1991; Dudley-Evan and St. John 1998) assume that NA should be repeated during the course, which is more obvious method because the PSA may change.

With regard to the three questions, it can be said that there is no specific method for NA. Thus, any decision about which type (s) of methods to apply in NA research is in the hands of researcher (s), because he/ they know more than others about the target research context/situation. This includes learners, stakeholders, culture, politics, environment, etc. that affect the process of investigation.

3.3.6. Research studies in NA

In literature on ESP, NA has been conducted on language programmes in many different settings (academic and professional) and areas (medicine, computing, etc.) with the aims of developing and designing courses/syllabuses or investigating problems. Within the Arab context, NA literature published by Arab scholars is limited, and less attention is given to NA (Kandil 2009). To my knowledge, no ESP needs analysis research has been conducted in Libya, except MA research papers or Swales (1971) "Writing Scientific English". The following is an overview of studies in NA which have been conducted in different parts of the world, and which cover number of fields of science.

In the Arabic world, a large-scale investigation in ESP was conducted at Yarmouk University- Jordan. Zughoul and Hussein (1985) investigated the English language needs of four faculties; Natural Sciences, Engineering, Medical Sciences, Economics and Administrative Sciences. The study focused on three major areas: "the English language use at the university, perceptions of students' language abilities, and perceptions of English language needs". For these purposes, two sets of questionnaires were distributed to the subject teachers and students. The findings revealed that English language was applied in most educational settings. This was due to three factors: the majority of courses were taught in English, 20% of teachers were non-Arabic speakers, and teaching materials were published in English. In addition, two elements of genre were practiced; class discussion and student questions in lectures. Students often asked questions in Arabic, while discussion involved both Arabic and English. It was also reported that both subject teachers and students agreed that all language skills were needed, but listening skills were the most important. Interestingly, the study found that students exaggerated their abilities in the different language skills, while subject teachers made a more realistic assessment. This is because the faculty members "feel that students are not sufficiently proficient in English to comprehend lectures". This factor should be taken into consideration when student self-assessment is investigated.

Ghenghesh, et al. (2011) report their experiences of investigating the perceptions of English language needs of undergraduate business students and their business faculty members at the British University in Egypt. Findings from both questionnaires and interviews show "a number of curriculum components for each language skill that should be incorporated in the syllabus for each English module that students would find

interesting and relevant to their needs." It was revealed that both students and teachers perceived English to be essential for study and work purposes. Skills such as giving presentations, listening to lectures, and reading academic texts were preferred as they were considered most relevant to their study and work. They also suggested that such skills should be incorporated in the syllabus for each English module. Another important suggestion which was made by both types of participants was that the research skills model should be introduced in the first year, rather than in the last two years. In addition, writing and speaking were considered the most important skills for business students, followed by reading and listening.

A number of students and teachers expressed dissatisfaction with the English modules, which they considered uninteresting, of little benefit and not suitable for the needs of students in the faculty. They suggested that reading material relevant to the degree area should be introduced in the English modules as they are motivating and interesting. The study also reported on the use of the NA approach in the Arab world, and stated that this approach had not received adequate attention, a fact which is also reported by Kandil (2009). Consequently, the needs of Arab learners are seldom or never analysed, and these students rarely have any input in their language teaching context.

Basturkmen (1998) explored the English language needs of students from seven departments in the College of Petroleum and Engineering at Kuwait University. In her study, Basturkmen employed mixed methods to generate responses from students and faculty members about various aspects of learner needs including language proficiency, expectations of a language course, etc. In the target situation, she found that language sub-skills of reading textbooks, writing lab reports/lab assignments, following lectures, listening to instructions and note-taking in lectures were all important for the students' study. With regard to the present situation, the findings reveal that students encountered problems in some language skills, but that there were different views amongst faculty members and students. Faculty members perceived that most students have inadequate writing skills, whereas few students reported inadequacy in any skill area other than speaking.

Another example is Alqahtani (2011) who applied NA to investigate the language needs of, and the impact of cultural variations on, postgraduate Saudi students studying at a British University. To understand the impact of culture on learning, he employed TSA

and PSA. The results indicate that Saudi students have specific needs, which are mainly related to culture differences. Such findings show that a students' cultural background is also an important aspect of study, as it may affect their learning process and progress. It has been suggested that the UK University English for Academic Purposes (EAP) needs some improvement to meet Saudis' "specific needs". Furthermore, more academic and cultural information needs to be provided for Saudi students.

A more global study is provided by Posteguillo (1998). This study concerns the importance of genre in language teaching and learning. He tried to investigate the models used in introductory sections of research articles in the field of computer science, comparing them with "moves" suggested by Swales (1990). His focus was on three sections: the introduction, results and discussion\conclusion, which were identified as the most frequently applied in the field of computer science. In this study, 40 articles were analysed which were selected from three different academic journals in computer science research and recommended by subject teachers at the Computer Science Department. The results show that the IMRD (introduction-methods-results discussion) written pattern cannot be systematically applied to research articles in computer science. For example, the introductory and concluding sections are more used in computer science research articles. The concluding sections seem to follow two moves: the statement of results and the recommendation for further research moves. The study concluded that computer science research articles "lack a systematic pattern" because some computer scientists do not follow a "clearly recognisable structural model", while others do, at least by using these two patterns for the introductory and concluding sections. Such results provide evidence that language is used differently in each culture, and that each text has a different pattern and a set of features which may distinguish them from other texts (Bhatia 2008; Dudley-Evans 2000; West 1997; Swales 1990).

Regarding ESP course development, Chostelidou (2010) carried out a NA study to identify the Greek tertiary education needs in order to develop a relevant ESP course. The elements of investigation included the students' prospective professional needs, language skills and tasks, deficiencies in language skills, preferences for certain learning styles, methodologies, and teacher roles, and suggestions for better ESP training. A mixed method was adopted in this project, and triangulation of sources and methods was also attempted in order to secure the validity and reliability of this study. The results reveal

that students are in favour of focusing on their specific discipline, and using materials relevant to this, but with a flexible syllabus that provides practice in both receptive and productive skills. In addition, their reasons for studying English varied between study and professional purposes. In terms of problems with language, writing and oral communication skills posed the greatest challenges to students. Furthermore, students reported that the PS arrangements of the ESP course did not meet their target identified needs. The students suggested that an ESP training programme which addresses the students' immediate needs as students and their long-term needs as professionals in the accountancy business was needed.

In order to understand the importance of a particular situation and particular teaching materials for that situation, NA has also been applied in English speaking countries, for example, to investigate the failure of immigrant nurses in their academic study at a US university. Bosher and Smalkoski (2002) wondered why many ESL nursing students were not successful in their academic courses. First, questionnaires, interviews and observations were designed for data collection to find out the nurses' objective needs. Secondly, a speaking and listening course was developed at the work place (health care) to identify the nurses' main area of difficulty: communicating with clients and colleagues, with a focus on "assertiveness skills, therapeutic communication, information-gathering techniques and the role of culture in health-care communication". The results reveal that communicating with clients and colleagues in the clinical setting was perceived as the greatest challenge. Interestingly, the research also reported that the modified course had been successful in helping students to communicate more effectively in clinical settings, both culturally and linguistically.

These studies were all affected by the development of NA approaches to different degrees. Some depended to a larger extent on Munby's (1978) Communicative Needs Processor, and others adopted Hutchinson and Waters' (1987) perspective of investigating both PSA and TSA. Qualitative and quantitative, mixed methods were the data-collection methods used by all these studies. Four of the studies discussed, i.e. Zughoul and Hussein (1985), Ghenghesh, et al. (2011), Basturkmen (1998) and Alqahtani (2011) took place in the Arabic region, and the present study also hope to contribute to the understanding of English language teaching in this area. There were a number of similarities in the conditions and status of English language teaching in all the countries

examined. For example, the participants of all studies; were adults and all required English for academic purposes in their native countries. In addition, some of the results of the four studies agree with those of the current study. For instance, they reported that students had an inadequate knowledge of English language.

In general, the studies have acknowledged that the voice of both learners and stakeholders are essential. The learners' perceptions of their needs often vary (as do those of the stakeholders) and are significantly affected by their attitude toward English, their environment, culture, and in some cases economic and political situations, which should be taken into consideration. The most popular research method applied among scholars seems to be questionnaires and interviews. The results have showed that researchers should draw on a mixture of sources when gathering information about learning and learners' needs if reliable results are to be obtained (Chostelidou 2010; Long 2005a; Jasso-Aguilar 1999; Basturkmen 1998).

What can also be understood from these studies is that the learners' voice is essential in establishing learning needs, and that these are always varied. Some learners see a narrow-focus as essential, and others do not (Chostelidou 2010); some find that all language skills are important (Ghenghesh, et al. 2011), but feel that writing and listening are more necessary, while others find communication is a greater challenge (Chostelidou 2010; Bosher and Smalkoski 2002). Zughoul and Hussein (1985) offered an example of TSA in which much information was obtained from faculty members and students through the completion of questionnaires. The study reveals that English is widely employed, and that listening comprehension is the most necessary skill for success at university level. This was indicated by both students and faculty members. Interestingly, it also shows that the views of all in a community are essential, as they might share the same view (s) or not, which increases the reliability of the research results.

Alqahtani (2011) shows the impact of culture on language learning in the Saudi context, which is an example of both PSA and TSA. The results reveal that some aspects of a student's' present situation, such as their language ability, different assessment types and culture were not considered by students themselves or by decision makers, which affected students' achievements. For example, female students faced difficulties in classroom interaction, as the EAP classes offered were mixed, which was unusual situation for them. With regard to the target situation, the study found that the most difficult skill to master

academically at British universities was writing. A lack of exposure to a real English-speaking environment, and lack of familiarity with the use of English also provided challenges for Saudi students at British universities.

Based on these studies and literature review discussions, one can conclude that NA has become a near- inevitable first step in identifying particular learners' needs and developing an ESP language programme. Furthermore, through an understanding of the strengths and limitations of all studies, the current study tries to take advantage of the development of NA theory by focusing on target language needs and language learning needs. It also applies triangulation methods and resources in order to obtain more accurate and reliable data.

3.3.7. NA implications for the current study

As discussed in 3.3.6-7, PSA and TSA are applied in order to investigate the needs of science students (Long 2005a; Graves 2000; Jordan 1997; West 1994; Robinson 1991; Hutchinson and Waters 1987). The data collected from the target community (PSA) is used alongside that collected from science departments and faculty members (TSA) to provide a complete picture of students' language needs in a science context. In my opinion, the two approaches are adequate for establishing a clear picture of why, how, when and where language is needed, because they illustrate the relationship between the students' present and target situations. That is, study of the students' present situation can be used to identify which include their strengths and weaknesses, styles, attitudes and so on, at the initial stage. Study of the students' target situation allows researchers to identify not only the communicative requirements of the students but also the types of tasks that the students will be required to perform.

In the light of this theoretical orientation, the target situation in this study is the science community, where related stakeholders and students' will be analysed, and teaching materials will be examined in order to identify the language needs of the target community. The study regards the PSA of science students and practitioners, and examined students' perceptions of language knowledge, attitudes, and preferences of learning as well as their satisfactions/dissatisfactions with the ESP course content, organisation and methodology. The practitioners' perceptions of the target students will also be investigated. Through these two approaches, the investigation aims to understand:

1. To what extent is English needed in the science setting?
    - What is the science community's present situation (PS)?
        - What is the science students' present situation?
        - What do the science students learn in the ESP course?
    - What is the science community's target situation (TS)?
        - Why and where is the language needed?
        - What type of genres are used in science classes?
        - What type of registers are used in science classes?

These two approaches are considered to be the starting points for investigations into learners' language needs as well as for developing/designing ESP courses (Chostelidou 2010; Bosher and Smalkoski 2002; Hamp-Lyons 2001; Jordan 1997; Dudley-Evans and St John 1998, West 1997; Zughoul and Hussein 1985). Furthermore, the other approaches (3.3.4.1 -5) could be combined with the two main approaches; PSA and TSA. Determining the target students' levels of English is crucial for practitioners, to allow them to decide which skills need to be the focus of a course. Other issues such as attitudes towards learning the language, styles of learning are also important including the students' perception of learning the target language; is it for study purposes only or also for work and other purposes? This type of information can guide the practitioner to select the most appropriate materials and activities for courses. With PSA, it is assumed that sources such as the science and English tutors, the students themselves and the place of study can provide valuable information about the students and learning needs. This information includes:

- Reasons for taking English
- Language competencies and challenges
- Preferred skills and activities
- Preferred materials
- Preferred style of language learning
- Attitudes
- Social activities
- Subject knowledge
- L1 check

- Physical teaching environment
- Tutor's profile (language, qualifications, experience and nationality)
- ESP course content
- ESP course pedagogy

As for TSA, I am seeking to know why, where, what, how and when English is needed, which could include investigating issues such as:

- Tutors' perceptions (e.g. reason/s for using the language)
- Teaching materials (e.g. language of texts, genre, register, etc.)
- Classrooms vision (e.g. language of delivery, sources, interaction, etc.)

Determining why English is needed, for instance, is important, as it offers a valuable guide to the students' specific needs, which allows course to be more relevant and beneficial as well as time efficient (Wharton 2004; Flowerdew and Peacock (2001; Benesch 1996; Seedhouse 1995; West 1994). Moreover, such focus is believed to help students to perform well in their academic studies as well as representing real-world language use (Flowerdew and Peacock 2001; Widdowson 1998). Another example of TS needs is genre (see 3.2.2), which is also an important element which requires investigation. Genre, as described by Swales (1990:58) "comprises a class of communicative events, the members of which share some set of communicative purposes". The reason for this investigation was the fact that language is used differently within different communities/disciplines. By identifying such elements, practitioners could ground their courses in the texts that students are likely to have to handle in their target contexts, and can offer suitable language resources and skills, and give students explicit instruction in the academic language of the content to which they will be exposed. To make it clearer, the type of activities practiced by computer science students (e.g. writing C++ programme) are different from those practiced by chemistry students (e.g. experiment reports). Identifying such differences according to Hyland (1999) will have the effect of "helping students to produce authentic text by introducing to them the accepted moves in writing." It is also argued that the implementation of genre analysis is one path to successful communication. Having acquired such genre knowledge in the specialist community, the students will then begin to practice them successfully.

It can be concluded that all NA approaches play roles in language teaching investigations. Gathering and analysing such data can allow researchers to determine needs and learning aims, and to design courses that are relevant to the specific purposes to which the language will be put, whether it is, for example, reading and understanding scientific papers, writing a report or writing a computer programme. It is hoped that the results of this study will make a valuable contribution to this aim. PSA and TSA can be especially important for newly founded programmes where there may not be a well-established curriculum, and can also be used for developing the current ESP course/syllabus or designing other ESP courses.

3.3.8 Limitations of needs analysis

Clearly, the role which needs analysis plays in any ESP course is significant (Flowerdew 2013; Richards 2001; John 1991). However, a number of limitations of this approach have been revealed: firstly, most ESP learners are not homogeneous. Therefore, students' needs in a group are not identical, and in many cases may vary quite significantly. Secondly, some necessary information for conducting the analysis may be inaccurate or unavailable. Moreover, information about students' needs is difficult to predict. For example, asking students about their language needs can be challenging because they may lack the ability to describe these needs in any meaningful way, and sometimes this can be misleading (Long 1996), because they are not often familiar with the specific purposes for which they are learning English, and they probably do not know exactly what they require in order to gain the best knowledge for the academic field they are about to entre (Basturkmen 2006). Basturkmen (2006) also argues that objective needs of students are not necessarily the same as their subjective needs or wants, because students may objectively need to deal with lab report texts concerned with study matter, but may want to read topics in English on other subjects of general interest. A third limitation of this approach is that perspectives of needs are different, and the decision of whose perspective to take into account in designing or developing ESP courses often depends on individual and subjective judgment (Jasso-Aguilar 1999). Moreover, learners' future needs, in many circumstances, are difficult to predict with any degree of accuracy.

Another criticism is that a NA may conclude with a variety of functions and concepts that, when turned into language forms, could not be organised into a coherent teaching sequence. A final limitation is that learners' needs may not always be successful initially,

because many variables are changeable as learners may start with one set of needs, and end with a new set of needs after a few weeks. Nevertheless, NA is still an effective method, and has had the beneficial effect of reminding language teachers and syllabus designers that the aim purpose in language teaching is to enable the learner to use the language effectively in the situations they will need to communicate in. It has also helped to focus on the range and variety of uses to which the language is put.

3.4. Summary and conclusion

This chapter presented the literature review related to the present study, namely; NA approaches. However, in order to understand the area of the present study, the first section of this chapter provided an overview of ESP in which English for science and technology is included. It also presented and discussed the link between ESP and NA where it has been argued that NA is seen in ESP as a starting point for all decisions made in the area of ELT.

The second section of the chapter discussed and presented the NA approach chosen for this study. It highlighted definition, approaches to NA and methods of collection and conducting, and provided examples of some empirical studies. The chapter ended with a discussion of how the selective approaches (PSA and TSA) were appropriate for the present study. It has been argued that these two approaches are the main methods of NA from which language and learning needs can be determined. My assumption is that a determination of such needs gained from one source might not be enough, but that the community context as a whole should also be taken into consideration; students, teachers and the place of study. In this way, a clear picture of the community's purpose for learning the language will be identified. For this reason, an attempt was made to adopt a NA approach as the starting point for gathering data to determine the language needs of the target population. The thesis will now turn to a discussion of the methodology used to obtain this data.

Chapter Four
Research methodology

4.1. Introduction

This chapter discusses the methodology employed in this study. Firstly, the main purpose and the research questions (RQs) of the study are provided. Secondly, the mixed methods employed for this study and the rationale of the choice of these methods will be described. The quantitative, qualitative and mixed methods are detailed as well as the limitations of mixed method paradigms. The next section involves a discussion of the research study in which the research context is outlined, the participants involved in this study are detailed, and the researcher's roles are explained. Through this study, I tried to create methodologies that would guide me to realise and address the target students' immediate needs as students and their long-term needs as professionals.

In the process, the research instruments applied in the study are presented. These include questionnaires, observations, interviews and teaching materials. The chapter, then, discusses the data analysis methods applied in the study, triangulation, the validity and credibility and some ethics and risks issues related to the study. Finally, the limitations of research methodology are discussed and conclusions are drawn.

4.2. Rationale for the study and research questions

The main objective of this study is to investigate to what extent English language is needed within a science context at the faculty of science. It aims to find out why, where, when and how the target language is needed which draws on the NA approaches of Hutchinson and Waters (1987) and Dudley-Evans and St John (1998), among others to investigate the language needs of the target community. In order to provide a broad understanding of the aims of the study, the following research questions were generated:

1. To what extent is English needed in the science setting?
   - What is the science community's present situation (PS)?
     - What is the science students' present situation?
     - What do the science students learn in the ESP course?
   - What is the science community's target situation (TS)?

- Why and where is the language needed?
- What type of genres are used in science classes?
- What type of registers are used in science classes?

The initial choice of specific research questions was shaped by the analysis of the existing literature of the target community, as discussed in Chapter 2, and also on the ESP approach set out in Chapter 3 which identified several areas that required investigation, which mainly based on the present and target situations analysis proposed by Hutchinson and Waters (1987), Dudley-Evans and St John (1998), West (1994), Robinson (1991), Nunan (1988), Richterich and Chancerel (1977) and others. Under the umbrella of NA, present and target situations approaches have been incorporated in shaping the study RQs , along with key concepts such as; necessities, wants, lacks, aims, subjective and objective. It is my view that the complex language needed by science students can be most comprehensively explored through the analysis of scientific discourses, which can demonstrate who needs language, and why, where and how that language is needed.

The first sub-question aims to explore the target community's present situation which is divided into two elements. The first is to identify who the learners are at the starting point which includes biographical information, language proficiency and language difficulties, attitudes and styles of learning. The second element concerns the current ESP course in terms of materials, activities and methods provided in this programme. Another area of investigation is the aims and objectives of the course, and examination of the English teachers in terms of their qualifications, and experiences of - and attitudes towards ESP. The sources of this information are the students themselves, the teaching establishment and the "user of institution" (Jordan 1997:24).

The second sub-question concerns the target destination needs, which include three elements; exactly where the science students will be expected to function in the academic/work place. The first element aims to understand who needs English, as the study deals with three disciplines (computer science, chemistry and physics), and then, why, where and how this English is needed. The final two elements concern text analysis, in both: genre and register (See 3.2.2). "The value of these approaches (…) have particular characteristics that distinguish them from other texts and from the generalised summaries of linguistic features that arise from an approach to text analysis that uses a

corpus of differing texts" (Dudley-Evans 2000:2). It is necessary to investigate these approaches, as all ESP activity has to be linked to a view of text. They can help teachers "to identify and focus on whatever aspect of language in use the learner needs most help with" (Painter 2001: 178), and focus learners' attention on the socio-cultural features of the text-type that occur in target discourse communities and in which linguistic choices are more likely to be made in its textualisation.

In 3.2.2, researchers (Hyland 2007; Dudley-Evans 2000; Bhatia 2004, 2002; Posteguillo 1998; Swales 1990) argue that the implementation of genres is one path to successful communication, and its instruction "used in the target communities is seen as a way ESP can help learners gain acceptance into those communities" (Basturkmen 2006:56), which, therefore, is an important reason for covering them in this study.

The discussion of ESP in 3.2, has also demonstrated that there is considerable interest expressed in the literature regarding register analysis, which is associated with the identification of key grammatical elements of scientific communication (See 3.2.2). It was noted in register analysis previously concluded (Barber 1962/1985; Swales 1971/1988) that "although scientific and technical writing has the same grammar as general English, particular grammatical structures and vocabulary items are used more frequently" (Basturkmen 2006:35). Hedge (2002) also points out that there has been a revival of interest in grammar in recent years, which suggests that students may have grammatical difficulties which interfere with the essentially productive skills or receptive skills. Such views of register are also necessary to be investigated in this study. An overall summary of the research activities is presented in Table 4.1, which displays the research questions to be answered, and other information relevant to the study.

Table 4.1: Research framework

1- Science students questionnaires		
Dimension	**Data**	**Analysis**
Who are the learners? What do the science students learn in the ESP course?	Questionnaires - Closed items	- Statistical - Interpretative
2- Stakeholders: science and English tutors interviews		
Why and where is the language needed? What type of genres are used in science classes?	Interviews - Structured protocols for science stakeholders	- Interpretative

Who are the learners? How do the students learn?	Interviews - Structured protocols for all stakeholders	- Interpretative
What do the science students learn in the ESP course?	Interviews - Structured protocols for English stakeholders	- Interpretative
3- Contextual Analysis: science and English classrooms observations & documents		
Why and where is the language needed? What type of genres and register are used in science classes? **TS**	Existing Documents - Textual Analysis of teaching and exam materials Class Observations - Science class observation	- Descriptive - Interpretative
What do the science students learn in the ESP course?	Existing Documents - Textual Analysis of teaching hand-outs Class Observation - Language class observation	- Descriptive - Interpretative

4.3. Rationale for research design

In looking at the research literature, it seems that there has been extensive debate among researchers with regard to methods of conducting research, research paradigm divisions, and the value of the enquiry (Gephart 1999). Within the NA approach, Robinson (1991) and Jordan (1997) suggest a number of different methods for conducting NA, which include questionnaires, interviews, case studies, tests and documentations. There is no legitimate way of asserting with absolute confidence that one method is better than another as "Each represents different investigation paradigm and the choice is based on the underlying assumptions of each paradigm" (Hoepfl 1997:48). Therefore, the decision about which method (s) would suit a particular researcher depends on the research questions under investigation.

For the purpose of this study, mixed methods (qualitative and quantitative) will be applied, and the reason for this is a combination of the researcher's beliefs, and the literature review (Long 2005a; Boyd 2000; West 1998; Brown 1995) which assumed that mixed methods would allow for the strengths and weaknesses of each method. The rationale for applying such methods lies in the fact that both methods are best to answer the research questions raised in the study. Furthermore, researchers who work in this area (e.g. Long 2005a; Jasso-Aguilar 1999) argue that multi methods and multi sources should be used in NA to increase the overall reliability and validity of the research. Witkin and Asltschuld (1995:279) also support this idea and state that "we do recommend that you use more than one data source or method and that you balance quantitative methods with

qualitative ones", because single data is "generally insufficient to provide an adequate basis for understanding needs and making decisions on priorities".

When data from the current study is interpreted, the findings of both methods will be brought together, and the analysis will either use areas where the findings converge to strengthen the study, or to explain any lack of convergence that may result (Creswell, 2003). It has been have assumed that such a combination of results will be valid and as the study will involve looking at evidence from different perspectives. In this study, mixed methods, multi or mixed methods, mixed models, qualitative plus quantitative, and combined qualitative and quantitative methods (Smith 2006) are applied to guide the researcher towards answering the research questions. It is hoped that this methods will not only give a multidimensional point of view, but it will also offer unbiased information that can be interpreted with a degree of certainty.

4.3.1. Quantitative Research

This mixed research method will be used to explore and understand student's beliefs, experiences, attitudes, behaviour and interactions, and students' attitudes towards English course, which is one of the aims of this study. Only a questionnaire (4.4.4.1) was utilised because the number of participants involved was greater than one-hundred.

Quantitative research relies primarily on the collection of quantitative data. Logical positivism or quantitative research employs experimental methods and measures to test hypothetical generalisations. It generates numerical data or data that can be converted into numbers which can be separated easily so that they can be counted and modelled statistically and factors that may distract from the intent of the research can be removed. The result of a collection of numbers then can be subjected to statistical analysis. Because of these advantages, a questionnaire has been used in this study so that the participants' results can be broken up easily and counted statistically.

This method also shares its philosophy with a positivist paradigm. It can be argued that this paradigm might not be suitable for social science research, and in some respect, this research, because the variables could be quantified and the experimental context could not be controlled. However, it offers a rich source of knowledge and "takes very specific, very strong positions on everything from the acceptable reasons for doing research to proper methods for collecting and analysing data" (Willis 2007:17). In contrast, an

interpretative method offers a wide range of methods for collecting data and ways of representing the results.

4.3.2. Qualitative Research

Qualitative research employs a naturalistic approach that seeks to understand phenomena in context-specific settings and aims to help researchers to organise and describe subjective data in a systematic way (Glesne and Peshkin 1992). It relies on the collection of qualitative data through interview, observation and documentation. Merriam (1998:5) describes it as "an umbrella concept covering several forms of inquiry that help us understand and explain the meaning of social phenomena with as little disruption of the natural setting as possible". It is defined as an inquiry process for understanding a social or human problem, based on building a complex, holistic picture, formed with words, reporting detailed views of informants, and conducted in a natural setting (Creswell 1994). Furthermore, it allows researchers to test an existing theoretical framework and to study the issues in depth. More importantly, this paradigm sees the world from the viewpoint of the people working in organisations, doing particular jobs, and responds to what they say, do and think about what they do.

As it is interested in understanding people's experiences in their natural context, this study seeks in-depth information from small groups of participants, and assumes what this will allow what Maykut and Morehouse (1994: 25) describe as "being at one with the persons under investigation". Creswell (1998) provides number of reasons for selecting a qualitative research method. He states that it is needed because:

- the nature of the research question often starts with a how or a what;
- the topic needs to be explored (variables cannot be easily identified);
- there is a need to present a detailed view of the topic;
- there is a need to study individuals in their natural setting.
- sufficient time and resources are needed for extensive data collection in the field and detailed data analysis of "text" information;
- audiences are receptive to qualitative research, and
- there is a need to emphasise the researcher's role as an active learner who can tell the story from the participants' view, rather than an "expert" who passes judgment on participants.

As the focus of this study on providing in-depth, rich and descriptive data; three types of data collection are employed: interviews, observations and documentations (see 4.4.4.2-4). The researcher will engage in recording of events in classes observations or recording of students or faculty members' talk (Clandinin and Connelly 1991:272). It is hoped that these will offer valid information. Moreover, the view of this paradigm is more acceptable and successful when it comes to investigating human behaviours because humans are individuals, and the present study deals with heterogeneous participants who have different views on what is real (Bassey 1990). It is also suitable for this study; because it will explore and describe the phenomena of innovation in language needs as perceived by the respondents. It is suggested by Lincoln and Guba (2000) that this type of research minimises the distance between researcher and participants in the study to ensure that the phenomenon of innovation is fully explored.

One factor of the qualitative interpretive method is "the nature of reality" (Creswell 1998: 76) and it is believed that the researcher, lecturers and students will offer a meaningful reality for this study. Methodologically, interpretive method focuses on the way research should be conducted. According to (Denzin and Lincoln 1994: 108) a methodology paradigm asks "how can the inquirer go about finding out whatever he/she believes can be known?". Within this paradigm, researchers use different data collection procedures, which include observation of participants, interviews, examination of teaching materials and even questionnaires. The input of all this data collection will provide valuable information that can guide and help the researcher to answer this study's research questions.

4.3.3. Mixed methods

A combination of qualitative and quantitative methods has become increasingly popular during the past thirty years, a fact which can be seen in a number of specialised published books and journals (see Ary et al. 2009: 559). It has been established that to combine both qualitative and quantitative methods "in creative ways that utilise the strengths of each within a single study could minimise weaknesses or ensure that weaknesses of one approach do not overlap significantly with weaknesses of another" (Ary et al. 2009: 559). Mixing data "means either that the qualitative and quantitative data are actually merged on one end of the continuum, kept separate on the other end of the continuum, or combined in some way between these two extremes" (Creswell 2009: 207-8). This kind

of combination could offer the researchers "the opportunity to examine whether their findings converge, are inconsistent, or contradict" (Ary et al. 2009: 560).

Similarly, Cohen and Manion (1994) define mixed methods as the use of two or more methods of data collection in the study of some aspect of human behaviour. It is seen as a kind of strategy applied to improve the validity and reliability of research or evaluation of findings, which include multiple methods of data collection and data analysis. This can work as a filter for selecting data, rather than relying on one method and one source which "may bias or distort the researcher's picture" of a particular situation under investigation. It is also described as "a powerful way of demonstrating concurrent validity, particularly in qualitative research" (Campbell and Fiske 1959).

According to Creswell and Plano Clark (2007:5), mixed methods research:

> "It is a procedure for collecting, analysing, and mixing both qualitative and quantitative data in a single study to understand a research problem or phenomena. As a methodology, it involves the assumptions that direction of the collection and analysis of data and the mixture of qualitative and quantitative approaches in many phases in the research process. As a method, it focuses on collecting, analysing, and mixing both qualitative and quantitative data in a single study or series of studies."

It is argued that mixed methods can provide richness of data, expand the interpretation of findings and offer a better understanding of research problems than either approach alone (Creswell and Plano Clark 2007). However, it is a relatively new approach, more complicated, and methodologists are still developing guidelines of sound practice (Onwuegbuzie and Leech 2006).

Greene et al. (1989, cited in Onwuegbuzie 2002) outline five major purposes for conducting mixed method research: (a) triangulation (i.e. seeking convergence and corroboration of results from different methods and designs studying the same phenomenon); (b) complementarity (i.e. seeking elaboration, enhancement, illustration, and clarification of the results from one method with results from the other method); (c) initiation (i.e. discovering paradoxes and contradictions that lead to a re-framing of the research question); (d) development (i.e. using the findings from one method to help form the other method); and expansion (i.e. seeking to expand the breadth and range of research by using different methods for different inquiry components).

Collins et al. (2006, cited in Onwuegbuzie and Leech 2006) suggest a number of steps that a researcher would go through when conducting a mixed research study. These are as follows: 1) determining the goal of the study, 2) formulating the research objective(s), 3) determining the research/mixing rationale, 4) determining the research/mixing purpose, 5) determining the research question(s), 6) selecting the sampling design, 7) selecting the mixed methods research design, 8) collecting the data, 9) analysing the data, 10) validating/legitimating the data, 11) interpreting the data, 12) writing the mixed methods research report, and 13) reformulating the research question(s).

The present study aims to understand the benefits of triangulation and complementarity (4.4.6 and chapter 7). Firstly, by triangulation, it is possible to achieve a better understanding of the study target community. This will allow more confident interpretation of the results, as each items of data will complete and support the other's strengths and weaknesses (Johnson and Turner 2003), regardless of the fact that the quantitative and qualitative components are treated as separate domains and do not integrate with each other (Bryman 2007). However, Woolley (2009:7) suggests that "quantitative and qualitative components can be considered integrated to the extent that these components are explicitly related to each other within a single study". In this study, the researcher presented the quantitative and qualitative findings independently (chapters 5 and 6), and then merged them together to answer the research questions (Creswell and Plano Clark 2007). During the final stage of empirical results presentation, findings from the quantitative and qualitative data were further compared and connected (see chapter 8). In other words, the two sets of results were compared and contrasted to produce a single interpretation. The integration of findings enables results from one approach to complement and support the other. For instance, through discussing some variables used in the quantitative analysis with interviewees, the weaknesses and strengths within those elements were further explored and improved. Moreover, the integration of both types of data enhanced the overall validity of the research.

4.3.4. Limitations of mixed methods

The idea of mixing or combining research methods has raised paradigmatic issues which remain unsolved. Barbour (1998) argues that a mixed paradigm could be possible, whilst combining methods within one paradigm, such as qualitative, is problematic, because each method within the qualitative paradigm has its own assumption. This has been

considered in this study. Miles and Huberman (1994:41) also argue that the " question, then, is not whether the two sorts of data and associated methods can be linked during study design, but whether it should be done, how it will be done, and for what purposes".

Generally, all research approaches have their limitations – so too does mixed methods research. One of the obvious problems with this approach is that it is time consuming; both at the beginning and at the end, especially when the researcher tries to fit the results together. Johnson and Onwuegbuzie (2004) highlight a number of limitations as follows:

- It can be difficult for a single researcher to carry out both qualitative and quantitative research, especially if two or more approaches are expected to be used concurrently; it may require a research team.
- A researcher has to learn about multiple methods and approaches and understand how to mix them appropriately.
- Methodological purists contend that one should always work within either a qualitative or a quantitative paradigm.
- It is more expensive, and time consuming.
- Some of the details of mixed research still need to be worked out fully by research methodologists (e.g., problems of paradigm mixing, how to qualitatively analyse quantitative data, how to interpret conflicting results).

One can conclude that there are many ways to carry out research, where each method has its advantages and disadvantages, and each makes it easier to understand some aspects and hides others, as does a mixed method. Regardless of these limitations, the employment of the mixed method is not intended to "replace qualitative or quantitative" methods, rather to:

- create ways to strengthen both the quantitative and qualitative methods within a single study, to "minimise weaknesses and to ensure that the weaknesses of one approach do not overlap significantly with the weaknesses of another" (Ary et al. 2009:559).
- provide richness of data, expand the interpretation of findings and offer a better understanding of research problems, and
- improve the validity and reliability of research or evaluation of findings, which include multiple methods of data collection and data analysis

Miles and Huberman (1994) and Barbour (1998) argue that combining both methods is possible. Punch (2005:240) also sees no reason for avoiding mixed methods. According to him, the combination allows researchers "to capitalise on the strengths of the two approaches and to compensate for the weaknesses of each approach". Furthermore, the limitations have been taken into consideration by the research. I worked with supervisors to make sure that the processes of data collection and analysis were consistent.

4.3.5. Conclusion

The foregoing discussion demonstrates that decisions about which methods would suit a particular type of research, depends on the research questions, which need to be answered. Therefore, there is no "good" or "bad" research method; both qualitative and quantitative methods do not exclude each other in a research study, and both are often used to complement one another. Both types of research also use similar elements; stating their purpose, identifying the research community, presenting results and aiming to collect data for a specific purpose. Moreover, all the three paradigms have strengths as well as weaknesses. This is because the nature of the world and human beliefs are difficult to judge.

What a researcher tries to offer is an appropriate approach or approaches for scholars to understand the world in which humans live. Again, a decision, of course, is in the hand of the researcher/s who should argue and convince the audience why a particular paradigm is chosen. As far as a paradigm "produces useful results over time, as well as useful theory, then progress will have been made", and as far as it presents a better understanding of the research situation, then it is worth considering (Onwuegbuzie and Johnson 2006).

4.4. The Study

4.4.1. Research context

The current study took place in November 2009 (over four days – for three to four hours per day) at a faculty of science in Libya. The reason for the chosen place and the limited time is due to the fact that access to universities in Libya can be problematic. Only one university was chosen as the researcher is known to the teachers and administrators at this university, and was therefore able to gain access, which might not have been possible in

an unfamiliar environment. Apart from problems caused by distance (the next closest university is about 600km from Sabha), an unknown researcher would find it extremely difficult to enlist the participation of the administrators, teachers or students. Finding volunteers for the project, even in Sabha, was very difficult, and only a few science teachers agreed to be interviewed and observed. Fortunately both of the English teachers who were in charge of the ESP courses agreed to participate. Because of this reluctance and the number of participants available, extending the period of data collection would not have resulted in a significant increase in data collected. As these English teachers teach large numbers of science students each semester, they were able to provide a lot of information about their students and their experience of working with the science community. In addition, the different types of data provided by the interviews, classroom observations and analyses of teaching materials supported each other and gave a rich environment for discussion and analysis.

As it has been noted in chapter one, the study took place at Sebha University, in Libya, and the subjects chosen for this study were undergraduate science students who were in the second, third and fourth semesters of their study as well as some faculty members (see Table 4.3). The following table (4.2) shows the time-table of data collection. The place of study was selected as I am one of the members of staff and is familiar with the place in terms of students and faculty members, especially English tutors, as I was at one time, the head of the English department (see 4.4.3). English, which was the area of investigation, is considered as a medium of instruction in some academic fields, such as medicine (see 2.3.4). It is also studied as a foreign language in the country as well as a language of communication in some sectors, such as oil and tourism (2.3.1 and 2.3.2.). The following table 4.2 shows the time-table of data collection.

Table 4.2: Timetable of data collection

Time	Type of data
October 2009	University Permission letter
November 2009	1. Questionnaire distribution: completed by science students 2. English and Subjects classrooms Observation: lessons voice recorded, notes taken during lessons 3. English and Subject lecturer interviews 4. Documentation: English and science subject teaching materials

4.4.2. Participants

Since the goal of this study is to provide empirical data to determine the extent of English language use within the science field, the sample population was focused on science and English faculty members and science students. The total population of 134 for the research includes 127 undergraduate science students of various disciplines (computer science, chemistry, physics, maths and natural history), 2 English language lecturers, 4 science lecturers, and 1 administrator (see 4.4.1, 4.4.2, 4.4.3 and 4.4.4 for more information). The participants were chosen on the basis that they satisfied two requirements: completion of questionnaires, and accessibility for interviews and observations. Below, Table 4.3 shows the details of the participants' involved in the study.

Table: 4.3. The study participants and data collection tools

Categories	Questionnaire	Interviews	Observation
CS	127	Position : lecturer Length : 30	No: 2 Length: 75 minutes
CH		Position : lecturer Length : 15	No: 1 Length: about an hour
PH		Position: H.D & lecturer Length : 10	NA
NH		NA	NA
MATH		NA	NA
Administrator	NA	Position: ASSA Length: 15	NA
English (EL1)	NA	Position : lecturer Length : 30	No: 1 Length: 1:50
English (EL2)	NA	Position : lecturer Length : 30	NA
Total	127 students	6 tutors	

CS = Computer Science, CH = Chemistry, PH = Physics, MA= Mathematics, NH = Natural History, A.S.S.A = Assistant Secretary of Scientific Affairs, No number = Doc = documents, St = students

To ensure ethical research practice and to protect the rights of these participants, all participants (instructors and students) were asked to read and sign a consent form. Permission to use human subjects in the research was also obtained from the university (see appendices 1 – 4).

4.4.3. Researcher's Role

The researcher is seen as "part of the social world" (Cohen et al. 2000:141), and according to the qualitative point of view, "researchers interact with those they study,

whether this interaction assumes the form of living with or observing informants over a long-standing period of time, or actual collaboration… the researcher tries to minimise the distance between him- or herself and those being researched" (Creswell 1994: 6). In this study, as a researcher, I previously worked and taught at the institution under investigation for more than seven years (before and after undertaking an MA) which means that I have extensive background knowledge of the university setting and the participants in the study, and am familiar with many members of the university. Bonner and Tolhurst (2002) pointed out three features of being an insider-researcher: (a) having a greater understanding of the culture being studied; (b) not altering the flow of social interaction unnaturally; and (c) having an established intimacy which promotes both the communication and the evaluation of truth. Moreover, insiders know the politics of the institution, not only the formal hierarchy but also how it really works. These advantages allowed me to access to information easily and mean that I have a good understanding of the material that will present in the course of this thesis.

Problems also exist, associated with being an insider-researcher. Hewitt-Taylor (2002), for example, argues that greater familiarity with the culture being studied can lead to a loss of objectivity. Insider-researchers may also be provoked by role duality. They often meet the challenges of how to balance their insider role (instructor, etc.) and the researcher role (Gerrish 1997). Another drawback for the insider is that research methods, especially interviews, are usually not part of the daily practice in Libya, and for teachers and students to say something negative in front of and/or about teachers and people holding a high rank or office is rare and saying something positive is viewed as boasting. This might be one reason why some teachers refused to participate, because I am an 'insider' researcher and held a high-level position in the Faculty.

With regard to the mixed method framework chosen for this thesis, the researcher is the primary means of data collection, interpretation, and analysis. I engaged in gathering information from a range of sources to understand the situation, analyse data, engaged in problem solving, and acted as an organiser. I began the process by obtaining official letters from my academic supervisor, asking for co-operation from the Department of Scholarship and the university in Libya.

As different sources of data collection were employed, and a number of disadvantages have been pointed out, it is important to address and overcome the disadvantages in order

to ensure credible insider research. In the context of this study, the problems of the use of a mixed method, and of being an insider-researcher along with the ways in which these could be overcome, were discussed with the supervisor and taken into consideration. In this respect, I have tried to share responsibility for ensuring ethical research practice for protecting the rights of these participants and for ensuring that this research does not have any unacceptable negative impacts. In order to develop a shared ethics environment, a frank discussion took place with all participants: lecturers, administrators and students, and then Information Sheets and Consent Forms (see appendices 2 – 4) were given out, read and then completed by all. As the primary researcher it is my ethical responsibility to ensure that any data analysis will be confidential and will not be attributable to any one individual.

The second task was the data collection which included completing the questionnaires, conducting interviews, observing English and science classrooms, and finally gathering English and science teaching hand-outs and materials. My primary roles during these sessions were to distribute the questionnaires and to help the students with any problems that were encountered in completing them (see 4.4.1). Whilst conducting interviews, I tried to provide the right atmosphere for the interviewees by offering them the right to withdraw, and by using English or Arabic language where appropriate. Effort was made to avoid any personal questions (for more see 4.4.2). During classroom observation, observational data during teaching periods was gathered, and this was conducted in the most unobtrusive manner possible. I also behaved as a casual observer seated at the edge of the classroom, hence, could remain out of the students' normal line of sight and still have a good view of the classes (see 4.4.3 for more information). The final task was to collect as many sciences and ESP courses hand-outs and examination papers (see 4.4.4).

4.4.4. Research Instruments

As discussed in 4.4, the aim of applying both qualitative and quantitative tools in this study is to capture a complete, holistic picture of the subject matter, with a view to uncovering something that might have been missed by utilising a single method. Such a decision was based on the principle that no single method, could solve the problem of rival explanations (as each research method reveals different aspects of empirical reality), whereas mixed methods can be a valuable research method for: "the validation of findings in terms of their accuracy; checking for bias in research methods; and the

development of research instruments" (Denscombe 2007:110). With this in mind, four major tools were chosen for this purpose, which were the questionnaire, semi- structured interviews, observations and teaching materials. It is hoped these will reveal the English language needs of the target science community and strengthen the reliability and internal validity of the research methods. The rationale and process of applying these tools will be discussed next.

4.4.4.1. Students' questionnaires

The first research tool used in this study was the questionnaire. A questionnaire is described as a quick method of obtaining information from a large number of respondents (Cohen, Manion and Morrison 2007). It is also frequently applied in ELT (Brown and Rodgers 2002; Cohen et al. 2000) research as well as in ESP contexts (Alqahtani 2011; Bosher and Smalkoski 2002; Mackay 1978). Long (2005a) also outlines that semi-structured interviews and written questionnaires are techniques that can be used to carry out needs analysis in foreign and second language educational setting. For example, Mackay and Mountford (1978) employed questionnaires for a survey of ESP needs and programme resources in Southeast Asian. They outline that a questionnaire on EAP reading needs, for instance, "should not 'lead' respondents by asking questions such as how much reading they are assigned or complete in English for their courses or research immediately. Instead, they should be asked about the availability of relevant literature in their first language (L1)" (cited in Long 2005a: 39). The questionnaire was chosen in this study for the following reasons:

- The number of participants of this study was expected to be fairly large,
- The questionnaire is not time consuming and can produce a large amount of information about many different issues in short time, and provides a flexible and convenient way for participants to express their own views.

The aim of the questionnaires was to answer sub-question 1 of the study:

- What is the science community's present situation (PS)?
- What is the science students' present situation?
- What do the science students learn in the ESP course?

They were prompted by the need to generate quantitative findings that would enable me to make generalised descriptions of what characterises the science students' starting-point or PSA (Hutchinson and Waters 1987): students' demographic information, their language competence, attitudes towards English, and their styles of learning. This approach (PSA) emphasises the importance of the students, their attitudes to learning, their interests and their styles of learning, all of which have an important influence on the students' motivation (Hutchinson and Waters 1987). Chen (2005:2) highlights the importance of this approach in the analysis of learners' target needs, stating that "by looking at learners' background situation, lacks, necessities and wants, it was recognised that the individual participants have their own general and specific needs both objectively and subjectively (…). This significant identification of needs became the basis of the course design". Moreover, this approach gives students the opportunity to participate in the syllabus design as adult students are more aware of what they want to use English for (Mackay and Mountford 1978). Such information can later be compared with and supported by findings obtained from the use of other research tools and with the existing literature to allow a clear picture of the PSA of the target students to be obtained.

The questionnaire was based on the framework (see Table 3.1) suggested by Hutchinson and Waters (1987) and questionnaires proposed by Basturkmen (1998). In developing the questionnaires, several related research studies and needs analysis were referred to (e.g. Chostelidou 2010; Harrabi 2010; Hyland 2006; Aguilar 2005; Dudley-Evans and John 1998; Brown1995; Richards and Lockhart 1994; Kaur 1993; Robinson 1991; Zughoul and Hussein 1985). Nevertheless, the questionnaire questions were modified with some items added to specifically fulfil the objectives of this study. Moreover, the researcher's experience in teaching ESP courses in the university also contributed to the construction of the questionnaires.

The questionnaire (see appendix 6), falls into five sets of questions aiming at investigating science students' starting-point. Section one asks for students' background information, such as demographic information, English learning background and attitude towards English learning. Section two attempts to establish the participants own evaluation of their language skills. In section three, an attempt is made to establish an overview of the students' learning styles preferences. Section four was designed to identify the students' perceptions regarding their preferred English language skill

preferred for learning the target language. Section five elicits the students' perceptions regarding the current English language course (e.g. students' reactions towards the course in terms of usefulness and difficulties that they had encountered, and skills, activities and methodology practiced in the course).

In practice, the questionnaire was written in English, and was discussed with my academic supervisor before it was distributed to the students. It consists of 30 {close-ended} questions designed to obtain information under 5 general sections: background of the students, students' language self-assessment, students' styles of learning, English language skills and activities, and attitudes towards ESP courses. Each section aims to gather specific information. For example, section 1, was designed to establish a student profile for the study. The types of questions are Likert scale, multiple choice and rank order, where participants are required to rate factors on a scale ranging from very good to very poor, numbered (1-5) or strongly agree to strongly disagree. For an example, see section five: *Attitudes towards the current ESP (item 27)*. This variable measures the students' perception of the course content with regard to the elements of interest and relevance of materials, activities and pedagogy, where the participants were asked to rate these from *strongly disagree, disagree, neutral, agree,* to *strongly agree*.

The questionnaires were distributed to the target science students during their academic study in November 2009. Before the questionnaires were distributed, the aim of the study in general and the questionnaires in particular was explained to the participants. Together with an explanation of what was expected from the students. The students were assured of the confidentiality of the information which they would provide, whilst the fact was also stressed that participation was voluntary. I did manage to obtain a sufficient number of participants, and only two male students refused to participate in the study. As mentioned in 4.4.2, 127 science students were involved in completing the questionnaires. Before starting to complete the questionnaires, all volunteer students were asked to read the information sheet and complete the consent form, which lasted about an hour. During the completion of the task, each question was orally translated into Arabic language (the participants' first language) to avoid any misunderstanding of the questions. Altogether 127 questionnaires were distributed and the same number were returned, which represented a 100% completion rate. The analysis of the questionnaire data started immediately after the fieldwork had ended (see Table 4.3).

4.4.4.2. Faculty members' semi-structured interviews

The rationale behind choosing such a method is based on the researcher's aim to obtain in-depth information about the science and English tutors' perceptions, experiences and thoughts (Cohen et al. 2000). It is also because the interview is seen as "a powerful method of data collection as it provides one-to-one interaction between" the interviewer and the interviewee (Tashakkori and Teddlie (1998:102). Through such a method, interviewees are able to discuss their awareness and interpretation with regard to a given situation (Cohen et al. 2000). Furthermore, a face-to-face interview, according to Punch (2005:168) is "a very good way of accessing people's perception, and definitions of situations and constructions of reality". It allows the researcher to gain a deeper insight into the phenomenon studied, and can obtain information that cannot be obtained by only observing the participants' feelings about and attitudes towards the world.

However, interviews are usually time-consuming and more expensive to administer than questionnaires (Johnson and Turner 2003). In order to conduct a semi-structured interview, Johnson and Turner (2003) point out that "the interviewer must always remain non-judgemental to the response" offered by the interviewees in order to reduce bias during the interview. The researcher should offer clarity or detailed information if required by the interviewees, and must make sure that the interaction between them is conducted in a respectful and non-threatening manner. It is also suggested that suitable questions should be asked, which are clear and in familiar language, avoiding terms and concepts from a particular discipline.

An investigation of learners' needs could probably not be completed successfully by only one or two means. This study intends to draw on a semi-structured interview so that the researcher can get as close as possible to the world of the target population and to understand how they interpret this world at various points and levels. Secondly, this method will be used to obtain qualitative data so as to complement the quantitative data produced from the questionnaires. Thirdly, the interviews will validate information that may already have been obtained. In other words, semi-structured interview questions are flexible and open-ended which allows the interviewees to add new ideas or topics that might emerge from the conversation apart from the specific questions introduced by the researcher.

This method targeted a few of the faculty members: two English language lecturers, three science lecturers and the ASSA (see Table 4.3). It attempted to provide the opportunity to investigate further and to gather data which could not have been obtained through other methods (questionnaires, observations, and documents). The data obtained from these interviews was utilised to contribute to the RQ1- sub-questions 1and 2.

In practice, the interviews were divided into two phases. The first phase of the interview targeted the science subjects' tutors and the ASSA. It is the researcher's intention to understand the extent to which the science students require English, and what kind of language (s) is required in the target situation. This can be obtained through the tutors as they are the insiders and are more knowledge in this area. It was hoped that the instructors would provide additional information about science programmes such as staff and materials that could help to produce clear picture of their real world. It was hoped that the interviews would provide information about the tutors' opinions concerning their students' language competence and attitudes towards the language. The second phase targeted the two English language lecturers. It was designed to allow the researcher to have a clear view of the ESP programme in terms of staff, teaching materials and methods. It was also designed to obtain information about the students' language competence, challenges that they face and their attitudes towards the language. It is hoped that such a combination of information will allow the researcher to view the target community's real world in terms of science and English subject programmes and students PSA.

Considering the limitations highlighted in the previous paragraph; in this study, different interview techniques were applied. For example, interviewees were given enough information with regard to the research objective. Consent and ethics checklist forms, and confidentiality and anonymity were also provided and explained (see appendices 2 -4). Furthermore, the interview questions (see appendix 5) were designed carefully in a way that could be understood by the respondents and also checked by the supervisor. They were guided by Mackay (1978: 24- 26) and Hutchinson and Waters (1987), where multiple questions, yes-or-no questions as well as personal questions were avoided where possible. The question did not demand any sensitive and/or personal data from any individual and did not induce any kind of psychological stress or anxiety.

In addition, the languages chosen for the interviews were Arabic and English. Arabic was used with Arabic speaking participants, whilst English was used with the foreign interviewees, as they have a high level of English. This was done in order to put interviewees at ease, and to obtain realistic in-depth data. Nevertheless, the Arabic speakers were offered the chance to use English if they wished. The researcher asked questions from the interview sets which were selected and matched to the position of the person being interviewed. However, the researcher was not restricted to the question sets (see appendix 5) which were developed in advance for this study. Thus, it really depended on the flow of the interviews, but all the questions were covered. The 6 interviews took two hours, for two reasons. Firstly, there were just two language teachers who were responsible for ESP courses. Secondly, the selection criteria for science participants was focused on the most experienced teachers, for example the length of experience in teaching, qualification in teaching – such as Master's or PhD, and a recommendation by the head teachers and other staff members in the faculty. Therefore, there were few of those teachers who agreed to be interviewed, as the new teachers who took the place of the experienced teachers who had left the faculty about two months before the current fieldwork was conducted; had no experience in teaching, and some were foreigners and new to the teaching or cultural environment. Furthermore, these teachers were coming from other cities, and were busy as they had part-time jobs in other institutions.

During the interviews, the questions were asked in a non-directive manner in order to meet the study's principal aim of learning about the interviewees' views, and were designed for clarification and understanding. Finally, they were recorded, and then transcribed and coded.

4.4.4.3. Classroom Observations

Observation is another very important method of data collection applied in this study. The rationale for using it is that it allows researchers "to directly see what people do without having to rely on what they say they do" (Johnson and Turner 2003: 315). Moreover, it shows situations as they occur, is not artificial and is often used to provide descriptions of the context as well as accounts of specific incidents that can be used as reference points for the study. In order to conduct observation, researchers Patton (1990) and Taylor and Bogdan (1984) highlight the fact that the physical environment, the space allocated and the researcher's behaviour should be taken into consideration during observation. They

also recommend that the observer should be relatively passive and unobtrusive, and that a tape recorder is helpful as back up for his/her note-taking. However, this method is difficult where "large populations" are involved, "more expensive to conduct than questionnaires" and data analysis is sometimes "time-consuming" (Johnson and Turner 2003: 315).

In this study, the observations were conducted in two areas: science subjects and English language classrooms. With science classes, the purpose was to discover what type of linguistic factors, genres and registers were applied in these courses, and would be needed in order to benefit from English courses. The researcher also observed the role of the participants and their interaction with the class and in class activities. It is also hoped that the researcher will discover which discipline is more exposed to English language and what language this/these discipline (s) use. In other words, it is hoped that an understanding will be gained into which types of language could be incorporated in to the ESP syllabus and how it could be taught. In addition, the observations attempt to discover "how and when English and the L1 are intertwined" (Dudley-Evans and St John 1998:135). Such observations allow the observer to understand how English language is used by the students and lecturers in those disciplines. With the English class, the aim is to look at the: course materials, teaching style and the learners' attitudes and language abilities.

In this qualitative data technique, the approach adopted was what Patton (2002: 291) refers to as "unobtrusive observations" or non-participant classroom observations. Before the day of observation, and with the ethical considerations in mind (see 4.4.8.). The lecturers were first informed of the research purpose and obtained their permissions to collect observation data. The arrangements concerning the location of the class were then worked out. Furthermore, all students were told about the purposes of the classroom observations and their permission was also obtained. On the day of observation, the researcher's role was passive and unobtrusive, sitting at the back of the classroom and remaining uninvolved with the class activities. Note-taking (see appendices 15 and 16) and voice-recording were the only resources used (McDonough and McDonough 1997; Taylor and Bogdan 1984). During the observations, the defined observation schedules were followed, with focus only on the content of the classes (English where available),

and how the students responded to it. Moreover, I tried to note any issues related to the study after the sessions.

The classroom observations were conducted on November 2009, and three categories of classes were observed: computer science, chemistry and English. These lectures were chosen due to the fact that their lecturers were available on this occasion and had agreed to be observed (see 4.4.2). The participants of the two computer science classes were all third year students who were taught both by Libyan lecturers; CSL1 and CSL2 (see appendices 12, 14). The number of students in each class was 12 and 9 respectively. The title of the first lecture, CSL1, was Pascal: Language 2, and the second one was about C++ Language. Both lectures were held in computer labs. These two observations lasted approximately 75 minutes, and data was collected on one occasion for each class (see appendices 13 and 15). The main resources used for the data collection in the computer science classes were a digital audio tape recorder (McDonough and McDonough 1997), a classroom observation schedule and the researcher's field notes (see appendices 8, 12 and 14). The 13 chemistry participants were third year students who were taught by a Libyan lecturer. The lecture took place in a chemistry lab and lasted approximately one hour. Observation of the CS was completed simultaneously. The schedule and the researcher's field notes were the only two resources used in documenting data from this class (see appendices 8, 17 and 18).

The final observation session targeted the English class; module B which took place approximately two months after classes had begun and lasted about two hours. The participants of this study were the English language lecturer and science students (see appendix 11). The lecturer was a male foreigner who is a non-native speaker of English and Arabic, and who had taught at the college for two years. The students numbered more than a hundred, and their first language was Arabic. They came from different departments; computer science, chemistry, physics, mathematics and natural history, and were in different semesters; 2^{nd}, 3^{rd} and 4^{th} (see appendix 11). As I had worked at the college previously, I have known the lecturer for two years, and I am well-known by some of the students.

During this visit, I used the field notes and the classroom observation schedule (see appendix 7) to document the actual classroom interaction between the lecturer and the students, and to record what was heard, observed, or felt as the lesson progressed

(Schmuck 1997). The field notes and observation schedule were the only resources used in this observation. The entire physical environment was also documented. In addition, time was taken to write down any thoughts that occurred to me during the observations (see appendix 11). I was passive and unobtrusive, remaining uninvolved with the classroom activities, and remaining seated at the back (see 4.4.3). Specific features on the observation schedule used for this study were coded, and notes were made on how the teacher ran the class.

4.4.4. Teaching materials

Examination of documents sources is the last method employed in this study. Such documentary evidence, according to Elliott (1991:78) can provide information on relevant "issues and problems under investigation". Saville-Troike (1989:114) argues that printed documents provide the researcher with a valuable source of historical and background information related to the study contexts. In addition to this, Dudley-Evans and St John (1998) argue that if one is to understand how business is conducted, text from management training and human resource management can tell us something about how business people think and work.

For the purpose of this study, the primary aim with science documents was to explore the nature of the reading teaching materials, e.g. textbooks, scientific papers, hand-outs and examination papers distributed by lecturers. They were needed to understand the extent to which English is used or depended upon in each discipline. To my knowledge, English is not, in fact, necessary in some disciplines. If this is the case (and it proved to be so) then it needs to be known. If English is not important for particular disciplines then students will struggle with it unnecessarily. They were also collected to find out what kind of language (e.g. describing procedures or writing reports, etc.), what functions (e.g. clarifying/verifying or getting more information, explaining, reporting, etc.) and what vocabulary is required to identify and describe equipment, tools and machinery. This information raise questions about the weighting given to particular areas of language within these disciplines, such as genre or register, etc. It may also help in determining what the students will ultimately have to read or write. Having such authentic evidence is especially helpful "for learning about real and carrier content" and can be used as a "basis for classroom materials" (Dudley-Evans and St John 1998:136).

The purpose of examining English classes teaching materials (teaching hand-outs and exam papers) is to understand what is taught in the content-area and what kinds of materials and activities are used with the target community. Such information is essential. First, it is necessary to understand what types of materials (e.g. general/authentic, science/arts) and activities (e.g. writing reports) target students use and are taught. Secondly, these finding must be compared with the students' target demands, in order to judge whether or not the ESP course content meets the target demands of the science students target demands.

In practice, teaching materials from four subjects (computer science, chemistry, physics and ESP) were collected. The necessary documents were photocopied and saved on the computer to ensure accuracy and completeness. This was completed with the full knowledge and permission of the participants. It is worth mentioning here that some science teaching materials were excluded. This is because that all teaching materials in these departments (MA and NH) are in Arabic. The other reason is that some teachers did not welcome the idea of being observed or interviewed. Table (4.4) shows both the science and English subject materials that were collected:

Table 4.4: Types of materials collected in science and English classes

Disciplines	Types	Subject
CS	Textbooks, hand-outs, exam papers and answer books	**Textbooks, lecture materials and hand-outs:** Visual programming; C++ programming; VB. Network; C Language; programming III (assembly); database design; HTML language; strings. **Exam papers and answer books:** VB. Exam paper; programming III (assembly); programming II(PASCAL); introduction to computer; Programming IV(introduction to C)
CH	lecture materials, hand-outs and exam papers	**a. Lecture materials and hand-outs:** proteins; amino acid; thin layer; chromatography; atoms, molecules and ions; acids and bases theories; collision's properties; quantum theory; and isotopes. **b. Exam papers:** three mid-term exam papers and one typical answer.
PH	lecture textbooks and hand-outs	**Lecture materials and hand-outs:** Wavelength; refraction; Newton's laws of motion: absolute frame; Absolute time; the postulates of special relativity; wave characteristics; **electromagnetic physics**
ESP	lecture hand-outs and exam papers	-Martin Bark and his family, gravity, the earth's rotations -education

CS = Computer Science, CH = Chemistry, PH = Physics, ESP = English for Specific Purposes

4.4.5. Data Analysis

The notion of data analysis is recognised as central in mixed methods (Onwuegbuzie and Teddlie 2003; Teddlie and Tashakkori 2009; Creswell and Plano Clark 2007). It is "the process of bringing order to the data, organising what is there into patterns, categories and descriptive units and looking for relationships between them" (Brewer 2000:105). The following briefly presents the methods applied in both quantitative and qualitative data, and provides more details of quantitative data analysis procedures that can be found in 5.2. Qualitative procedures can be found in 6.2.2, 6.3.2 and 6.4.2.

4.4.5.1. Quantitative data analysis

The quantitative instrument for this study was based only on questionnaires, which were distributed to the target community during their studies in November 2009 (see 4.4.4.1.). First, the responses for the questionnaire items were manually reduced, coded and categorised in a Microsoft Excel document according to predetermined classifications. In this process, the descriptive and inferential statistics technique was used to analyse the data as well as to compare groups or measure relationships between variables, where percentages for all items of the questionnaires results were also obtained (Creswell and Creswell 2005). However, none of the software programming, such as SPSS was applied in this analysis due to the small amount of data obtained. It is also the researcher's belief that such software is not needed as descriptive and inferential statistics can be used for the data analysis required in this study. Details of how this type of data was analysed is presented in chapter 5.2.

4.4.5.2. Qualitative data analysis

Qualitatively, the current study was based on three instruments: semi-structured interviews, classrooms observations and documentation. It is emphasised that the interview must be coded which will contribute to the quality of the qualitative data analysis and will assist later in the analysis of the data, ensuring accuracy and relevancy advised (Miles and Huberman 1994; Patton 1987; Merriam 1998). Therefore, the verbal data from this semi-structured interview was analysed qualitatively. Miles and Huberman's (1994) tactics for generating meaning was used as a guide in the interview data analysis, which included making generalisations, comparisons, contrasting and interpreting meaningful patterns or themes. The data was first displayed, transcribed, and

coded. The transcription of data was, then, carefully read and then marked by theme which was directly related to the categories generated during the analysis (see 6.2.2).

Content analysis (Miles and Huberman 1994; Patton 2002) as follows (see Table 6.8) was used for observation data analysis, where data reduction, coding techniques were developed. Nunan's (1991) framework (Table 7.9) was used as a guide for analysing the data which also shows how the data was reduced and coded. Next analytical categories and sub-categories (see Table 7.9) were developed and defined (which were derived directly from the texts) and utilised to organise and group codes into meaningful clusters (Miles and Huberman 1994; Patton 2002; Cohen et al. 2000). More details of how this process was conducted can be found in chapter 6.3.2.

Finally I will consider teaching materials. With the science subjects teaching materials, the framework of Ellis and Johnson (1994) was adopted with some modifications to suit this study. Bear in mind that no software programme was used in this process of analysis. As a first-time user of the SPSS, for example, I found its programming language difficult to master, and the idea of using a statistical package was extremely daunting because of the mixed teaching materials this study is dealing with (Arabic and English, and different codes and symbols; computer science and chemistry). Moreover, this software is designed to work with English texts, not Arabic. Therefore, a manual approach was developed, with the help of the frameworks suggested by Ellis and Johnson (1994), Breen and Candlin (1987) and Hutchinson and Waters (1987), and data analysis procedures suggested by Miles and Huberman 1994, Bryman and Burgess (1994) and Patton (2002), useful and easy for analysing such materials. In practice, the analysis process (see 6.4.2 and Table 6.11) included searching the data, developing and defining analytical categories and sub-categories, coding/ indexing the texts according to those categories and interpreting data accordingly (Miles and Huberman 1994; Patton 2002). Such an analytical process helped to show and organise what was important and relevant to the study, and ruled out aspects that were not of interest.

The frameworks of Breen and Candlin (1987) and Hutchinson and Waters (1987) were integrated for analysing the English course teaching materials with some changes (see 6.4.2). In practice, the qualitative data analysis procedures suggested by Miles and Huberman (1994), Bryman and Burgess (1994) and Patton (2002) were applied here as

well (see Table 6.11). Chapter 6.4.2 provides details of the data analysis procedures used for both science and English teaching materials.

4.4.6. Triangulation

The present study (see 4.3) applied mixed methods which included questionnaires, interviews, observations and documents in order to strengthen the validity and reliability of the data findings through triangulation (see chapter 7). According to Onwuegbuzie (2002) triangulation seeks convergence and corroboration of results from different methods and designs studying the same phenomenon. Such a technique has the power to explain the richness and complexity of human behaviour by studying it from more than one perspective.

In this study, triangulation is considered as an essential method to obtain a more detailed and balanced picture of the situation (here it is English language needs), and then to verify and cross-check the research findings (Creswell 2003). The intention in applying both qualitative and quantitative methods is that I would become more confident with a result if different methods had all led to it. This will allow the weaknesses and biases, which could arise from the use of only one method, to be overcome. Some findings obtained from the questionnaire; for example regarding the views of the science students were also obtained through the use of the semi-structured interview and observation. By comparing the findings of these three methods, more accurate information can be obtained in the area of investigation.

4.4.7. Validity and credibility of the study

To gain reliable results, the researcher establishes the credibility of his/her study by attempting to describe systematically the characteristics of variables and phenomena, generating and refining conceptual categories, and discovering and validating associations among phenomena (Cohen and Crabtree 2008; Shenton 2004; Miller 1990). In the present study an attempt was made to gain valid and meaningful data. Firstly, the content and length of the study questionnaires were discussed with my supervisor, and some changes and improvements were made. Furthermore, the questionnaires were designed to avoid individually identifiable information and the layout and completion limit of the questionnaires were given special attention.

A qualitative study is considered credible when it presents accurate description and interpretations of human experiences that people who also share that experience would immediately recognise. To ensure the credibility of this study, multiple sources of data and methods of data collection were utilised (Patton 2002) which included interviews with and observations of target students and lecturers. The interviews with the faculty members gave a valid representation of their views about their lessons and the problems they faced, and showed attitudes to English. The participants were also allowed the choice of speaking in English or Arabic in order to put them at ease, and to obtain realistic in-depth data. Furthermore, evidence of original materials (interviews and interview transcriptions, observation notes and subject documents) was provided to support the participants' points of view (Creswell 1994). In addition, a voice-recorder was used to keep data which might be referred to when needed. Teaching materials from the target population were also gathered from a variety of sources.

Applying both quantitative and qualitative analyses also helped to compare and support the results, and discover relationships between different variables. During the analysis an attempt was made to give a balanced description of the data as a whole, with the realisation that the complexity and the richness of this data inevitably meant missing some aspects out.

4.4.8. Ethics and risks

The research took place in a university, where all the normal safety measures were in place. Ethical approval forms were also completed (see appendix 2), and a permission letter to carry out this research at Sebha University was obtained. With regard to the target population, this study did not raise any problems as all the participants, lecturers and students were over 18, no information of a sensitive and/or personal nature was kept on any individual and the study did not induce any kind of psychological stress or anxiety. The participants took part voluntarily and were allowed to withdraw at any time. The participants were given detailed information with regard to the research objective, and all those involved in this research were asked to read and understand the enclosed research information sheets (see appendix 4**)** before the consent forms (see appendix 3) were completed.

4.4.9. Limitations of data methodology

Some of the limitations of mixed methods that have been outlined earlier in 4.3.4 were encountered in the present study. One of the general problems was related to the sample size of the study, which only focused on three science disciplines staff who agreed to take part in the study, and one level of an ESP course, rather than the entire Faculty. Therefore, findings might only be reflective of those who took part in the study, and may not show a general picture of other science and ESP classrooms or the Faculty community. Second the findings of this study are specific to one faculty at Sebha University, and might not be applicable to another faculty or university. It is suggested that more research would be needed in other faculties and universities in the country to determine the extent to which English language is needed by science students.

With regard to the science students' questionnaires, it was difficult to know whether or not respondents had understood questions properly, despite the fact that I translated and explained every item of the questionnaire. They may also have answered superficially, especially if they felt that the questionnaire had taken a long time to complete. Students may also have been unwilling to answer the questions, for example, two male students withdrew after about twenty minutes. Furthermore, students might not wish to reveal information or might think that they will not benefit from such work. In addition, culturally, Libyan students are more likely to complement their teachers than criticise them, even if they were told why the information was being collected, that the results will be beneficial, and that anonymity and confidentiality would be maintained.

In terms of the science faculty members' interviews, the greatest limitation of this method was the small number of the interviewees and the time available. Firstly, a number of participants who had agreed to be interviewed left the Faculty whilst the researcher was abroad, and new staff took their place. The consequence was that new staff refused to be interviewed which caused a reduction in the number of participants, but luckily, the two English teachers agreed to be interviewed. Secondly, the interviews had to be kept short due to the fact that, although there were few experienced teachers who agreed to be interviewed, they live some distance from the Faculty and have part-time jobs (see 4.4.4.2 and 4.4.1.). This fact also forced the researcher to cancel some tasks as priority had to be given to the academics main responsibilities. This, to some extent, affected the process and the quality of the interviews. Another incident that must be noticed is that part of the

ASSA discourse was not captured on the tape recorder because the battery went dead during the interview. This issue was noticed after a few minutes, and was able to be sorted out later.

Interruptions during interviews were another incident that should be mentioned. This usually happened when interviewees were disturbed by other staff. Other problems were caused by the quality of the batteries used since they went dead three times during the interviews. However, all unclear or missed data was sorted out as soon as it had been noticed. Finally, my lack of experience in using the interview as a research tool seems to have influenced the results to some extent. During the interviews, the researcher found himself supporting the interviewees' perceptions many times, rather than asking for more clarifications, especially with EL1. For example, the researcher, on many occasions, replied and commented on EL1 comments regarding the students' language weakness by saying "Yes, you're right. It's really a problem", instead of asking for details or clarification of such cases. Nevertheless, this kind of engagement might offer the participants a kind of relief and give them confidence to say more on the subject. Regardless of such limitations, it can be said that the findings generally provide what was required, and with other data findings, can be used to answer the study research questions.

Two problems occurred whilst carrying out classroom observations. First, once I arrived on the day of observation, I was told that some lecturers had left the faculty, which forced me to re-organise this task. In addition, a number of lecturers showed no desire to be observed, even though their participation had been promised, which limited the class observation tasks to three in total. Nevertheless, such limitations in of class observation did not affect the study too much, for two reasons; firstly the fact that, it was reported by science staff that English is not applied in maths, natural history and physics departments at the moment; and secondly that interviews and teaching materials compensate for the weaknesses of class observation, which is one of the advantages of using the mixed method. Secondly, some lecturers were not happy to be voice-recorded, only two CS lecturers agreed. The refusal to allow voice-recording by those lecturers was due to their feeling that recording the classes might interfere with the flow of the classes and might also prevent students from responding to or raising questions. Another lecturer said that English is no longer applied in their sessions.

Regardless of the fact that existing materials often provide valuable insights into a set of people that cannot be observed or noted in another methods, there have always been a number of limitations with this type of evidence. One of the major problems faced was the unavailability of teaching materials, which is due to the fact that most of the science and English teaching materials are adapted and selected from books and web pages, and are only available in disorganised and often incomplete hand-outs. Furthermore, there were restrictions on the availability of teaching hand-outs. The unavailability of hand-outs also limited the number of documents gathered, as there was shortage of the target teaching materials at the college stationery stall. Finally the analysis method was time consuming and in such a study time and space is fixed.

4.5. Conclusion

This chapter has presented the rationale of the study and the approaches, methods and principles that underline my choices and concerns in the process of conducting it. Through the use of multiple sources of data and methods of data collection, an attempt will be made to build up a detailed and in-depth description of English language as needed by science students. In spite of the small number of participants, it is hoped that the findings will help to discover the science students' language needs, and that this information can be used later as a guide for designing more appropriate ESP syllabi for the target population, and which can also be applied to more English language classes at Libyan universities.

Chapter Five
Quantitative Results

5.1. Introduction

This chapter presents the results of the quantitative data, which was obtained from the closed-ended questionnaire to answer the first sub-question of the research question (RQs) for this study. A total of 127 responses were obtained from second, third and fourth-semester undergraduates attending the ESP course (B) in the academic year 2009 (see 4.4.4.1 and Table 4.3). The findings later be triangulated and discussed with other research findings in Chapter 7, bring a full understanding of the present situation in target community.

1. To what extent is English needed in the science setting?
   - What is the science community's present situation (PS)?
     - What is the science students' present situation?
     - What do the science students learn in the ESP course?
   - What is the science community's target situation (TS)?
     - Why and where is the language needed?
     - What type of genres are used in science classes?
     - What type of registers are used in science classes?

The chapter begins with a presentation of the data analysis processes, i.e. how the quantitative findings were coded and analysed. The findings are then presented and finally a summary and conclusion are offered.

5.2. Questionnaire data analysis

Data analysis is defined as the "reduction of copious amounts of written data to manageable and comprehensible proportions" (Cohen et al. 2007:475). The descriptive statistics method was applied to the results of the survey questionnaires, in order to analyse all items and to discover the frequency and percentage of agreement and disagreement among the participants regarding the various issues raised. This method of analysis is very useful for viewing and organising data because it can present a large

amounts of information in a sensible and understandable way (e.g. in tables, charts, etc.) that can demonstrate the presence of basic sample characteristics without losing or distorting the information.

In this study, after the survey questionnaires were completed, they were first checked to gain an overview of the results, e.g. the number of the questionnaires received and any missed answers. Next, the data was reduced to a form that could be analysed, a process which is referred to as "data reduction", and which consists of coding data in preparation for analysis (Cohen, et al. 2000). The quantifiable data was coded and entered into a computer file employing Microsoft Excel, and this was then double-checked to identify any missing data and to guarantee the accuracy of the data entry. Some manual data analysis was carried using Microsoft Excel (not SPSS), because the quantity of data was small, and straightforward to understand. Moreover, the use of a manual approach is recommended for new researchers in order to gain an insight into the intuitive aspects which are the essential basis of any method of analysis.

Figures and tables were used, which show how the data was reduced, coded, and presented in a bar chart as well as the percentage calculation of every item. Such distribution helped me to gain a sense of what the students' response patterns looked like, which in turn helped me to address the target research question. For example, in order to find out what the greatest language challenges faced by the participants. I calculated the participants' implementation activity scores (Part 4, No 28 in the questionnaire) from their responses on a five-point Likert scale, which represents 8 statements placed in random order on a five-point scale of degree of agreement or frequency: 5 = strongly agree, 4 = agree, 3 = neutral, 2 = disagree, and 1 = strongly disagree. This scale represents a particular value (5, 4, 3, 2, or 1) respectively.

There is no simple or specific formula to ensure validity in the analysis of data, but careful attention and comprehensive analysis were applied to achieve this goal in this study. For example, it was necessary to merge some of the themes because based on the feedback received - this was recommended to be useful; it was also found to be helpful because it gave the chance to re-read the script data and refine the analysis more than once, based on my understanding and discussion with colleagues, especially regarding the suitability of certain ideas or analysis under certain themes. Furthermore, the data analysis

method was overall useful because, whilst completing the transcription work, the familiarity allowed for more effective engagement with the data.

5.3. Questionnaire findings

The presentation of the data findings is based on five themes generated from the data and with reference to the target research question. The themes are as follows:

1- Students' objective information
2- Students' language self-assessments
3- Students' styles of learning
4- Students' language skills and activities preferred
5- Students' perceptions of current ESP course

The first theme offers general information about the students' background at the PS which includes information like gender, language knowledge and usage, their own assessment of their standard of English, and their future plans. The second theme highlights the students' perceptions to the value of English and the importance of language skills. The third one concerns the students' styles of learning, and category four presents the students' self-assessment of language activities and their level of difficulty. The final theme illustrates the students' perceptions of the current ESP course in terms of teaching methods, materials, activities and physical environment. During the data analysis, each theme will be supported with relevant data (e.g. tables and figures) taken from the questionnaires.

5.3.1. Students' objective information

The results of the questionnaires show that a large number of science students who were attending ESP course B were female and only 4% were male (Table 5.1). Science students are largely female in Libya, whilst male students tend to be more prevalent in technical or military colleges (2.3.4). Data also reveals that none of the participants speak a language other than Arabic or English (Table 5.1), which is because English is the only compulsory language taught in schools and science and arts colleges (2.4). This language is studied for six or more years at preparatory and secondary schools. The amount of time spent studying the language varies due to the fact that the education system in Libya has been changed in the last few years (see 2.3.1), so that the number of years spent at

secondary school was lengthened to four years from three and then reduced to three years in 2004, and because some students repeated one or two years of preparatory or secondary schooling.

Table 5.1: Students objective information

Statement	**Total No of cases**	**Male**	**Female**	
Gender	127	4%	96%	
Statement	**Total No of cases**	**One**	**Two**	**More than Two**
Number of languages	127	0%	100%	0%
Statement	**Total No of cases**	**6 years**	**7 – 8 years**	**More than 8**
Years spent studying E	127	46%	54%	0%
Statement	**Total No of cases**	Preparatory schools.	Secondary schools.	Private schools.
Location of study	127	100%	100%	21%

The participants were also asked about their attitudes towards learning English (item5). The data shows that English is seen as a difficult language to learn by 40% of the participants, third of them consider it to be easy to learn (Figure 5.1), and of the remaining participants, 25% are undecided.

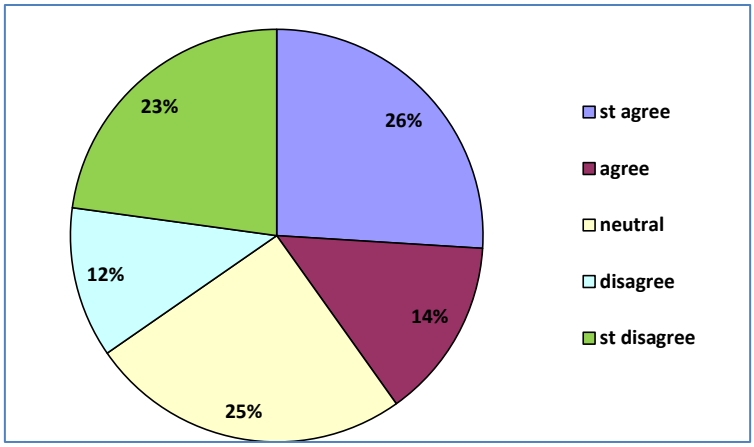


Figure 5.1: Students' perceptions of the difficulty of learning English

The students were also asked for their attitudes towards the language in terms of the ease of integrating it with their first language, especially for study purposes. The data shows that more than half of the participants felt that English could be easily integrated into their specialist areas of study, whereas 44% of them felt that this was difficult. A third of the target students were in favour of studying the target language outside the study place. However, this seemed to be of little interest to the majority of the participants, who reported that they only use English within their place of study (Table 5.2).

Table 5.2: Students' views of the value of English

Elements	Yes %	No %	Total
Is integrating English within a subjects field of value?	56%	44%	127
Do you study English outside the university?	34%	66%	

Item 8 of the questionnaire required the participants to list how frequently they use the language in daily life, for example do they watch or listen to English programmes, and do they practice English with native (NS) and non-native speakers (NNS). Table 5.3 reveals that only a quarter of the participants appeared to be developing their language skills through such habits. Furthermore, only a small number showed any interest in practicing the target language with NS or NNS.

Table 5.3: Students activities during their free time

elements	Yes %	No %	Total
Do you watch English TV channels?	26%	74%	127
Do you listen to English new/music	26%	74%	
Do you practise English with a native speaker	6%	94%	
Do you practise English with a non/native speaker	6%	94%	

The questionnaire also invited the participants to provide their reasons for learning English. When we looked at the data, figure (5.2), it was noticeable that the majority of the participants studied English for two reasons: study purposes and because they felt that English was an important language. In addition, a quarter of participants considered that it was important for work purposes, few felt it was important for leisure purposes and 14% felt that it was of value for other purposes.

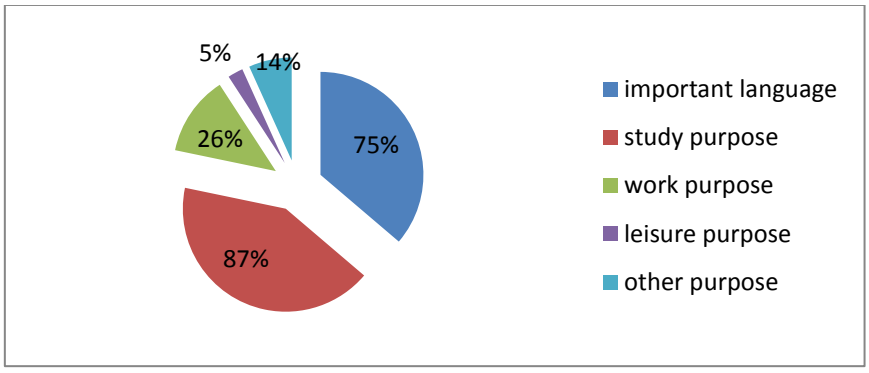


Figure 5.2: Students' purposes of studying English

The participants were also asked to note their attitudes towards using the target language after graduation. The data (Table 5.4.) shows that half of the respondents seemed to be

aiming to pursue higher degrees and that they wish to complete these studies abroad. A third aimed to start looking for a job after graduation, rather than doing any further study. The data also indicated that only 1% of the target community hoped to run a private business rather than carrying on their study or becoming involved in public work. Finally, (15%) of the respondents have not decided yet what to do after university.

Table 5.4: Students' future plans

Statement	Total No of cases	Responses %
Complete further studies	127	50
Look for a job		34
Establish own business		1
I do not know		15

5.3.2. Students' language self-assessments

In terms of their language abilities, most students appeared to be weak (Figures 5.3 – 5.7). For example, Figure (5.3) reveals that the majority of science students who were attending an ESP course felt that they did not have adequate language skills, which seems to be a common factor in a number of institutions in Libya (see 2.4). Some of the participants felt that they had a high level of English ability (3% reported that they were "advanced") whilst 21% felt that they were "intermediate".

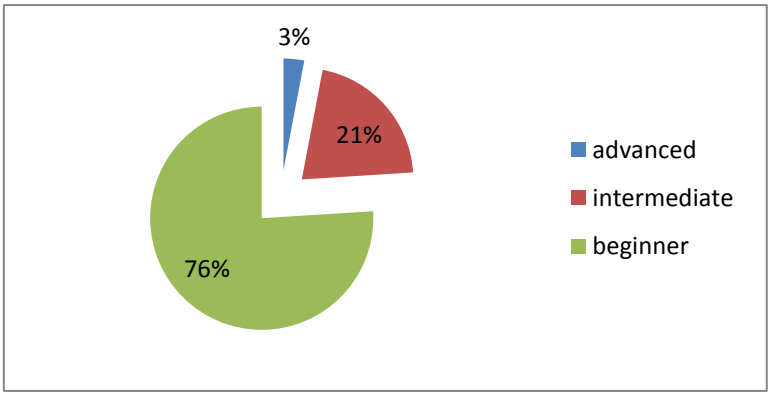


Figure 5.3: Students' self-assessment of their levels of ability in English

When asked about their self-evaluation of performance in English language macro-skills, the students' ratings were diverse from one skill to another, as shown in figure (5.4) below. It seems that students were generally satisfied with their reading, writing and listening skills, but not with their speaking skills. Moreover, reading and listening were

seen as the easiest skills to comprehend and apply. In contrast, speaking was reported to be the hardest macro-skill, with nearly half of the participants reporting that they were weak in this.

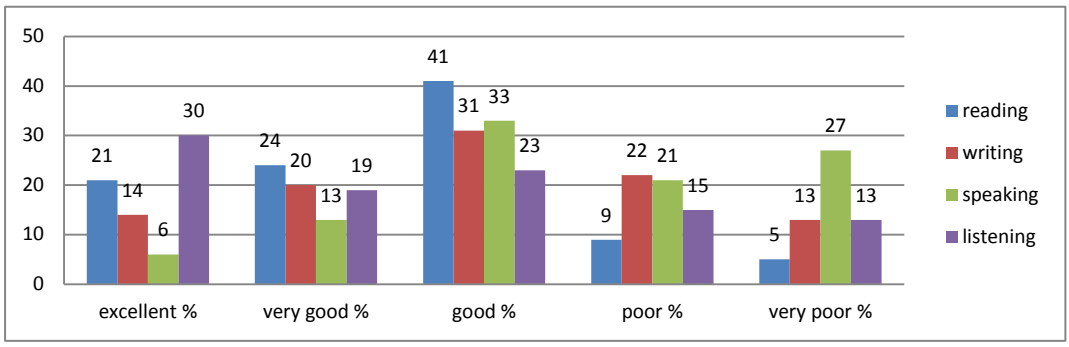


Figure 5.4: Students' macro-skills assessment of reading, writing, speaking and listening in general

The participants were also given the chance to determine and rate some micro-skills that they perceived as difficult (questionnaire, item 13). Figure 5.5 indicates that interaction with teachers and writing accurately were the main difficulties faced by science participants, whilst most of the participants seemed to be satisfied with their receptive skills (reading lecture materials and listening to sessions).

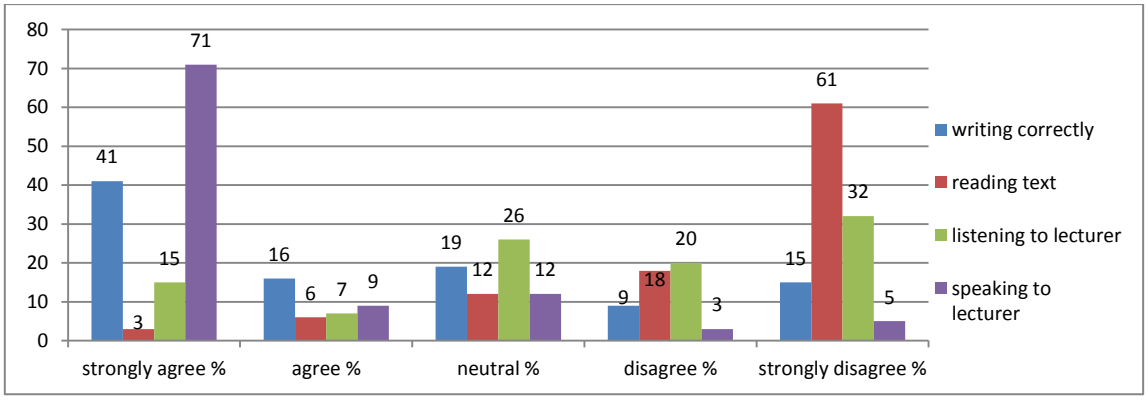


Figure 5.5: Students' micro-skills assessment of writing correctly, reading text and listening to lecturer

With regard to other micro-skills such as grammar, vocabulary, pronunciation and spelling, figure 5.6 reveals that challenges were mostly encountered when handling language rules by most of the participants. Other sub-skills were also reported as being less challenging than grammar. Three sub-skills (vocabulary, pronunciation and spelling) appeared to be challenging to a quarter of the target students.

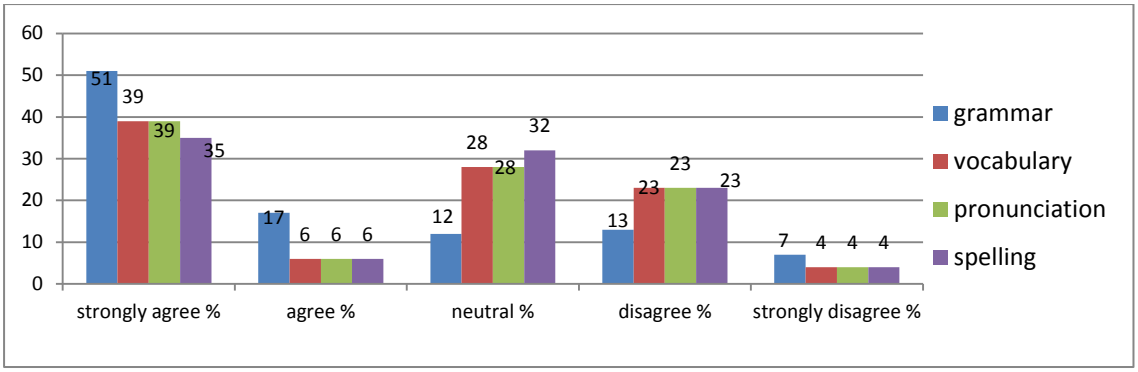


Figure 5.6: **Students' micro-skills assessment of grammar, vocabulary, pronunciation and spelling**

The questionnaire (items 14 and 15) asked the participants to rate their understanding of semi-technical and technical words. The results presented in Figure 5.7 indicate that the majority of science students estimated their ability to comprehend both science and general words to be good. A quarter of them claimed that they still struggle to recognise either.

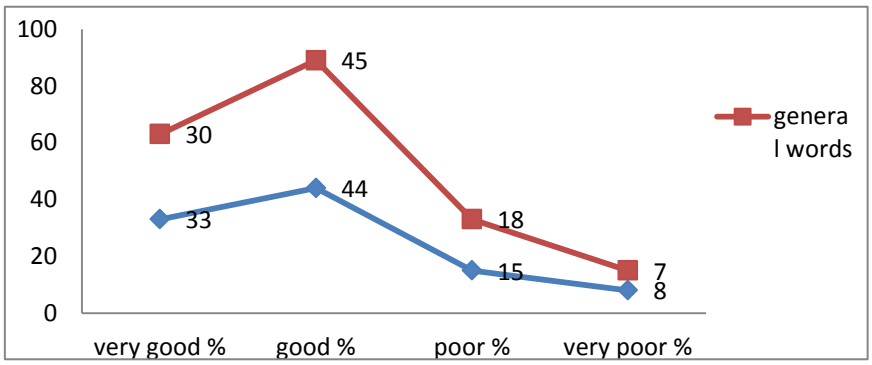


Figure 5.7: Students recognition of general and scientific words

5.3.3. Students' styles of learning

Items 16- 22 of the questionnaire gave the respondents a chance to express their views concerning how English courses ought to be run. First, item 16 of the questionnaire invited the participants to indicate, which language of delivery would be most suitable for them in English lessons. It is clear that the use of code-switching is favoured by most of the respondents (86%). Thus, only a small number of the participants noted that they would like English to be the sole language used in classes, and surprisingly only 2% noted that they would prefer Arabic to be the single language used (Table 5.5).

In addition, the applicants were provided with three options regarding the delivery of English classes per week: once or twice a week and more, items 17 and 18 of the questionnaire. The majority of participants suggested that having one class per week in the morning would be most suitable for them, whilst others did not seem to mind if the course ran twice or more in one week or in the afternoon (Table 5.5).

Table 5.5: Students' English class preferences

Preferences for English classes		**Responses**	**Total**
Language of delivery	Arabic	2%	127
	English	12%	
	Both	86%	
Frequency	once a week	76%	127
	twice a week	13%	
	More	11%	
Period	Morning	82%	127
	Afternoon	18%	

Item 19 of the questionnaire requested information about the participants' views of the physical environment used for classes, mainly the size of the classroom, the place of study and the type of materials. The results (Table 5.6) indicate that most of the respondents had a marked concern about the class size, in terms of the number of students in each class, and that they preferred small classes. Only 11% did not find this a concern. It is interesting to note that the majority of the respondents also stated a preference for having a textbook (72%) rather than hand-outs (50%). Only 5% had no preference either way. With regard to the place in which English classes were conducted, more than half of the participants (54%) saw a language lab as unimportant for language learning (Table 5.6).

Table 5.6: Students' perceptions of learning resources

Elements	**Essential**	**Partly**	**Not essential**	**No of cases**
Number of students	89%	11%	**0%**	**127**
Textbook	72%	23%	5%	127
Hand-outs	50%	32%	18%	127
Language Lab	20%	26%	54%	127

As highlighted in Table 5.7a, question 20 asked the participants to note their views regarding the usage and value of visual equipment in delivering ESP courses. It is interesting to note that the majority of the respondents were relatively interested in seeing

diagrams and in having discussion sessions and practical activities in English. Few respondents appeared to be uninterested in such methods; this could be due to the fact that images are not generally included in materials for some science disciplines such as Mathematics. The majority of the participants also appeared to have relied heavily on teachers and less on their own initiative for knowledge-creation, as they preferred to rely on teachers who explain everything to them.

Table 5.7.a: Students' styles of learning

Elements	Strongly disagree %	Disagree %	Neutral %	Agree %	Strongly agree %	No of cases
a. Lesson offers discussions	2	2	8	56	32	127
b. Lesson offers diagrams	2	4	8	57	29	127
c. Lesson offers practical activities	2	5	4	59	30	127
d. Prefer a teacher who explains everything	9	6	8	68	9	127

Question 20 of the questionnaire, asked the participants to rank their preferences of learning the language through reading, grammar and listening and speaking to native speakers. The results in Table 5.7.b show a strong preference for two dimensions of learning style - namely reading and grammar. This means that most of the participants tend to be interested in comprehension activities and understanding the language rules, whilst only a few of the participants exhibited a preference for learning the language through listening and speaking to native speakers.

Table 5.7.b: Students' styles of learning

Elements	Strongly disagree %	Disagree %	Neutral %	Agree %	Strongly agree %	No of cases
e. prefer to learn by reading	0	0	0	72	28	127
f. Prefer to learn through grammar	0	0	0	69	31	127
g. Prefer to listen to NS	13	44	26	17	0	127
h. Prefer to talk to foreigners	29	54	0	17	0	127

Item 21 deals with technical and semi-technical materials where the applicants were asked to express their preference regarding English texts and materials. Figure 5.8 reveals that more than half of science participants desired scientific materials rather than general

ones. However, nearly quarter of the respondents do not mind to integrate both the scientific and general English materials in ESP courses.

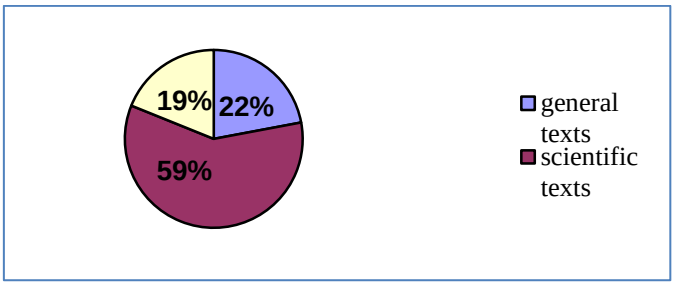


Figure 5.8: Students' learning preferences

Finally, item 22 of the questionnaire asked the applicants to note the way in which they would prefer to study; individually, in pairs or in small or large groups. Results (Figure 5.9) show that most science participants seemed to be happiest working in small groups and pairs for activities. More than a quarter of respondents felt that individual work was desirable in the classroom. Interestingly, large classroom group work appeared to be unpopular with the majority of science applicants, with data showing that only 7% enjoyed classroom work in large groups.

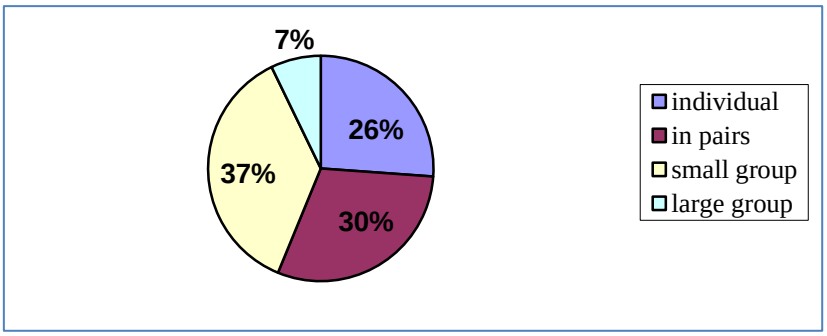


Figure 5.9: Students' learning preference

5.3.4. Students' language skills and activities needed

This category presents items 23-25 of the questionnaire, which asked the participants for their preferences regarding language macro- and micro-skills and some classroom activities. First, they were invited to report their views regarding the four main English language receptive and productive skills. Figure 5.10 below summarises the descriptive statistics of the results. Generally, it seems that all macro-skills were deemed necessary, but to different degrees. Interestingly, reading skills were ranked as the most necessary by

all the participants. Writing, listening and speaking were also found to be necessary to half of the community.

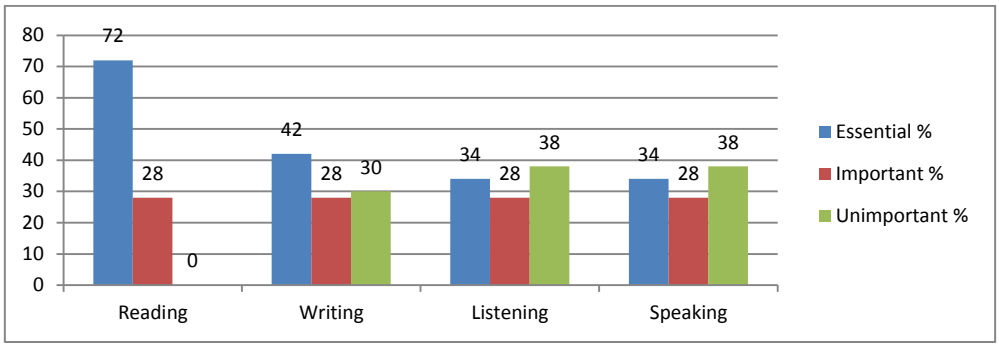


Figure 5.10: Value of macro-skills

For micro-skills, item 24 of the quantitative questionnaire asked the target population for their views about reading materials and different genres. The results in Table 5.8 show that both scientific and general materials were considered to be necessary by the science participants, however, the majority of respondents favoured scientific materials. The data also indicates that more than half of science students were interested in being able to identify the main idea of lectures and understanding the topic in more detail. Skimming and scanning comprehension activities were also favoured by more than half of the students. Moreover, most of these participants reported that the ability to take notes during lectures and understand the meaning of main words were the most important skills.

Table 5.8: Students' views of some genres of skill

Statements	Reading scientific text	Reading general text	Identifying main ideas	Skimming	Scanning	Take note	Recognise key lexical items
Essential %	32	20	21	23	21	67	70
Important %	49	48	43	41	43	19	19
Unimportant %	19	32	36	36	36	14	11

The participants were then also asked to provide information with regard to the writing activities which they preferred. Table 5.9 shows that skills such as writing summaries, experiments or reports were not preferred by more than half of the participants. Nevertheless, less than 50% of students were in favour of writing summaries and experiments. Oral presentations also appeared to be rarely performed by this community, as most of them did not consider it to be essential. The participants were also asked whether or not listening skills are important in understanding science reports or instructions. It is revealed that most science students (77%) saw these skills as

unimportant for their study, and only a few (23%) emphasised the importance of such skills.

Table 5.9: Students' views of some genres of skill

Statements	Writing summaries	Writing experiments	Writing reports	Practicing presentation	Listening to reports/ instructions
Essential %	10	5	0	0	10
Important %	26	26	13	5	13
Unimportant %	64	69	87	95	77

The questionnaire also asked the target students about their views regarding language and sentence structures, and sentence structures. The data below (Figure 5.11) shows that competency in the use of language structures and sentence structures were considered to be essential by the majority of the participants. However, studying sentence structures was considered to be of lower importance than understanding language rules.

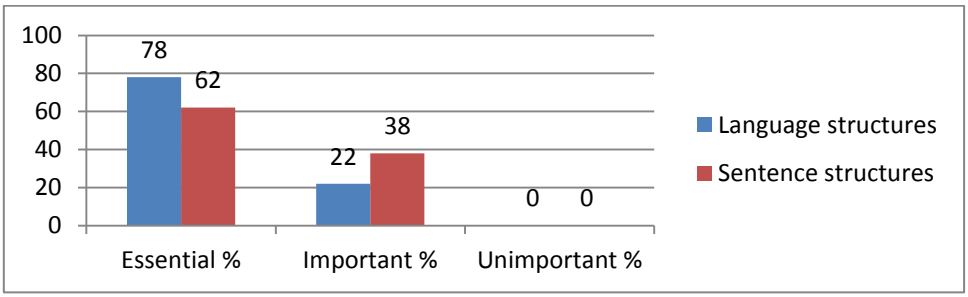


Figure 5.11: Students' preferred activities in English classes

Finally, the students expressed their preferences regarding some language activities. From Table 5.10, it can be seen that filling in the gaps, matching and multiple choices activities are the most attractive and may be familiar to most of the participants. Answering comprehension questions was also considered beneficial by over half of the respondents. The data also indicates that more than half of the students hope to speak the English language fluently and have accurate pronunciation. However, crosswords and punctuation exercises seemed to be the least favourite activity amongst the majority of the participants.

Table 5.10: Students' preferred activities

Element	Fill in the blanks	Crossword	Matching	Multiple choice	Comprehension questions	punctuation	pronunciation	Speaking fluently
Yes	89 %	20%	89%	89%	54%	33%	51%	64%
No	11%	80%	11%	11%	46%	67%	49%	36%
Total	**127**							

5.3.5. Students' perceptions of the current ESP course

First, item 26, sub-question "a" of the questionnaire asked the participants if they generally enjoyed the current English course offered in this semester. The data presented in figure (5.12) shows that approximately half of the applicants were interested, less than quarter of them responded negatively, and the rest were indifferent to the course.

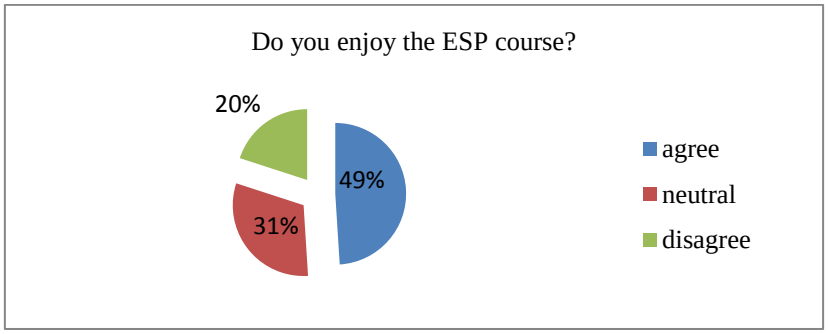


Figure 5.12: Students' general views of the English course

The other three items of the previous question "b, c and d" invited the participants to provide information regarding: language and time of delivery of the course, and class size. In relation to the language used in teaching the English lessons, it was clearly indicated by all applicants that only English language was used. Similarly, all respondents reported that English lessons were conducted in the late afternoon, usually between 4 and 6pm. Finally the number of students in English classes was ranked as large by all of the target community (Table 5.11).

Table 5.11: ESP classroom environment

Element		Responses %	Total
Language of delivery	English	100	127
	Arabic	0	
	Both	0	
Time of delivery	Morning	0	127
	Early afternoon	0	
	Late afternoon	100	
Class size	Small	0	127
	Medium	0	
	Large	100	

Item 27 of the questionnaire, seeks the students' perceptions of whether or not the current ESP course is relevant to their needs in terms of special needs, content and teaching methods. It is noted (see Figure 5.13) that the majority of the students felt that the English

language course was not of value in terms of needs, topics and activities. However, few respondents appeared to have participated in activities on the English course.

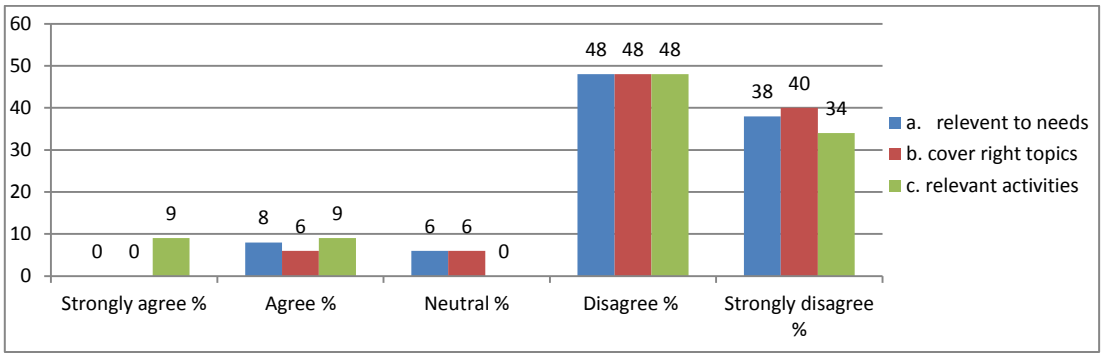


Figure 5.13: Students' perceptions of course content

The same figure (5.14) also reveals results regarding the content of the course, in terms of arrangement and studies (see question 27). Item (d) asked the participants whether or not the English course was easy to follow. From the data, it seems that more than half of the respondents reported that the course was not well organised or easy to follow. Less than a quarter of the participants claimed that the course was easy to follow in terms of organisation. Items (e, f) looked at the students' views concerning the amount of information that English lecturers delivered in English classes. The data reveals that more than half of the respondents felt that the amount of teaching materials offered by their lecturers was viewed in between. Furthermore, approximately a third of the participants claimed that the course was relatively acceptable in both cases. However, a small number responded that there were too many materials and that they were too challenging.

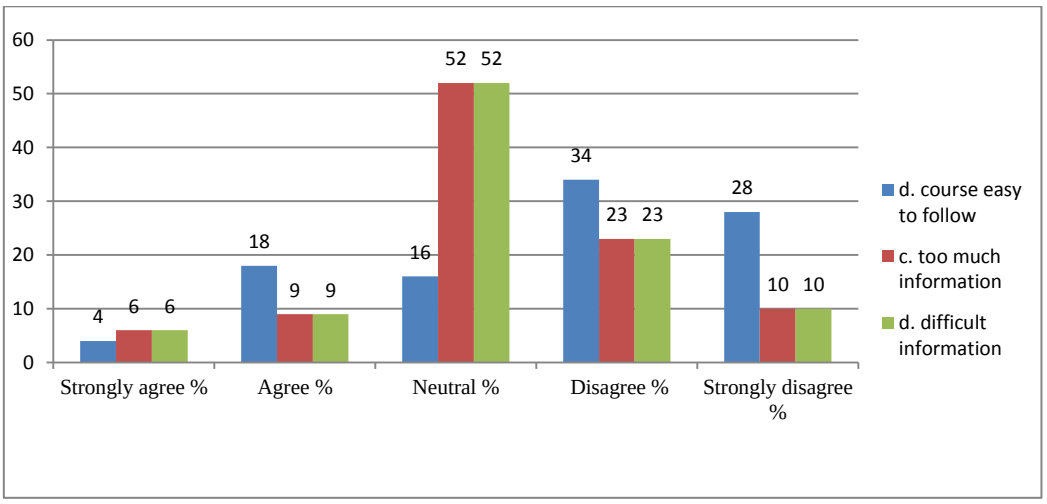


Figure 5.14: Students' perceptions of the course content

Question 27 of the questionnaire requested the participants' views regarding the class atmosphere, time allowed for students to speak, encouragement from the teacher, clarity of teacher's questions and feedback. Table 5.12 shows that more than half of the students felt that language teachers offered a welcoming atmosphere in English classes. Few felt that this was not provided. The data also indicates that most of the participants appeared to be uncertain about whether or not they were given an adequate chance to talk and use their own words in the target class. Almost a quarter of them felt that chances of student-talk-time (STT) and encouragement to apply their own words in class were offered.

The data also illustrates that the majority of participants claimed that the language teacher's questions were ambiguous. The results suggest that a quarter of the students felt that clear and understandable questions from the teacher were essential. Finally, it appears from table (5.12) that approximately half of respondents (47%) were uncertain about whether or not the language teacher provided them with useful advice that focused their attention on the lesson's activities. However, 41% of the participants claimed that feedback on lesson issues had not been offered to them. Still, the results also suggest that few felt that getting feedback from the teacher during the class session was important.

Table 5.12: Students' perceptions towards some teaching methods

Elements	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Total
a. Welcoming atmosphere	0%	16%	20%	46%	18%	127
b. Student speaking time	0%	0%	78%	12%	8%	
c. Opportunity for students to use their own words	0%	0%	78%	12%	8%	
d. Teacher's questions	11%	61%	4%	14%	10%	
e. Teacher offers feedback	0%	41%	47%	12%	0%	

Item 29 of the questionnaire invited the participants to provide information in connection to language skills, namely grammar and sentence structures, vocabulary, spelling, pronunciation and punctuation. The results in the table (5.13) suggest that the majority of science students were frequently expected to practice grammar and vocabulary skills. However, learning and practicing other skills such as; sentence structures, spelling, pronunciation and punctuation appeared to be less of a focus in this course as the majority

of respondents did not feel that they had been involved in such skills. Nevertheless, some of these participants (24%) indicated that the language sentence structures were taught and practised.

Table 5.13: Language skills in which students are involved.

Elements	Yes %	No %	Total
a. Language structures	92	8	127
b. Sentence structures	24	76	
c. Vocabulary	76	24	
d. Spelling	5	95	
e. Pronunciation	10	90	
f. Punctuation	5	95	

The participants were also asked to provide information regarding the genres, which they practised on this course (Table 5.14). It can be seen from the results that the majority of respondents indicated that they did not engage in skimming or scanning general/science texts or asking/answering questions in class. They also stated that they were not asked to practice writing summaries or reports on this course. In contrast, all of the respondents noted that writing exam question answers was the most frequent sub-skills to which they were exposed in English classes. Moreover, the ability to follow lectures and to take notes were also reported as skills which were practised by most of them on this course, whilst about quarter of them replied that this was not required.

Table 5.14: Genres activities in which students are involved

Elements	Yes %	No %	Total
a. Skimming & scanning general text	27	63	127
b. Skimming &scanning science text	25	75	
c. Writing summaries	0	100	
d. Writing reports	0	100	
e. Writing exam question answers	100	0	
f. Following and taking lecture notes	76	24	
g. Asking questions in class	18	82	
h. Answering questions in class	18	82	

5.4. Summary and conclusion

From what has been presented above, the target participants' present situation and their views towards the current ESP course can be summarised as follows - also see also Table 5.15.

Most of these students were female, due largely to the fact that most male students tend to join technical, occupational and military institutions. All of the students are non-native English speakers learning English outside of its natural environment, and practising the language inside the classroom only. Most have learnt English for six or seven years before joining the university. However, these students are not homogeneous in terms of their language experience. 40% of the students consider English to be a hard language to learn, whilst 35% sees it as an easy language to learn, and 25% feel somewhere between the two. Most of the science participants are in favour of integrating English into their study, which is evidence of the role that the English language plays in science education and research. Moreover, English holds an important position in the students' life; it was expressed by students as a necessary language not only for pursuing their graduate studies at a foreign university and getting jobs, but also for leisure purposes. This kind of interest in learning English appeared to be more related to gaining knowledge rather than specifically for study.

With regard to students' self-rating of their language ability, most of the students rate themselves as poor; however a few of them claimed to have a high level of English. As the questionnaire findings show, many students feel that their English comprehension and listening skills are much better than their writing and speaking skills. This may be due to the fact that the teaching of the English language in Libya focuses on reading comprehension and language rules from an early level up to secondary levels (2.3.2 and 2.3.4). The students also rated themselves mostly poor in the accuracy of their writing, and in their interaction with tutors, which can be largely due to lack of special attention to these skills in the early stages of learning English at preparatory and secondary schools. Students, however, indicated satisfaction with reading lecture materials and listening to sessions.

In terms of some language sub-skills, the findings show that language rules are a complex and challenging activity for most of the participants, following by vocabulary,

pronunciation and spelling, in which about 25% of the participants indicated difficult. In contrast, a large number of the participants presented a positive impression in the recognition of science and general words, and few students reported to have difficulties in comprehending both science and general words.

The data also reveal a range of attitudes, beliefs, and behaviour in relation to methods of learning and comprehending the language, which seem to be divergent from one to another. In terms of the language used in ESP classes, integrating both English and Arabic are preferred by most of the students, whilst a few seem to be more interested only in English. In addition, students preferred these classes to be run once a week- in the morning rather than the afternoon. However, a few students felt that two-hours of teaching per-week was not enough, and were strongly in favour of increasing this to more than two hours per-week, for teaching ESP and offering continuity in these courses.

The evidence from this study also suggests sound reasons for decreasing the number of students in ESP classes, as most of the participants were in favour of having smaller classes rather than larger ones, which is evidence of their awareness of the advantages of a small class in learning English (3.2.3). The majority of the participants preferred textbooks over hand-outs for learning the language. Nevertheless, both textbooks and hand-outs are important, as more than half of the students felt some sort of comfort in being able to hold the literature in their hands. In contrast, the use of a language lab was considered as unnecessary by most of the students. There were only a small number of students who were interested of applying such technology in ESP classes. In addition, a large number of the participants tended to be visual learners, as they expressed a desire to see diagrams, and to participate in practical activities.

Science students seemed to be more interested in being exposed to scientific materials rather than general ones. This could be due to the fact that authentic materials represent what students feel they would actually encounter in the real world, and encourages them to make the relevant connection between the use of language, and the purpose of communication (3.2.2). General materials were also desired and welcomed by a number of the participants, which reflects the fact that students are also interested in gaining knowledge in other subjects, and need to spend more time studying language skills.

Further to these styles of learning, all students preferred to learn the target language by practicing reading activities and understanding language structures. This result is closely related to the findings mentioned in 2.3.2 and 2.3.4 in that grammar and reading comprehension are the only two areas examined in all of the language learning levels in Libya - preparatory, secondary and university. Other skills: writing, speaking and listening are neglected in the English classes. These results also reflect the participants' negative attitudes towards oral activities, as the majority of them did not enjoy practicing listening and speaking activities. In addition, science students tended to be more dependent learners, as a large number of them expressed a desire for a teacher who does everything for them. This supports what has been mentioned in 2.3.2, 2.3.3 and 2.3.4, that the traditional dominant role of the teacher is still imposed more strongly in Libyan universities; this will decrease the students' autonomy and confidence in learning the language (3.3.4.5). Furthermore, a desire for working in small groups, both in pairs and individually, rather than in large groups, was voiced by most of the participants.

With regard to the importance of the four language skills, there were different views between the participants. Although both receptive and productive skills seem to be deemed necessary by the participants, focus on reading skill is more necessary- this has been emphasised in many places. Others claimed that speaking, listening and writing are not important, which also supports the previous findings indicated, that these skills are less practiced in English classes. The participants also expressed their interest in carrying out some micro-skills, such as identifying main ideas, skimming, scanning and understanding key words. Again, students reported an interest in understanding the target language grammar, such as language and sentence structures, punctuation and pronunciation. Respondents may possibly think that more grammar activities will develop their language proficiencies. Surprisingly, writing micro-skills such as writing summaries, experiments and reports, and presentation skills, seem to be absent from, or unpractised, in science curricula as they were reported to be unimportant by most of the students. The students also provided their views regarding some language activities, and activities, such as filling in the blanks, multiple choices and word matching are seen as more important than crosswords and comprehension question activities.

The final area of interest is the students' perceptions of the ESP course. It is understood that the ESP classes, where English is the only language used, contained a mixture of

science students, in large classes, and were run in the late afternoon. Moreover, the course materials which were given out to the students' included scientific and general materials, where the focus was on understanding language structures and key lexical items. Besides this, the participants generally expressed a positive attitude toward the course and teachers. In addition, they were relatively satisfied with the amount of information and materials to which they were exposed, as well as the teaching methods applied in this course.

In contrast, there are elements which need to be evaluated further; session time, number of students in each classroom and language applied in the course were amongst the students' concerns. In addition, classes in the morning, the use of small groups and bilingual teachers were preferred by the majority of the participants. The other concern was the materials and activities used, which seemed to be irrelevant to students' professional needs, as the majority believe that studying topics related to their degree area would be more interesting and relevant for them; this highlights the need for subject content to be integrated into ESP courses.

Such findings should draw the attention of language teachers and related bodies, not only to equipping students with the right language skills and teaching environment, but also to making the ESP course more related to their degree specialisms and needs. The findings have also shown that there are a number of curriculum components for each skill which should be incorporated into the ESP syllabus, which students would find interesting and relevant. Teachers, for example, can focus on the training of language communication skills, while integrating terminology and subject content into the course. They can select interesting, subject-related material and topics, vocabulary and writing tasks from a variety of science books and authentic online material, as well as in science subjects – teaching materials, to ensure the relevance that students need, and which will have an important influence on their motivation to learn the language effectively.

Table 5.15: Summary of questionnaire findings

Science students present situation	
St objective information	a. Most students were female b. All speak Arabic and English c. All studied English over a six years period d. All studied English at government / private schools in Libya e. Attitudes towards English were (75% positive), but 50% considered it difficult to learn f. English is learned for study purposes (87%), work purposes (26%), leisure purposes (5%) and other purposes.
St self – assessment	a. Mostly beginner (76%), intermediate (21%) b.. Listening and reading are more comprehensible skills than writing and speaking c. Communication and writing correctly are the main challenges d. Handling general and science texts are expressed as difficult by more than half of participants
Learning styles	a. An integration of English and Arabic in English classes is preferred by the majority b. Once a week and in the morning are the preferences for frequency and timing of classes c. A small number of students in class, and the use of textbooks rather than hand-outs are favoured by the majority d. Language lab is preferred by 54% f. Classes should include discussions, diagrams and practical activities according to the majority g. Scientific materials are more preferable than general materials f. Larger group activities are not favoured by the majority
Skills and activities needed	a. reading then writing are the most skills wanted b. take notes is the most skills needed, than identify main idea , skimming and scanning c. writing report is only preferred by 13% d. learning language rules and comprehended authentic vocabulary are more preferred e. oral presentation is not in favoured by the majorly f. fill in gaps, matching, multiple choice activities are more desired by the majority
ESP course present situation	
Present situation (PS)	a. ESP was of interest to most of the students b. English was the main language of delivery c. The time of delivery was usually late afternoon d. The class size was large e. The teaching materials were irrelevant to most of the students, but were considered to be easy to follow by nearly a third of the students f. Most students were uncertain whether or not the information provided was too much or too difficult g. The teacher were created a welcoming atmosphere h. The students uncertain whether or not the teacher and STT and feedback were provided i. The teacher's questions were unclear to most of them j. Grammar and vocabulary were the skills to which most students were exposed to, while spelling pronunciation and punctuation were used on a very limited basis k. Writing exam questions answers, following lectures and taking notes were the genres that students were most frequently asked to use, followed by skimming and scanning texts. l. Interaction, writing reports and summaries were not used.

Chapter Six
Qualitative Results

6.1. Introduction

The preceding chapter presented subjective information about the science students and their views of the current English course, which were taken from the results of the quantitative questionnaires. This chapter presents the results from three types of qualitative data separately: 1) tutor interviews, 2) science and English classes observations, and 3) existing science and English teaching materials used to contribute to answer the RQs of the study (see Table 6.1).

The findings will be presented separately in three sections, accordingly. Presenting each set of data individually will make the origin of the particular information clear to the reader. Each section will provide a brief introduction to the data, a description of the processes of data analysis, a presentation of the findings, and finally a summary and conclusion. The first set of data to be presented is taken from the tutor interviews.

Table 6.1: Chapter data analysis divisions

Sections	Participants	RQ sub-questions
1. Interviews	Science tutors and ASSA	1.Present Situation Analysis (PSA) 2. Target Situation Analysis (TSA)
	English language lectures	
2. Observations	Computer science and chemistry classes	1. Target Situation Analysis (TSA)
	ESP- module B class	2. Present Situation Analysis (PSA)
3. Teaching materials	Computer science, chemistry & physics	1.Target Situation Analysis (TSA)
	ESP- module B	2. Present Situation Analysis (PSA)

6.2. Interviews

6.2.1. Introduction

This section presents the results of six interviews (see 4.4.4.2 and Table 4.3) which took place at the target institution in Libya. The rationale for applying interviews in qualitative research is well acknowledged (Seidman 2006; Richards 2003; Merriam 1998; Miles and Huberman 1994) and is known to be a suitable approach for obtaining valuable data which reveals individuals' experiences and attitudes. It is also valuable since it allows

those individuals to express their experiences in their own words (Patton 1990). This has already been highlighted in (4.4.4.2).

The aim of this section is to combine the interview with other methods (questionnaire, observations and documents) to answer the RQs as follows:

1. To what extent is English needed in the science setting?
   - What is the science community's present situation (PS)?
     - What is the science students' present situation?
     - What do the science students learn in the ESP course?
   - What is the science community's target situation (TS)?
     - Why and where is the language needed?
     - What type of genres are used in science classes?
     - What type of registers are used in science classes?

The section begins with an explanation of the interview analysis procedure which is followed by the presentation and discussion of the interview findings in relation to the coding categories that have been established to answer the target RQs mentioned above. This presentation will be supported by extracts taken from the interview transcriptions, and which offer insights into the participants' views towards particular issues. Finally a summary of findings and a conclusion will be provided. The findings will then be triangulated with other data (questionnaires, observations and documents) which will be presented in Chapter 7, and it is hoped that this will allow conclusions to be drawn about the language needs of the target population that relate back to the study's original aims.

6.2.2. Interview data analysis

The primary data sources for this study are six interviews, and it is hoped that the findings will contribute to answering the RQs (see 4.4.4.2). Data gathered from science subject lecturers and ASSA is important for understanding the degree to which science students need English and what kind of language skills are required at the TS. Data obtained from ESP lecturers including staff biographies, English course materials, skills, activities, students' English language capabilities and attitudes is crucial for gaining an

understanding of the PS of the target community from the perspective of language lecturers.

Miles and Huberman (1994) suggest three approaches to qualitative data analysis which include interpretive, social anthropological and collaborative social research. In this research, the interpretive approach has been applied, in which the interview data is analysed in order to interpret the "meanings made by both the social actors and the researcher" (p. 8). The reason for using this approach that interpretive analysis involves reading through or beyond the findings, making sense of findings, attaching significance to what has been found, considering different meanings, and offering potential explanations and conclusions. Patton (2002) writes that the interpretative approach "involves explaining the findings, answering why questions, attaching significance to particular results, and putting patterns into an analytical framework" (Patton 2002:438).

Miles and Huberman (1994: 10) suggest three steps for data analysis: data reduction, data display and conclusion drawing/ verification", which can either be carried out by using a *case study* or by *cross-case* analysis. A case study is written for each individual and it is "valuable when the evaluation aims to capture individual differences or unique variations from one programme setting to another, or from one programme to another" (Patton1990:54), whereas a cross-case analysis means grouping together answers from different people to common questions or analysing different perspectives on central issues (Patton 2002: 440).

In this study, a cross-case study will be used. The purpose of cross-analysis is to enhance the ability to gain deeper understanding and careful analysis. It also helps answer some questions relating to issues beyond the specific case study (Miles and Huberman 1994). In practice, the interview data analysis procedures went through six analytical phases: 1) data transcription and coding; 2) organising the data; 3) immersing myself in the data; 4) generating categories; 5) data interpretation and analysis; and 6) presentation.

First, the researcher listened to the all data carefully and translated the Arabic interviews into English. Data for each participant was, then placed in a file and transcribed (see appendices 9 and 10). The transcribed texts were formatted; lines were numbered, and the talk turns were preceded by the identification of the interviewees' symbols shown in appendix 9. The names of participants that appeared in the interviews were replaced with

the initial letters of their discipline. For example: an English language lecturer was identified as "EL1", and a chemistry lecturer as "CHL". As the focus of the study is on the content of the participants' responses, rather than the manner in which they were delivered, the researcher has chosen the sections of the discourses that provide the satisfactory answers to the research questions, and excluded those which were considered irrelevant (see appendices 9 and 10).

Secondly, coding was applied in order to capture important interview data, to learn how participants make sense of their experiences and how they act in certain situations. In contribution to this, Miles and Huberman (1994, Patton (1987) and Merriam (1998) emphasise that interviews must be coded to ensure the quality of the qualitative data analysis and to assist with later analysis of the data and ensure its accuracy and relevancy. The researcher went through each case study in depth, highlighted key points, wrote labels in the margins, and made notes to himself. The data then was checked again, organised, and finally directly related back to the generated categories. Table 6.2 shows the main categories and sub-categories established for this data, whilst Table 6.3 illustrates the processes of coding, identifying conceptual data and then relating each set of data selected back to the main categories. The researcher did not use computer programmes for the qualitative data analysis, as the data was not of a scale large enough to need such software. Instead, the researcher chose to adopt a manual approach, which involved immersing himself in the interview data, and reading and re-reading the transcripts in order to become familiar with the participants' perspectives.

Table 6.2: Interview data analysis categories and sub-categories

RQ1, sub-question 1	
Categories	Sub-categories
Present Situation (PSA)	Students' language competence Students' language challenges Students' attitudes ESP course teachers' biography ESP course physical teaching environment ESP course aims and objectives ESP course teaching materials ESP classroom teaching methodology
RQ1, sub-question 2	
Target situation (TSA)	Reasons for using the language Genres and language skills Where and with whom the language is used

Table 6.3: Example of the coding process

Participants	Code text	Interpretation	Sub-category	Category
EL1	It is **various**…computer students are little better…I fix an exam tomorrow. They will **not understand it**. It is not only in our college,… everywhere, They **understand nothing**	Heterogeneous levels and lack of language competences	**Students' language competence**	**Present Situation (PS)**
CSL	They **do not have the basic of the language**… They are weak in all language skills… It is related to their English background… they **get nothing from these courses**	Lack of language competences		
ASSA	our students' **English background is really poor**… there is **no benefit**...	Low level of English		
CHL	For example, they **do not know** what these **terms mean in Arabic**.	Problems with technical words		

The findings, then, will first be interpreted and analysed according to the categories and subcategories (see Table 6.2). This analysis will begin with an introduction to each theme, and then each sub-theme will be described, and supported with relevant extracts taken from the interviews. Such extracts are essential as they can show the participants' experiences and views on those experiences in their own words as well as providing perspectives from the target community as a whole. Finally, a summary and conclusions will be drawn from the findings.

6.2.3. Interview findings

In order to present what has been found with regard to the PS and TS the findings are divided into two parts. Part one, 6.2.3.1 concerning sub-question 1 (PSA), is divided into eight themes: 1) students' language competence, 2) students' English language learning challenges, 3) students' attitudes towards the language, 4) ESP teachers' biography, 5) ESP course aims and objectives, 6) ESP course physical teaching environment,7) ESP course teaching materials, and 8) ESP classroom teaching methodology. Part two, 6.2.3.2 concerning sub-question 2 (TSA) consists of three themes: 1) reasons for using the language, 2) genres and language skills and 3) where and with whom the language is/will be used.

6.2.3.1. Present situation analysis

This section aims to identify what the target students "lack" at the beginning of the course and then progresses to a discussion of their "necessities" and "wants" for the future

(Hutchinson and Waters 1987:55-57, see also 3.3.2 and 3.3.4.6). In other words, it aims to understand exactly what teachers believe the learners already know and then to match this with their target demands. As mentioned earlier, the students' present situation will be examined within eight themes (see Table 6.2).

a. Students' language competence

All the faculty members interviewed (English and science lecturers and ASSA) perceived students as having inadequate language competence, and rated language levels between "beginners" and "pre-intermediate" (extract 6.1). They felt that most of these students joined the faculty with a limited knowledge of English in terms of language skills and vocabulary. According to ASSA, for instance, a number of foreign lecturers has been contracted with to improve the students language abilities, but the results were disappointing due to the students' low language capability (Extract 6.1 and appendices 9 and 10).

Extract 6.1.

CHL	For example, they do not know what these terms mean in Arabic.
R	So, chemistry terms are the only challenges …
CHL	Yes.
CSL	They do not have the basic of the language.
CSL	They are weak in all language skills
CSL	What is the reason behind this?
R	It is related to their English background.
ASSA	(..) our students' English background is really poor. To cope with such situation, we brought lecturers who speak English. However, they have got nothing. The course that they have taught was not intensive.
EL1	To my knowledge, computer students are little better than other Students tomorrow is the exam. They will not understand it
EL1	No. They do not have similar level. Very few of them are okay
EL2	I would say, something between beginners and pre-intermediate

English lecturers gave a more specific assessment of the computer students' language knowledge. According to these lecturers, computer students are more knowledgeable than those in other disciplines (e.g. chemistry or physics), because they are more frequently exposed to English (see appendix 10, lines 31 - 34).

b. Students' English language learning challenges

According to CSL, ASSA, EL1 and EL2, most science students who join the faculty come with only a slight knowledge of English, and encounter a number of problems with

English tasks which include all the language skills (reading, listening, writing and speaking). ASSA argues that there appears to be no sign of improvement amongst computer students, despite the fact that some computer subjects are now delivered in English by foreign lecturers (Extract 6.2). This result, according to him, is due to the weakness of the computer students' language competence as well as the presence of unqualified tutors. He maintained that the department had a flexible curriculum, which meant that lecturers were free to select their teaching materials. However, the outcome was unacceptable as the materials provided by them were not up-to-date or fit for purposes, which reflected their lack of teaching qualifications. In fact, two of these tutors had been dismissed by the time I returned to the faculty to conduct the second phase of the study (see appendix 9). EL1 also claimed that he cannot teach communicatively because the students' language skills are very weak. It has been argued that a bilingual teacher would be more helpful to these students, because a tutor's inability to speak Arabic means that he/she fails to communicate with the students successfully (see appendix 10, lines 125 – 133, 143 - 149).

In chemistry, understanding terminology (see extract 1) is seen as the only difficulty that students currently face despite the fact that some of these words have an Arabic equivalent. In contrast, no language related challenges have been reported in physics as teaching and materials are mostly in Arabic (see appendix 9, lines 215 – 220).

c. Students' attitudes towards the language

In this regard, the participants who were asked about how the students see English language have given positive views to using the foreign language, to some extent, regardless of difficulties they encounter with the language. ASSA reported that few computer students that he had observed or questioned had interest in using the language. EL1 also noticed that nearly all science students who joined the ESP course were consistently present for ESP- module B, which might be understood as another positive attitude towards the language (see extract 6.2).

Extract 6.2

ASSA (..) our students' English background is really poor. To cope with such situation, we brought lecturers who speak English. However, they have got nothing…
… For example, I have observed the two (xxx) lecturers and only found out three or four female students who were interested and motivated in learning English. I also

	asked these female students whether they understand the lecture delivered in English or
EL1	not. They said, yes.
	English class. Everyone is present, no single person is absent

d. ESP Teachers' biography

The results of the interviews reveal (see extract 6.3 and appendix 10) that the ESP course, module B is taught by two foreigners whose educational background involved degrees in English language: EL1 has an MPhil and a diploma in education in English language and EL2 has an MA and a BA in English as well as experience in teaching. EL1 has experience and is interested in ESP. However, EL2 has not previously been involved in any ESP programme and his involvement in this course was only to cover a shortage in bilingual English lecturers at the Faculty, which he described as a challenge. EL1 is more interested in teaching grammar, reading and speaking, whereas EL2 is more comfortable with teaching writing and speaking skills. Both lectures are experienced in computer use; neither of them has used technology in delivery of the ESP course. In addition, the length of ESP classes and the size of the classes as well as workload were among the problems faced by these tutors.

Extract 6.3

EL1	MPhil + DE in English language
	About 13 years
	Yes, back home and here also
	Grammar (..) Now I feel more comfortable of teaching grammar.
	Of course spoken English.
	I would say speaking and reading
	Of course, I am interested in teaching ESP, especially computer science.
	Yes, back in India. I have taught EIL students

e. ESP course aims and objectives

From an educational point of view, setting the aims and objectives of the course is the foundation stone of any programme. With regard to the aims and objectives of the ESP programme, it is understood that there was no clear aim, objective or specific syllabi for the course (see extract 6.4), which means that teachers did not have a clear idea of the learning aims and objectives, for example, why this course is taught and what should be taught. However, both English lectures reported that they (the Head of the English Department and English tutors) meet to discuss such issues (see appendix 10).

Extract 6.4

EL1	(..) We discuss among ourselves and with the English department, and we decide course in that way (..)
EL1	Aims left the teacher's choice and according to general knowledge
EL2	Actually, we find, we make the syllabus according to our department Head. We sit together and decide on the syllabus…

f. ESP course teaching physical environment

In connection to this, the results of this study (see extract 6.5) show that English language classes are heterogeneous. In each class, there were students from computer science, biology, chemistry and physics departments who all came with different levels of English. The English language course is often delivered in the afternoon between 2 and 6 pm, which is due to the fact that the morning is given over to the main science subjects. Each English lesson lasts about two hours per week, and more than 90 students are gathered in one hall.

Extract 6.5

EL1	(..) Usually in the evening (..) From two to four and four to six. Because during the morning time they have to take their main sessions To be frank, it is not the right time learning particularly English, because after their main lessons they become very tired. So English needs activities. It requires activities (..) They should be fresh (..) … nearly two hours. (..) in the classroom you can find some people from chemistry some students from computer some from biology (..)
EL2	No. They do not have similar level. Very few of them are okay I would say, something between beginners and pre-intermediate. So far I feel that students from computer department. I can say that Biology and to certain aspect Zoology students

According to EL1 such an environment is unsuitable (see appendix 10 lines 46 – 51, 124 – 125, 225 - 230). Firstly, the time seems to be inappropriate because students are tired and English lessons need active and fresh learners. Secondly, the class is large, which appears to cause some problems with language teaching and learning; for example what to teach in terms of materials, and how to teach in terms of conducting activities. It was suggested that English lessons should be delivered in the morning where students are still fresh, and that they should be three times a week to enable students to improve their competence by being continually exposed to the language. However, EL2 seems to be satisfied with two hours per week (see appendix 10).

g. ESP course teaching materials

In this part of the thesis, the aim is to discover the type of materials used in teaching: authentic or unauthentic, the type of sources: science books, or the internet and the methods of selecting materials. According to both English lecturers (EL1 and EL2), there has never previously been an English course specifically designed for science students. Therefore, the responsibility for adopting these materials is theirs. It was made clear that each lecturer adopts his own materials for the course, are selected according to his own experience, which are mixed in terms of subject-area, and which are selected from science books or the internet. According to EL1, the only method used to select these materials is to conduct a brief discussion with the students. Following this discussion, the teaching material is selected in terms of "register" only. Others issues (e.g. authenticity, genre, culture, interest, and relevance) seemed be ignored or unknown to EL2.

Extract 6.6

EL1	(..) the teacher is free to choose. According to their needs, teachers can choose the syllabus (..) Teachers are free, according to his understanding level (..) Of course there is always an interaction with the head of English department (..) regarding the materials what it should be taught. Sometimes (..) we choose some passages related to the students' main subjects, for example, computer.
R	(..) How do you identify the language needs of your learners?
EL1	According to the faculty they belong to. That means; some are from the computer. So I
EL2	select some materials for computer … Yes (..) science books. Some passages we are taken from computer, and sometimes e-materials. We are referred to online-materials Emm (..) it is too difficult to answer (..) we interact with them, we ask them questions, we encourage them to speak, we give them assignments, so through that we understand their requirements.

h. ESP classroom methodology

Teaching ESP courses is described as a challenge by EL2, because he does not have experience in this area, and has only taken the job because there are not enough staff at the Faculty. He also feels that scientific materials are difficult to use because they contain technical words, especially in physics and maths. In addition, both lecturers experienced difficulties in dealing with the students in terms of their language competence.

Regarding teaching methods, it can be said that old methods seem to be applied most frequently in these classes. According to both lecturers, the teaching materials focus was put on reading comprehension texts, and language structures and vocabulary activities (e.g. reading silently, skimming and drilling). However, writing and listening activities were also rare used (see extract 6.6 and 6.7 and appendix 10).

Extract 6.7

EL1 I apply different methods, reading silently, drill, of course some structures, I mean grammar (..), it depends on the hand-out to be given in each class.(..) I use different methods. I sometimes explain the whole passage, sometimes certain words; sometimes I might even discuss certain questions, and help them understand the things in an easier way by giving the meaning and explanation (..) it dependence. Not a particular way (..) It is depending upon the situation and the materials. (..), reading comprehension, we read the paragraph listening and drilling work is there (..) after the teacher reads the paragraph in the class, once, twice.

EL2 No, no, they read it to themselves. We give them some time; three, five, ten minutes, Listening (..) emm (..) to some extend writing.

EL1 noted that he had not encountered any problems in dealing with classroom management as all the students were obedient and willing to contribute. It was also reported that visual tools were not used in the delivery of ESP materials despite the fact that both lecturers are familiar with computers (see appendix 10 lines 183 – 185, 377 - 380). In terms of assessment, written tests are conducted once or twice per semester. According to EL1, in these tests, one passage is selected, which is known to all students in advance, where reading comprehension, grammar and vocabulary are tested. However, oral/aural examinations are excluded from ESP courses (see appendix 10, lines 350 - 352).

6.2.3.2. Target situation analysis

This part looks at the TSA (Hyland 2006; Dudley-Evans and St John 1998; Jordan 1997; Robinson 1991; Hutchinson and Waters 1987) of science students, which will be discovered through the science tutors perspectives. It is hoped that some of the tasks in which the target community are expected to participate as users of the target language will be identified. For this purpose, the community TSA is divided into the three sub-categories (see Table 6.2).

a. Reasons for using the language

It is understood from the interviews (extract 8) that English language is a compulsory subject at this faculty and is treated as an official subject. This means that students are required to attend lectures and to pass exams, which are almost all done in English. This might explain why English as a subject seemed to be considered as more necessary for study purposes by the interviewees (extract 6.8). With regard to science subjects, data shows that each discipline requires English to different degrees at this stage. Students in the computer department seem to be the most exposed to English, and in this field some presentations and subject materials such as Computer Programming are entirely in English. According to both CSL and ASSA interviewees, other computer science subject materials and presentations are a mixture of Arabic and English. In the short-term, therefore, students are required to read materials and write computer programme in English. They are also required to answer examination papers written in English and to listen to lectures delivered in English. In the long-term, students will be required to design computer programmes and Networks for work purposes (extract 6.8).

Extract 6.8

CSL	English is more used than Arabic (..) Reading is more important because they are acquired to go online and read references in English. At work. Take for example, programming. It is completely taught by English. They need English for both studying and working purposes.
ASSA	It's a compulsory course which is divided into three modules A, B and C, and must be passed. All science and Arabic departments' students should complete these three modules within 4 years. It is used as a vehicle for communication in different subjects, and technology is mostly a western product. So English is needed in most of disciplines, not only for study purposes but also for career purposes. Take for example, computer science where all subjects are mixed with English especially Languages Programming, networks and other which are written in English not in Arabic

Moreover, English seems to be extremely needed by both students and practitioners as translation is still a problematic issue in the CS area. Both CSL and ASSA stressed that there has been problem regarding translation (extract 6.9) in terms of standardisation as the Arabic Language Academy has not yet reached an agreement regarding most recent scientific terminology. This issue has caused misunderstandings between Arab practitioners, as every country or researcher has translated words differently.

Extract 6.9

CSL We apply both Arabic and English in these courses. We also translate not only term words but also sentences
In fact, there are no references written in Arabic, it is very rare specially advanced subjects. Take for example Operating System and Compilers System. You could not find any reference written in Arabic (..)
R. So there is no standard translation… that is why you focus on using English.
CSL Yes.
ASSA Other thing is that we do not have standard translation…

In terms of Chemistry departments, the data reveals that English is needed for both study and work purposes as 20% of chemistry teaching materials and all chemical equations are written in English. For study purposes, it was reported that students are required to read and understand most chemical equations and instructions which are usually written in English. For work purposes, graduate students working in laboratories are required to write reports and understand machines operation instructions in English (see extract 6.10, Table 6.4 and appendix 9). However, lessons and materials are written and presented in Arabic and students are not required to read, write or speak English at the moment.

Extract 6.10

CHL (..) 20% is English. However, all the chemical equations symbols are written in English… …Take for example "Ammonia" which has the same Arabic pronunciation امونيا. This does not need to be translated into Arabic. However, term such "mechanism". We try to simplify it for them (..) this means ميكانيكية التفاعل.
Yes. We will write it in English but we explain it in Arabic.
Not only for study purposes. It is also essential for work purpose.
Reports and equipment are all in English (..) I mean, people, for example, who work at laboratories should have good writing skills, because all the Lab test reports are written in English (..) And the equipment instructions are also written in English. In other words, we are surrounding by it.

In contrast, English is not required by physics students as the data showed that all subject teaching materials and lessons were in Arabic. Nevertheless, PHL strongly emphasised that students should study English in order to cope with the explosion of knowledge, a field in which most research, journals and conferences are in English. English is thus, needed for future study and for work purposes. Such a view is also supported by the ASSA, who offered a very broad sense of the need for English both for study and work purposes, as the majority of advanced scientific materials are mostly in English (see appendix 9 and Table 6.4).

Table 6.4: Science subjects TS

Dimension	Variable	Target Situation Analysis (TSA)
Why language is needed	CS	Staff: A/E spk, LD: A/E, L/Mat**:** A/E, EC: compulsory , Purp: study and work
	CH	Staff: A/spk, L/D : A, L/Mat: A/E, EC: compulsory subject, Purp : study and work
	PH	Staff: A/spk, L/D : A, L/Mat: A , EC: compulsory subject, Purp : study and work
Language be used: Medium and types	CS	Medium: 4 skills Types: academic texts, lectures, technical Vocabulary
	CH	Medium: writing and reading Types: technical vocabulary and manuals
	PH	Medium: writing Types: Math terms
Genres	CS	Lectures, design programmes, network
	CH	Lectures, lab report
	PH	N/A
skills	CS	Subject: within discipline Level: undergraduate
	CH	Subject: within discipline Level: undergraduate
	PH	Subject: within discipline Level: undergraduate
Use of language with	CS	Lecturer: Arabic and English native speakers, and among others
	CH	Lecturer: mother-tongue
	PH	Lecturer: mother-tongue
Place	CS	Physical setting: lecture class, library Non-physical setting: work Linguistics context: in own country, may be abroad
	CH	Physical setting: lecture class, might be at library Non-physical setting: work Linguistics context: in own country, might be abroad
	PH	Physical setting: lecture class, might be at library Non-physical setting: NA Linguistics context: might be abroad

b. **Genre and language skills**

The data reveals a number of activities that occur in science settings including listening to lectures, taking notes, understanding and reading lecture hand-outs and writing laboratory reports. All of these activities are needed for academic and work purposes to varying degrees in different disciplines. In computer science, it seems that most tasks require English, where reading and writing are defined as the most important skills needed at the TS followed by listening and speaking (see extract 6.11). In lecturers, students are required to read hand-outs, write notes, ask for clarification, understand general and specific points. In examinations, they are required to read and understand questions, write

relevant and accurate answers, ask for clarification and listen to instructions. In private, they need to skim and scan books and references; take notes, practice theory and follow instructions (see Table 6.5).

Extract 6.11

CSL	(..) I would say that reading and writing are the most important skills which need to be focused on.
R	Writing and reading skills. What about speaking and listening?
CSL	I don't think they need these skills unless they wish to study abroad.
R	I think they do need listening as some lectures are taught in English.
CSL	No, we only teach computer terms in English and we explain these subjects in Arabic. I wish if we could have taught these courses in

In chemistry departments, it was reported that reading and writing chemical equations and Periodic Table symbols (study/short-term requirement) as well as laboratory reports (long-term requirement) are the essential requirements. Thus, emphasis should be placed on reading, writing and understanding scientific terminologies whether they are chemical elements, equations or instructions, in short-term. In the long-term, it seems that all the short-term requirements are still important, and that in addition, individuals need the ability to read and write scientific reports (see appendix 9, lines 28-31, 93-102). In contrast, the use of English language skills is limited with the department of physics where only small symbols and mathematical equations are formed in English (see Table 6.4).

Table 6.5: CS TS skills needs at the Faculty

Instrumentality	*Tasks*	*Sitting*
Reading	reading hand-outs	**Lecture**
Writing	taking notes	
Speaking	asking for clarification	
Listening	listening for general understanding and specific points to remember	
Reading	reading and understanding examination questions	**Examination**
Writing	writing relevant and correct answers.	
Speaking	asking for clarification	
Listening	listening to instructions.	
Reading	reading for main information – skimming reading for specific assignment oriented information - scanning	**Private**
Writing	note taking, describing theories, practices	

c. Where and with whom the language is/will be used

In looking at the participants' response, it is clear that English is used in places of study than places of work in science settings, but to different degrees (see extract 6.10. and 6.12). For students of computing, it seems that English is essential in both the study and work place environments. This is due to the fact mentioned two points previously that some computer subject materials are written in a mixture of Arabic and English, and others are entirely in English (see extract 6.12 and appendix 9).

Extract 6.12

CSL	Reading is more important because they are acquired to go online and read references in English. At work. Take for example, programming. It is completely taught by English. They need English for both studying and working purposes. (..) I would say that reading and writing are the most important skills.
ASSA	It is used as a vehicle for communication in different subjects, and technology is mostly a western product. So English is needed in most of disciplines, not for study purposes but also for career purposes.

Participants also reported that English is needed for communication purpose by computer students (see extract 6.13). Whilst most subject staff are native speakers of Arabic and some are foreigners. As the results, computer students are sometimes required to interact with their tutors in English (in lectures delivered by non-native speakers (NNS) of Arabic). The data also shows that a few native Arabic speaking tutors are in favour of applying English in their classes. For example, CSL and ASSA claim that they feel more at home using English as the medium of instruction in their classes, which could be due to their Western educational backgrounds (see appendix 9).

Extract 6.13

CSL	No, we only teach computer terms in English and we explain these subjects in Arabic. I wish if we could have taught these courses in English. These courses are taught in Arabic and each lecturer depends on his own translation, because there is no standard translation in the Arabic world.
ASSA	(..) our students' English background is really poor. To cope with such situation, we brought lecturers who speak English. However, they have got nothing. The course that they have thought was not intensive. Take for example "Digital Communication" which I am teaching. It is impossible to find a reference in Arabic language. You might find one, but you could not find that good quality of information as you would expect. I have insisted to be taught in English rather than in Arabic.

The CHL claimed that in the chemistry department, English is needed more in the study environment than in the work place, for example for writing lab reports and understanding some equipment instructions; as was mentioned earlier, most terminologies are in English, but specialist discourse is conducted entirely in Arabic (see appendix 9, lines 2 and 47- 88). In contrast, physics students, as noted earlier, are rarely exposed to English from which it can be concluded that English is not needed in the short-term (see appendix 9).

6.2.4. Summary and conclusion

The aim of the interviews was to contribute to answer the RQs by obtaining information about the perceptions of insiders regarding the science subjects target needs and their present situation as well as about the ESP course. It can be concluded that such data has offered valuable information concerning the study RQs.

In term of sub-question 1; the students' PSA, all participants (science and English lecturers and ASSA) claimed that most students join the university with a quite low level of ability in all English language skills, which surely affects the TS needs. However, there have been encouraging signs (especially from computer students) that students will continue to learn and use the language. Table 6.6 illustrates the positive aspects of the target students' PS, as they were viewed by the participants.

The situation of the PSA of the ESP course seems to be similar to the students' PS. It was found that the ESP module is taught by foreign teachers. The aims and objectives of this course seem to be unclear, as is the syllabus. All students, teaching materials and methods were heterogeneous. One positive aspect of this course is that some students appear to be interested in English, as reported by EL1. The English lecturers are also generally content to conduct this course particularly since the choice of teaching materials and the syllabus are in their hands. However, on a negative note, the English staff appear to be dissatisfied with other issues, ranging from the students' language competence to the physical teaching environment.

In terms of sub-question 2, science and ASSA participants agreed that English language is needed for both study and work purposes, but to different degrees, according to the place, time and discipline. English is essential for computer students as all computer structures

programming are entirely in English. In addition, some of the teaching materials are in English, and some subjects are taught in the language. The results indicate that computer students are required to have an intermediate level of all macro-skills and some of micro-skills (e.g. taking notes, listening to lectures, recognising computer coding, understanding content, scanning for specific information and reading hand-outs, etc.) in order to cope with the TS requirement. This is less necessary in chemistry, as only terms are required to be learned in English, some of which are known to the majority of students. However, the ability to write scientific reports is required for work purposes.

In contrast, English is not essential for physics students. Table 6.4 summarises the TS needs of each department. In can be concluded that there is a gap between what science students already know at the PS and the requirements of the TS. More discussion of the target community present situation will be presented in chapter 7.

Table 6.6: English and science lecturers' views of the students PS

Participants	Code text	Interpretation	Sub-category	Category
EL1, EL2, CSL, CHL, PHL & ASSA	They do not have the basic of the language … They are weak in all language skills …our students' English background is really poor… between beginners and pre-intermediate… computer students are little better than other… Biology and …Zoology students… are very slow in picking the language …	**LComp**: Mostly very weak in all language skills, computer students are better than others	**Students' Present Situation**	**Present Situation (PS)**
	They like English classes… no single person is absent… Some are writing and some are copying and some are doing nothing	**Att:** mostly positive		
	...they do not know what these terms mean in Arabic… They are weak in all language skills… They cannot translate; they get nothing from these courses written in English …They understand nothing …they failed to understand certain things… chemistry terms are the only challenges	**Chall:** Lack in all language skills, Lack in technical terms,		

6.3. Observations

6.3.1. Introduction

This part presents the results of the classroom observations which were conducted at the study place, and which included classes from three disciplines: English, computer science and chemistry (see Table 4.3). The rationale for using observation in qualitative research,

as discussed in 4.4.4.3, is well known (Johnson and Turner 2003; Richards 2003) and established. The aim in this study is to support and complete the findings obtained from other research methods, in order to learn more about the language needs of target population.

The presentation of this data is divided into two parts. The first part covers the English classroom observation, and concerns the target community's PS. It includes issues such as the environment, teaching materials and methods, attitudes and behaviours that relevant to the RQs, sub-division 1:

- What is the science community's present situation (PS)?
    - What is the science students' present situation?
    - What do the science students learn in the ESP course?

The second part presents the data from computer science and chemistry classrooms, and concerns the TS of the target community. It includes issues such as language (s), genres, registers and skills used in science classes, particularly where they are relevant to the RQs, subdivision 2.

- What is the science community's target situation (TS)?
    - Why and where is the language needed?
    - What type of genres are used in science classes?
    - What type of registers are used in science classes?

This section of the thesis begins with the presentation of the analysis procedures for each set of data. This is followed by the presentation of the findings, which is divided into two parts. Part one presents the English classroom findings and part two deals with the science classroom observations. Finally, a summary of the results and conclusion are provided.

6.3.2. Observations data analysis

In this study, the analysis of the observation data was conducted from a qualitative perspective. Due to the fact that the English classroom observation was not recorded, the results were mainly taken from a combination of my field notes and classroom

observation schedule. The science classroom observations were taken from three documentation tools: a classroom observation schedule, the researcher's field-notes and class sheets and audio -recorded.

To analyse the data, content analysis was applied (Miles and Huberman, 1994; Patton 2002) as follows. Firstly, all data (field-notes, classroom observation schedule and class sheets) were read to obtain a sense of the data as a whole. The CS classes recorded data was also carefully checked and initial interesting features related to the study were noted. These were then entered onto a spread sheet (see appendices 9 and 10). Secondly, data reduction and coding were developed by highlighting the exact words/sentences from the texts that appeared to capture key concepts. Nunan's (1991) framework (Table 6.7) was used as a guide for analysing the data. This framework also shows how the data was reduced and coded. Next analytical categories and sub-categories (see Table 6.8) were developed and defined, which were derived directly from the texts, and which were then used to organise and group codes into meaningful clusters (Miles and Huberman 1994; Patton 2002; Cohen and et al. 2000).

These categories have become the basis for the analysis of the findings, and are thus considered highly relevant for the aims of the study. This kind of categorisation enables more efficient analysis and is often important in helping to make sense of the amount of data that is generated from such qualitative research (Miles and Huberman 1994). Finally, findings related to each theme were presented, analysed and supported by extracts taken from the data (CS classes' audio-recorded data notes, the classroom observation schedule and the researcher's notes).

Table 6.8: Observation data analysis themes

Categories	Themes
Present Situation (PSA)	**sub-question 1**
	ESP course teaching environment, ESP course teaching content, ESP classroom teaching methodology, The students' general attitudes towards the ESP course
Target Situation (TSA)	**sub-question 2**
	a. Language (s) used in the classes, b. Kind of genres used in science classes, c. Kind of registers used in science classes d. Students' attitudes towards language in use in science classes.

6.3.3. Observation data results

The data analysis will be presented in two parts (6.3.1). The first part concerns English classroom data relating to the target community's PSA. The second part concerns the science classroom data relating to the TSA of the target community (Table 6.8). Finally a summary of both sets of findings will be provided, and a conclusion will be drawn.

6.3.3.1. Part one: English classroom observation

The purpose of this section (see 6.3.1) is to look at the current English PSA in terms of four categories: teaching physical environment, content and methods and students perceptions of English.

a. Teaching environment

Some of the issues that affect learning are the size and the heterogeneous academic level and discipline of the classroom, and the classroom atmosphere: - the positions of the seating and, board, lighting and visual aids. At first glance, it seems that the teaching classroom atmosphere was not conducive to learning and was inappropriate for four different reasons: class size, organisation of seating, timing and use of teaching aids (see appendices 11- A and Figure 6.4).

The English classroom was a large hall, with reasonable air-conditioning, light, and a small whiteboard (160 × 120) located at the front, behind the lecturer. There was only one walkway, which divided the theatre in two, and on each side were three single seats are stacked together. In connection to this, the EL1 was not seen in making close contact with the students, which might be due to the organisation of the seating. He was only observed moving at front of the class. Moreover, it appeared that the position of the seats made it difficult for some students to copy from the board; especially those students seated at the back of the class. Some students were observed standing up from their chairs in order to see the board on occasions (see extract 6.14, appendix 11- A and Figure 6.4).

Extract 6.14: Sample of the observed English class reflection report

> "… He was only walking at the front of the class and interacting with those sitting in the front lines. I think this was because of the seating arrangement and the large number of students. It seems that the seating arrangement prevented him from seeing every student equally, and from

> reaching every students, e.g. to monitor their work or provide helps. This was a particular problem for those who were sitting close to the wall and those who were at the back of the class. It might have prevented him from setting pair/group activities and other activities such as role-play, none of which were applied.

This class is held once a week for two hours in the late afternoon (4-6 pm), and is led by a foreign male. The hall was full, and more than one hundred heterogeneous students were attendance. Most of these students were female, and were sitting separately from the male students, who were all at the back of the class. Both female and male students were enthusiastic and seemed enjoyed the class. Their English language levels were varied (see extract 6.15 and appendices 10-11 A and B).

Extract 6.15: Sample of the observed English class reflection report

> "… the class is held once a week, and more than one-hundred students were present. The students came from all science departments; chemistry, computer science, physics, mathematics and natural history and are in the 2nd, 3rd and 4th semesters. Most of them were studying natural history as was proved by the attendance register. Their English language ability was mainly at beginner level, although there were few pre-intermediate students. The tutor mentioned that the computer students, and two or three of the physics students were the best in the class. As the lecturer and I came into the classroom, the first thing that was noticed was that the students were all waiting for the lecturer to…"

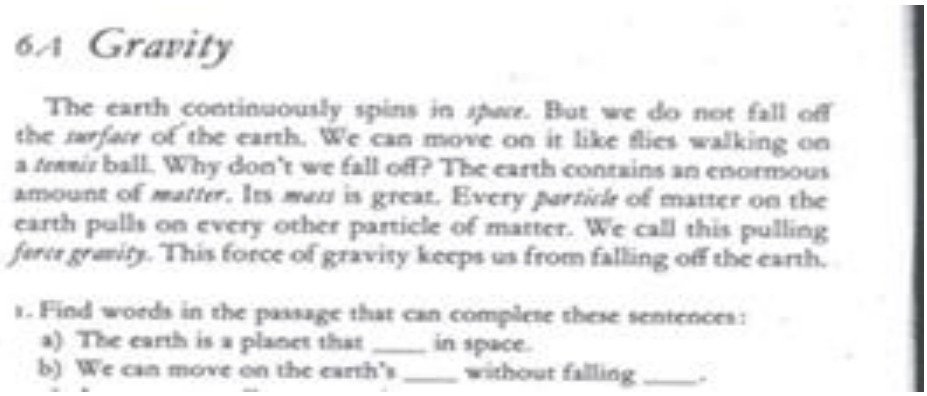
b. Teaching content

From what has been observed, the English course materials seem to be old fashioned in appearance, have indefinable objectives, and contain inauthentic content, which does not meet the recommended ESP materials (Hutchinson and Waters 1987; Dudley-Evans and St John 1998. The teaching materials used in this lecture were not aesthetically pleasing, and consisted of a black and white A4 paper hand-out comprising two short reading comprehension texts followed by grammar and vocabulary activities (see extract 6.16 and appendix 11.B). This hand-out appeared to be quite general, and although it was possibly more relevant to physics students, it could be adjusted to suit those in other disciplines. The objective of this session was not clear as there was no syllabus to follow or to consult. At the top of the hand-out was written "The simple present tense: could, would", from which it could be guessed that the focus of the lesson would be on presenting and discussing such structures. However, this did not happen.

From what was observed (see appendix 11.A and B) it was clear that the focus of the lesson was to develop reading comprehension and enriching the students' vocabulary, as well as developing students' awareness of some language prepositions. It can also be said that this hand-out is easy to follow, useful and to some extent, suitable for the class. The text is easy to understand because it is very short and is more general than specific in terms of language items such as vocabulary and structure. It also met the students' linguistic levels, which seemed to be between beginner and pre-intermediate. The lecturer, it is believed, selected the right materials, in terms of the students' competence, as was observed.

In terms of activities, the observed texts show that several macro- and micro-activities were provided such as skimming, filling in the gaps, multiple choice and true or false statements, and matching words and definitions which are linked to the text (see appendix 11.B). These types of exercises seem to be designed to enable the learners to practice what they had learned and allow them to develop new language, structure and words. They are valuable to a certain extent, as they are fairly general in content and suit the language levels of all students. The situations presented are, to some extent, meaningful and linked to the text, which could help the students to develop their linguistic competence.

Extract 6.16: Sample of the English class hand-out



6.1 *Gravity*

The earth continuously spins in *space*. But we do not fall off the *surface* of the earth. We can move on it like flies walking on a *tennis* ball. Why don't we fall off? The earth contains an enormous amount of *matter*. Its *mass* is great. Every *particle* of matter on the earth pulls on every other particle of matter. We call this pulling *force gravity*. This force of gravity keeps us from falling off the earth.

1. Find words in the passage that can complete these sentences:
   a) The earth is a planet that ____ in space.
   b) We can move on the earth's ____ without falling ____.

c. Methodology

This section concerns two main points; how the lecturer ran the class, and how he delivered the teaching content. With regard to the first point, the observation results show that the classroom was teacher-centred (Fullan 2007; Biggs 2003) and that the students appeared to be being spoon-fed (see extract 6.17 and appendix 11.A, lines 36-124). It was

noticed that the lecturer spent more time talking than the students, and that this was mainly related to managing classroom activities, passing on knowledge and helping the students to understand and complete the lesson exercises. This is considered as a kind of interaction in which the students could practice the language by responding to what the tutor said (see appendix 11.A, lines 36-124).

Extract 6.17: Sample of the observed English class reflection report

> "… the EL1 spent more time talking than the students. It was noticed that a substantial amount of time was given to answering questions about the exercises and explaining and clarifying the meanings of words, than encouraging students to carry out other activities, such as pair/group works… the teaching method, in some respects, appeared to be teacher-centred as he was more intent on delivering in the class than engaging students in meaningful ways by asking them to…

The majority of the students remained passive during the session where only a very small number of them showed interest in participating in the class tasks; even when encouraged by the tutor, e.g. when he called them by their name (see appendix 11). The most frequent type of interaction that occurred during the class was the lecturer initiating questions and the students responding with a few words. Students' responses were often restricted to the few individual who were seated in the front lines, and even then, they only answered if they were asked a direct question. None of the students asked for further details or clarification of any point. Moreover, it was noticed that the majority of the students' talk-time was dedicated to speaking to one another in Arabic. This discussion mainly involved students asking each other about grammatical issues or the answers to questions (see appendix 11.A).

In terms of the languages used in this class, both English and Arabic were heavily used. English was applied by the lecturer and a few students whilst Arabic was used by the majority of students. Since the lecturer did not speak Arabic and the students spoke little English, a number of problems were encountered. On many occasions, the tutor and the students were not able to deal with each other adequately and did not understand one another (see Extract 6.18 and appendix 11.A).

Extract 6.18.

> …the students were given five minutes to read it silently, and asked to raise any problem whilst he was moving in front of the class. "*What word is a synonym for the word spin*?" the lecturer asked. No respond. Then he asked, "*Another word means or is similar to spin*". It seemed that the

> majority of students did not understand what he was talking about… *"Ok, Gravity is a field force pulling together all matter"*… most of the students did not seem to have caught the. …

Secondly, I will address the method used to deliver the teaching. From what was observed, it can be said that old methods (see 2.3.2) were most likely to be applied in classroom activities as greater focus was placed on vocabulary and grammar issues in teaching (see appendix 11.A), than on communicative activities, which were almost entirely neglected. When teaching grammar activities, the lecturer applied a deductive or "top down" approach, whilst with lexical items, he explained words using synonyms and antonyms as well as by using the text. Reading silently and skimming were the two techniques most frequently used to develop the students' comprehension skills (see appendix 11.A). During the class content presentations, few students were involved in the class activities, and most of them simply wrote down the answers to questions and the meaning of words, which were new to them.

d. Students' Attitudes and Behaviours

Students' attitudes, whether positive or negative, are seen as one of the key factors in language learning. The results of the observations show that overall, only a small number of students (all female) appeared to be very positive regarding the language and learning. This was proven by their interaction with the lecturer and amongst themselves. Furthermore, these motivated students were comfortable using the language, willing to participate in class activities and also shared ideas with each other (see extract 6.19 and appendix 11.A).

Extract 6.19.

> "A few students (motivated ones) were noticed working together, sharing ideas and checking their bilingual pocket dictionaries. They seemed to like the course, to respect their lecturer, and to work hard to please him. It was also clear that these students felt very comfortable with the lecturer, which was apparent in the way that they interacted and joked with him…"

The majority of students (lacked motivation) were not involved actually in any of the class activities. They sat silently most of the time or chatted with each other about class issues (e.g. clarifying the meaning of vocabulary) in Arabic. These students were listening and writing down whatever they could catch from the lecturer or from their

classmates, but they neither asked the lecturer for clarification nor participated in any of the class activities. They were also observed having difficulties in dealing with the text-based activities, e.g. speaking, grammar and interacting with the lecturer (see extract 6.20 and appendix 11.A).

Extract 6.20

> "… another two female students in the front line of the class shouted, while other students were looking at each other and some were asking what the lecturer wanted.
> "*Ok. "What is the opposite of push*?" the EL1 asked, while he was writing three words on the board. Again, two female students in the second line raised their hands. "*Yes, please"*, the EL1 requested one of them to give the answer. "*Just one, push is pull,* she replied. "*Good*", he responded. "*Yes*, …" the EL1 pointed to another student and called her by her name. "*Yes, pull."* "*Thank you". "Are they right*?", he asked. No comment. "*You are right. Does particle mean big or small?"* he asked again. *It's also in the text"*, he explained. No respond. "*Of course, it's small"*, he answered. Once the questions were answered, most of them wrote them down in their hand-outs and few consulted each other because they do not know what is going on, I think.

6.3.3.2. Part two: Science classrooms observations

This data is presented through four themes and extracts are provided throughout to support the analysis. The themes are:-

a. Language (s) used in the science classes

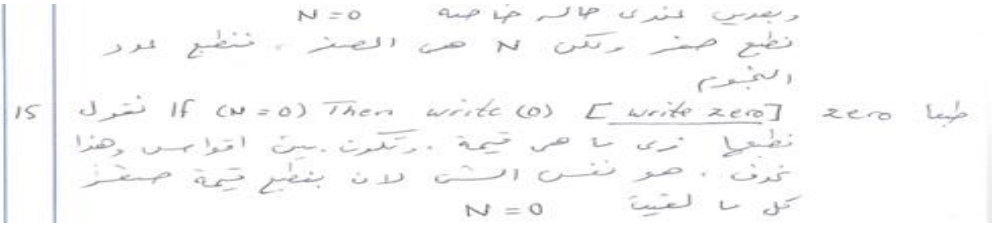
From what has been observed (see extract 6.21 - 22 and appendices 12 - 14), it is clear that both Arabic and English are used in these computer science and chemistry, but to different degrees and in different ways. In computer science, English is used heavily. It was observed that nearly 25% of the CSL1's lecture was in English. This mainly involved the presentation of computer coding instructions, but the code-switching method is applied as a tool of interaction between tutors and students. Moreover, all the computer programming languages are written in English, but explanations and discussion were delivered in Arabic, (see appendices 12 - 16). This seems to be due to the facts that computer programming languages are mostly written in English.

Extract 6.21: Sample of the researcher's reflections on the CS class

> (…) the majority of the students were listening attentively and brave enough to play a part actively. What was delivered was a computer programming language called Pascal. Both Arabic and English were used in the presentation. The majority of the programme instructions were written in English, with the exception of numbers (e.g. 1, 2,3…) mathematical symbols (e.g. -, =,

>, <), and punctuations symbols (e.g. comma, brackets slash) which are the same in Arabic; but reversed (from right to left). The integration of both languages was also applied when the lecturer posed a question and wrote it on the board "Factorial n اكتب برنامج يحسب" which means "Write a programme that calculates the Factorial n?".

Extract 6.22 Sample of the CS observation field-notes

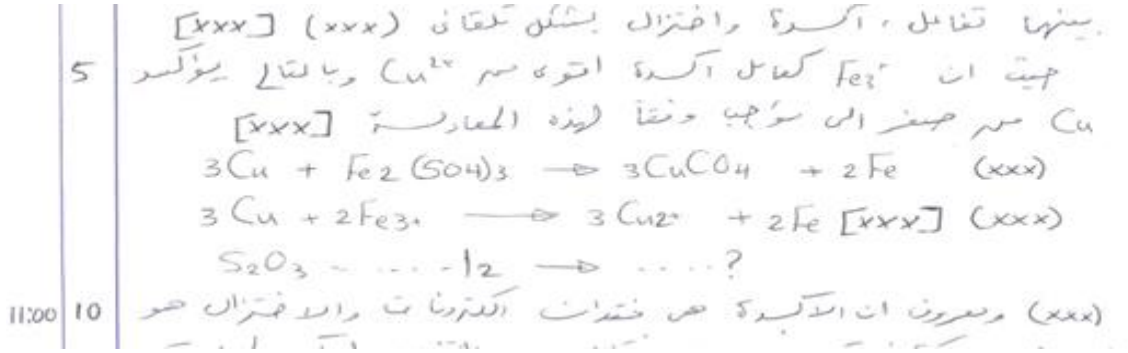


In contrast, Arabic was the main language used in the chemistry lecture (see appendices 18 and 19). During the observation, it was noticed that English was only used for chemical equations, e.g. H2O or Fe2 (SO4)3**.** Interestingly, all chemistry elements were written in Arabic whether or not they have an equivalent in English, e.g. كلوريد الكالسيوم *Kloread kalicium* means calcium chloride, حديد *hadead* means iron. The observation clearly demonstrated that Arabic was applied as the language of interaction in this department (see extract 6.23 and 6.24).

Extract 6.23: Sample of the observed CH class reflection report

Within the period of observation, not a single English sentence or phrase was heard, neither from the CHL1 or the students. For example, if we translate the first sentence of the field-notes, it will appear like this: "… everyone knows that the oxidising agent Fe3+ with reducing agent Cu below it in the order…". You can see that the whole sentence is in Arabic and the only thing in English is Fe + and Cu. Even the number "three" is pronounced as "*thalatha*".

Extract 6.24: Sample of the CH class observation field-notes



b. Kind of genre used in the science classes

This type of analysis aims to enable statements to be made about how CS and CH texts work. The focus will be on the social processes of the target communities such as explanations, descriptions, reports, discussion and lectures. From what has been observed, it can be said that both disciplines use the same genres with some specific variations. The common spoken genre for both communities is to listen to lecture and to take-notes which include explanations and discussions. All these are completed in Arabic, except for some computer codes and chemical symbols which are presented in English (see also appendices 18 and 19). The written genres for CS students include two types: 1) writing computer languages programming in English; 2) taking notes during explanations and discussions of any of computer language programming under the lecturers supervision. The written genres for CH students include procedure, explanation and discussion, and are presented in Arabic with the inclusion of some chemical symbols in English that seem to be known to all chemistry students (see appendices 18 and 19).

Furthermore, in the CS genre, both CS lecturers followed the same order for delivering their lectures (*information report, instruction and explanations*). Referring to appendix 13, it can be seen that the CSL1 started the second part of the programme (Pascal: REPEAT) by giving some brief information about it. He then presented the structure of the programme, and ended with an exercise illustrating how this programme could be implemented (see appendix 13).

With regard to the chemistry lecture, it was observed that the CHL first introduced the *redox reaction,* and then showed how this reaction happens and what results can be obtained from such a reaction. Finally, he offered a number of examples for discussion and clarification (see appendices 18 and19). All these structures were presented orally in Arabic, but the chemical equations symbols were in English, e.g.

$$HBrO3 + 5HBr \rightarrow 3Br2 + 3H2O$$

c. Kinds of register used in the science classes

In this section, the linguistic features used and shared by both communities (CS and CH) will be demonstrated separately. These include lexical items, and sentence and

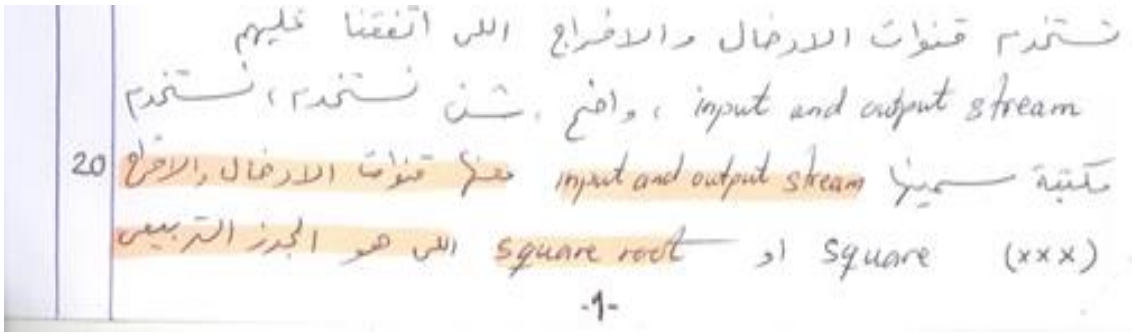
grammatical structures. In terms of lexical types, it was observed that CS courses consist of highly specific technical and sub-technical language related to computer programming. *Highly technical* words such as *Rand, Abs, if else if* were observed, that could only be understood by a computer specialist, and are only found in a CS context (see also appendices 13 and 15). *Sub-technical* words, e.g. *read, write, begin, repeat, power,* etc., were also noticed in both CS lectures, but they can also be found in everyday social contexts (also see appendices 13 and 15). Interestingly, within a period of 18 minutes, these words were repeated frequently (*while* "20 times", *repeat* "more than ten times and *write, read* and *end* "more than five").

As expected in any area of science, acronyms were also widely used in both CS lectures, e.g. *ROM, Max, pow, Abs, stdlLibih, exp, rand, sqrt,* as well as prefixes such as *in* and *out: input* and *output.* In addition, typical phrases were also observed such as *end of file, do begin, read end, begin write star, repeat statement, variable case, input and output stream, etc.* (see also appendices 13 and 15). These words were mentioned earlier, and appeared to be familiar to most of the students observed. However, it was noticed that CSL2 translated most English words into Arabic whilst he was delivering his session (see extract 25 – 26 and appendices 14 and 15). This could either be a result of the lecturer's preference or knowledge that the students lack the necessary vocabulary to understand the English.

Extract 6.25: Sample from the observed CS class reflection report

> "Surprisingly, it was observed that nearly all English words and phrases presented in this session were translated into Arabic. This was not noticed in the previous lecture. Nevertheless, one student asked for the meaning of the Language code "Abs" which was explained to him immediately."

Extract 6.26: Sample from the observer CS class field-notes



With regard to sentence structure, it was observed that simple sentences were more used during CS lectures, e.g. “This is wrong number, write star, end file, etc.”, and few were complex sentences (see appendices 13 and 15). The complete sentences that appeared in CSL2 were all in the simple present tense. In terms of chemistry registers, it was noticed that none of the target registers such as “lexical items, sentence and grammatical structures” were used in the lecture. Despite the fact that all the chemical equations were mainly written in English, not a single word was written or pronounced in English (see appendices 17 and 18).

d. Students’ responses to the class language in use

The results show that both computer science and chemistry students were exposed to English language, but in different ways and to different degrees. It seems from what has been observed that all students have positive attitudes towards English, and that they do not lack motivation. Male and female students in all classes were observed to be comfortable and confident with asking or answering questions and participated in class activities (see appendix 12 lines 3-4,12-14, 19-22 and appendix14 lines 6-9 and appendix 17, lines 16-19). However, all this interaction, e.g. asking and answering questions and participations, was conducted in Arabic (see appendices 13, 14 and 17). Throughout the lectures, all the students appeared to understand what they were doing. On one occasion, for example, it was observed that one of the CS students applied something that she had learned previously and suggested that the lecturer use “zero” in one of the exercises. Apart from that, there was only one common sense question raised by a student, which concerned the meaning of the term *Abs*.

6.3.3.3. Conclusion

In terms of the English classroom observation results (see Table 6.9) valuable information has been obtained concerning the English course PS: the language teaching environment, teaching content, teaching methods and the students’ attitudes and behaviours. The findings show that the teaching environment is often inadequate for conducting English lessons as a result of a number of factors discussed previously.

It can be said that whilst these materials are useful to some extent, they do not seem to be entirely authentic or relevant to the learners’ situations (see 6.3.3.1 and Table 6.9).

Teaching methods have also been criticised and viewed as inappropriate in some respect (see 2.3). Finally observation of the students' attitudes and behaviours revealed that, generally, they were passive in terms of learning the language (see 6.3.3.1). Overall, it seems both lecturers and students face challenges in terms of all the issues presented above, which cannot be solved separately, as they are affected both the teaching and learning of the target language.

With regard to the science classroom observations findings, it can be concluded that both communities (CS and CH) need English, but to different degrees and for different purposes. Based on what was observed CS students are more exposed to English since computer programming documents are in English. Computer programming language has specific structures and codes which cannot be understood without background knowledge of this field. Many words that were used in these two lectures were common to all disciplines, but sometimes more field-specific words were used (see appendices 13, 15 and 16). The CH department seems to be less exposed to English as only chemical equations are written (but not always read) in English (see appendix 19). As a result, all that is required to memorise these symbols and apply them when needed. Finally, all the students appeared to be motivated to understand the language to which they are exposed and have the ability to take an active part in class activities without hesitation. The next section will examine the target population documents

Table 6.9: Summary of ESP classroom observation findings

1. Teaching Environment
- English Teacher: non-native, Indian nationality - Students: heterogeneous (subjects: computer science, chemistry, physic, botany and biology), semester (2nd , 3rd and 4th) , level of English (beginners to per-intermediate), - Class atmosphere: large hall, reasonable light, air-conditioned, one walkway divided the class into two sides, no rows between seats, class seems comfortable with little sharing - Time: 2hrs per week (4 - 6pm) - Teaching aids: small whiteboard.
2. Teaching content:
- Materials: inauthentic hand-out and very short text - Activities: reading, grammar and vocabulary exercises
3. Teaching methods

- Grammar-Translation Methods, - Teacher-centred, - Limited teacher-students and students-teacher talking time, - Language Teaching: English, - Language of interaction: English between teacher-to-students and Arabic between student-to-student. - Supporting/Encouraging: No developing independent or self-motivated learners.
4. Students' attitudes:
- Language competence: diversity, almost low - Passive learners: low motivation and contribution in class activities, and silent most of the time. - Students were attentive - Students have language difficulties

6.4. Teaching materials

6.4.1. Introduction

This section attempts to analyse a corpus which comprises more than 40 thematic documents from computer science, chemistry, physics and English language departments. Selections from this corpus were analysed, including samples of lecture hand-outs, references, examinations and students' answers to examination questions and ESP teaching hand-outs. All items are authentic, representative and meaningful (see Table 4.4. and appendices 11-B, 16, 19 and 20). With such materials, as has been suggested in the methodology chapter (4.4.4), the aim is to support, complement and enrich the results of the face-to-face interviews and observations, and to contribute to answering the RQs of the study. ESP course teaching materials will provide necessary information concerning the English course PS, whereas science teaching materials will provide evidence related to sub-question 2; students' TS.

The section begins with the presentation of the data results and the data analysis procedure. The results are divided into two parts. Part one presents the ESP materials findings sub-divided into five categories. Whilst part two presents the science subject teaching material findings, which are sub-divided into four categories. Finally, a summary of the data is provided and a conclusion is drawn.

6.4.2. Teaching materials data analysis

As the aim of document analysis is to offer a truthful account of the data gained in these documents, and to validate their interpretation, the analyst will provide examples from documents that underline issues or ideas discussed for ensuring the trustworthiness of

document analysis. In addition, offering the original authentic data on which the analysis is based, "the readers are able to make their own determination of whether the concept helps in making sense of the data" (Patton 2002:457).

Part one deals with the English course teaching material. Breen and Candlin's (1987) framework has been adopted (see Figure 6.3) which sees English teaching materials as representing three sets of considerations: *purposes* which include aims and objectives; *methodology*, which acts as a means of achieving these purposes, and which can be further analysed in terms of content and process; and *evaluation* which looks at the efficiency of the methodology and the suitability of the original purpose (Littlejohn 1992). Bear in mind that some changes have been made to this framework (e.g. the term *organisation* has been applied instead of *sequence and subdivision of content*), and that only those features which I was able to identify in each of the six teaching hand-outs analysed have been recorded; the others have been omitted as the focus here is on the content, not the methodology (see Figure 6.1).

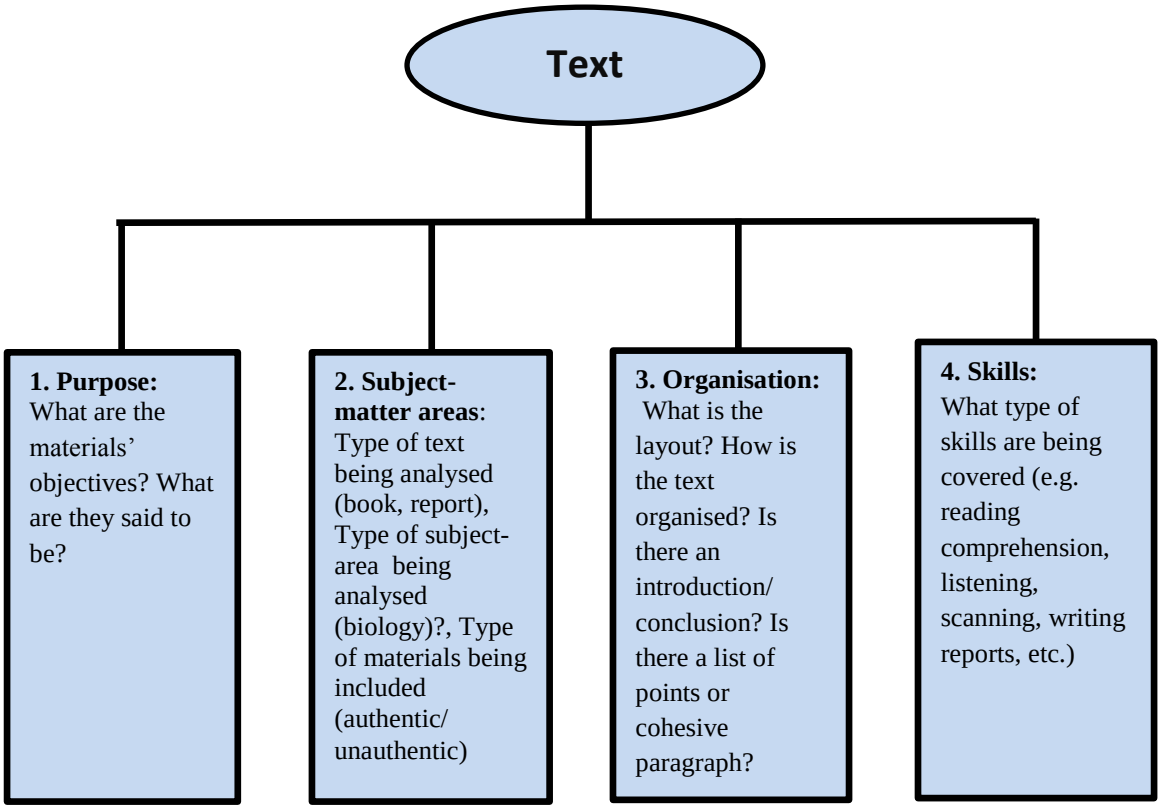


Figure 6.1: Methodological framework used for ESP teaching materials analysis

Moreover, other items have been integrated into the framework suggested by Richards and Rodgers (2002) and Hutchinson and Waters (1987) that meet the purpose of teaching materials analysis (6.4.1). Therefore, I have restricted myself to those areas listed under the framework designed (see Figure 6.1.). In doing so, the same qualitative data analysis procedure suggested by Miles and Huberman (1994), Patton (2002) was applied here (see Table 6.10). Figure 6.1 presents the analysis of the findings using the four main themes generated from the data:

- What are the aims of materials?
- What is/are the subject-matter area(s)?
- How is the content of the materials organised?
- What types (s) of macro- and micro-skills are covered in the materials?

Table 6.10: Example of process of data analysis

Elements	Code text	Interpretation	Themes	Category
CS teaching materials	11-2-2 قراءة السلاسل الرمزية يمكن قراءة السلسلة الرمزية المعرّفة كمصفوفة باستخدام أداة الإدخال cin كما cin >>Array_name ; cin .getline (Array_name ,String_length ,stop_character) ; where Array_name is a String array	40% Arabic and 60% English	language	Target Situation (TS)

	Private Sub Command2_Click()
	Dim A As Integer
	A = Val(Text1.Text)
	If (A > 0) Then
	MsgBox " This is Positive value"
	Else
	MsgBox " This is Negative value"
	End If
	End Sub
		highly technical words, sub-technical word	registers	

ESP teaching materaisls	The earth continuously spins in *space*. But we do not fall off the *surface* of the earth. We can move on it like flies walking on a *tennis* ball. Why don't we fall off? The earth contains an enormous amount of *matter*. Its *mass* is great. Every *particle* of matter on the	Physics, unauthentic	subject-area	Present Situation (PS)
	Read Passage 2B (The Sun's Family) again, then answer these questions: a) What are the names of the other planets besides the earth? b) Where are the earth and all the other planets moving?	Reading	macro-skills	
	2. Fill each blank with the necessary word: *from*, *in*, *of*, *on* or *to*: a) The earth spins ___ space. b) There are 365 days ___ a year.	Grammar: prepositions	micro-skills	

Part two deals with the science subjects teaching materials. In order to analyse these materials the framework suggested by Ellis and Johnson (1994) will be adopted, with some modification (Table 6.11 shows the original framework). In this study, the discussion will be categorised under four themes (see figure 6.2): *language, genres, organisation and registers*. The analysis will include reading the target texts, searching the data set for themes, developing analytical categories from those themes, coding/ indexing the texts according to those categories and interpreting data accordingly (Miles and Huberman 1994; Patton 2002). Such an analytical process can help to reveal and organise what is important and relevant to the study, and can be used to rule out aspects that are not of interest. The following four main themes have been identified, which will be used to present and discuss information related to the sub-question 2, concerning the TS:

1. language (s) used in science materials
2. genres used in science materials
3. text organisation
4. registers used in science materials.

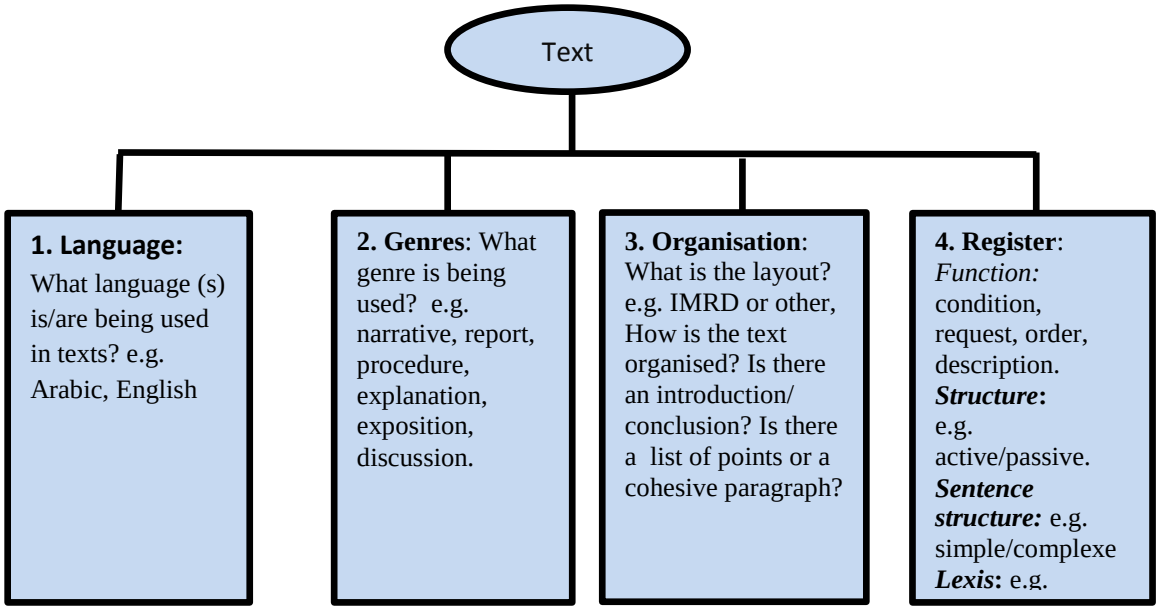


Figure 6.2: Methodological framework for analysis of science teaching materials

6.4.3. Teaching materials results

The results (see 6.4.2) will be divided into two parts: ESP course teaching materials and science subjects' materials. First, the results concerning the current ESP course materials

will be presented and discussed using the four themes which have been established in 6.4.2. Secondly, the findings related to the science classrooms materials will be presented. These are divided into four themes. Bear in mind that each theme begins with the analysis and a discussion of computer science materials (CS) followed by chemistry (CH) and then physics materials.

6.4.3.1. Part One: ESP teaching materials

This sub-section aims to discuss the content of the current ESP course offered to the target population in order to answer the RQs, sub-question 1. The findings will be presented and discussed according to the four themes mentioned earlier in 6.4.2. These are:

- What are the objectives of materials?
- What type of genres are applied in materials?
- How is the content organised throughout the materials?
- Which macro- and micro-skills are covered in the materials?

a. Objectives of materials

The ESP course teaching hand-outs do not clearly identify the objectives of lessons. Each text evidently has a different objective, but this can only be understood from the content, since neither course outlines nor syllabi are available. All hand-outs seem to share one objective; to improve general reading comprehension ability and competence with language structures and to provide students with a wider vocabulary. For example, students might be asked (see extract 6.27 below) to choose the right preposition from a list to fill blanks in a sentence.

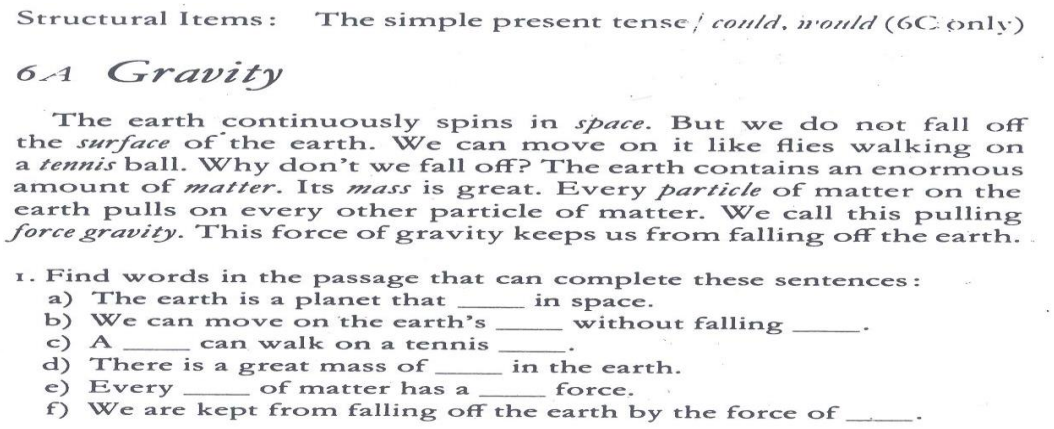
Extract 6.27: A sample of an ESP hand-out

2. Fill each blank with the necessary word: *from*, *in*, *of*, *on* or *to*:
   a) The earth spins ____ space.
   b) There are 365 days ____ a year.
   c) A fly can walk ____ a tennis ball.
   d) Different kinds ____ plants grow ____ the surface ____ the earth.
   e) The distance ____ the moon ____ the earth is about 233,500 miles.

b. Genres applied in materials

From data gathered, it appears that all English teaching materials are adopted from language courses. Some of the materials are unauthentic and not all of it is physics focused (see extract 6.28 and appendix 11-B). Most texts comprise six passages, of which only three are relevant to the field of physics, e.g. *Gravity, The Earth's Rotations* and *The Sun's Family* (see appendix 11-B). Although the other passages might be useful for humanities learners, they are not particularly helpful for science students.

Extract 6.28: A sample of the ESP teaching hand-out



Structural Items: The simple present tense / *could*, *would* (6C only)

6A *Gravity*

The earth continuously spins in *space*. But we do not fall off the *surface* of the earth. We can move on it like flies walking on a *tennis* ball. Why don't we fall off? The earth contains an enormous amount of *matter*. Its *mass* is great. Every *particle* of matter on the earth pulls on every other particle of matter. We call this pulling *force gravity*. This force of gravity keeps us from falling off the earth.

1. Find words in the passage that can complete these sentences:
   a) The earth is a planet that _____ in space.
   b) We can move on the earth's _____ without falling _____.
   c) A _____ can walk on a tennis _____.
   d) There is a great mass of _____ in the earth.
   e) Every _____ of matter has a _____ force.
   f) We are kept from falling off the earth by the force of _____.

c. Organisation of materials

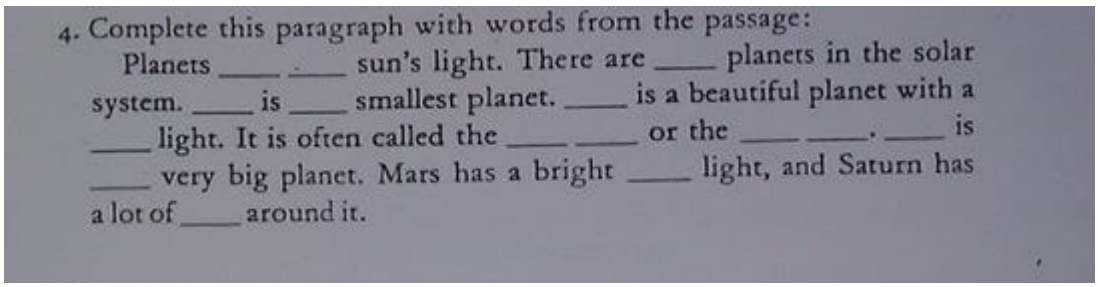
The physical appearance (i.e. the cohesiveness and consistency of the layout, the print, and the type of size) of the six sample ESP teaching hand-outs is poor. Furthermore, the materials seem to be out-of-date, lacking in clarity and poorly constructed. In addition, the design of the hand-outs means that some activities cannot be used. For example, there might not be enough space for students to write their responses to an exercise. In another example, although it appeared that the use of the simple present tense "*could* and *would*" was the aim of the hand-out, there were no activities relating to this in the text (see appendix 11-B).

Despite the poor quality of the hand-outs, all lessons are well organised, and are subdivided into tasks which normally provide sufficient work. Moreover, each lesson follows a sequence of language activities, such as gap filling and matching (see appendix 11-B).

d. Skills and activities

The data shows that the main emphasis in the materials is on reception rather than production skills. The sample teaching materials show that the receptive skill of reading is mostly frequently emphasised, with a focus on understanding words and phrases. For these activities, students might be required to choose the right words or phrases for particular activity. Skimming is also required where questions are based on comprehension of the text. However, listening skills were entirely neglected (see appendix 11-B). In terms of the productive skills of speaking and writing, it was found that short written tasks were most commonly required, which mainly involved students using single words or short sentences (see extract 6.29).

Extract 6.29: A sample of the ESP teaching hand-out



4. Complete this paragraph with words from the passage:

Planets ____ ____ sun's light. There are ____ planets in the solar system. ____ is ____ smallest planet. ____ is a beautiful planet with a ____ light. It is often called the ____ ____ or the ____ ____. ____ is ____ very big planet. Mars has a bright ____ light, and Saturn has a lot of ____ around it.

In terms of micro-skills, lexical and language structures activities are included in almost all hand-outs. These activities appear to be essential for developing reading skills, and the lexical activities support students' autonomy by encouraging them to deduct the meaning of unknown lexis from context, and underpin their ability to understand what is being taught. The grammar activities, on the other hand, aim to raise students' awareness of language competence, such as prepositions, adverbs and verbs, and give them practice of using them. Surprisingly, all of these covered activities seem to be conducted individually, since pair and group works were not observed (see appendix 11), and all in all, most of the tasks do not exploit language in a communicative or "real-world" way.

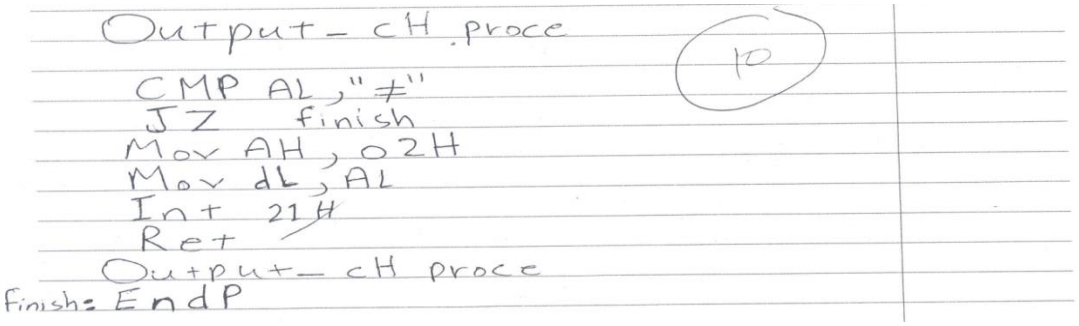
6.4.3.2. Part two: Science subjects teaching materials

a. Language (s) used in science materials

By looking carefully at the computer science teaching materials data (see appendix 16), it appears that CS students are frequently exposed to English. It has been observed that in some cases, 100% of a lesson's materials are written in English, whilst in others are

mixed by both Arabic and English. These findings include all CS materials; exam papers, teaching hand-outs and textbooks. It seems that students are required to read lecture materials, to write and design computer programme, to take notes and answer exam papers that are either totally or partly written in English (see extract 6.30) and to listen to all lectures delivered entirely or partly in English. This, to some extent, is due to the fact that references in some CS subjects are only available in English and/or there is no way of applying Arabic language in these subjects (this can be noted from textbooks , which have been translated into Arabic), , whereas others subjects integrate both languages, e.g. SQL Server - VB.Net.

Extract 6.30: A sample of a student exam answer



The following extract 6.31 also provides evidence of the integration of Arabic and English in CS materials. It can be observed that the question is written in Arabic, e.g. Write the following commands اكتب الاوامر التالية , whereas the computer command codes are written in English. It appears that practical computing language or coding structures cannot be written in Arabic, especially the language of computer programming and network design. However, this does not mean that Arabic is entirely excluded, because in some cases, especially exam papers (see extract 6.31), most questions are written in Arabic, and only computer coding structures are provided in English (see appendix 16).

Extract 6.31: A sample of the CS exercise question

- اكتب الاوامر التالية

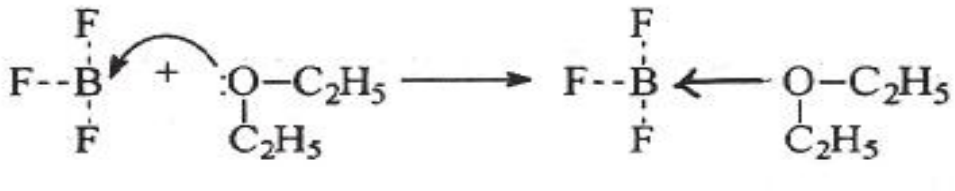
Inherits System. Windows. Forms. Form, Protected Const
SQL_CONNECTION_STRING As String= _ "Server=localhost;").

في هده الاوامر تم تعريف متغير اسمة SQL_CONNECTION_STRING *ن توع* string *دلك*

Regarding chemistry teaching materials, it can be said that chemistry students appear to be less exposed to English language than computing students. Such students might only be required to read, write and memorise specific symbols. It was observed that 85% or 90% of the literacy sections of teaching materials were written in Arabic and that the practical parts were in English (see appendix 19). It seems that only chemical equations, some titles and the terms and names of a few scientists were written in English, e.g. Co2 + H2O + CacL2; *e/m*, cmHG, Z = 2 w d u N * ; wavelength, amplitude, photon; isotopes, structure of atoms, weak acids, the neutron; and Heisenberg, Thomson, Millikan, Pauli (see appendix 20).

It was also noted that most of the chemical element names which were written in Arabic had been translated word-by-word from English or Latin into Arabic. In other words, they had nearly the same Latin pronunciation, e.g. uranium = يورانيوم , anion = الأنيون, noble gas core = غاز النبيل. Some others were mixed in terms of pronunciation, such as Hydrochloric acid, where Hydrochloric = الهيدروكلوريك has the same Latin pronunciation and acid has an Arabic equivalent which is حمض. It should not be forgotten that some chemistry teaching materials are 50% in English. The English sections mainly occur when the structure of an element (s) or reactions are presented, (see extract 6.32 and appendix 19).

Extract 6.32: The structure of a chemical reaction



English seems to be utilised to a lesser degree in the physics department. It is understood from the teaching materials that physics students are not required to read materials or write in English or even listen to lectures or seminars delivered in the language. This is due to the fact that approximately 98% of physics teaching materials are in Arabic (see appendix 20). What has been noticed is that only physics laws, mathematical equations (e.g. DinΘ = nΘ,dW = B. p = mv= 0.2kg.10m / s =2kg. m / s) and some terms (e.g. reference frame) are written in English. Therefore, students are only required to memorize a limited number of physics laws and mathematical symbols (see extract 6.33).

Extract 6.33: The structure of physics laws

Faraday's Law:

$$\varepsilon = -N\frac{d\Phi_m}{dt}$$

Newton's First Law

$$\sum F = ma$$

b. Genres used in science materials

In this section, the focus is on the written genres of the target community, as suggested by Nunan (2008), namely *recount, narrative, procedure, report, explanation, exposition* and *discussion*. By looking carefully at the obtained data, it can be seen that there are two types of texts applied in CS materials which include procedure and explanations (see appendix 16). Take for example the Visual Basic Programming hand-out. It can be noticed that brief information is offered first, followed by an explanation of how to perform each step of the programming, and finally instructions are given about how such a programme can be conducted and finally implementation is discussed (see appendix 16). In contrast, all scientific genres found in the chemistry and physics corpus hand-outs, e.g. explanations, descriptions, reports and discussions, were in Arabic (see appendices 19 and 20).

c. Organisation of materials

The analysis of the CS teaching materials reveals that three systematic layouts have been used: *introduction, method* and *implementation*. The *introduction* (which is often short) gives a summary about a programme; *method* presents the structure (s) of a programme and *implementation* shows how a programme is conducted. All these sections are in Arabic and English. However, there were differences between these materials, and no common structural pattern could be identified, particularly since all texts have different layouts (see extract 6.34 and appendix 16). For example, CS text layouts differ from other scientific texts in terms of organisation, e.g. IMRD "introduction, methods, results, discussions".

The analysis found that in all the texts written in English, there was a title, an introduction and a list of points or short paragraphs. It was also noticed that different ways of

representing knowledge were employed, for example, tables and images were all applied. Images, for instance, are often used as authentic examples to show how a programme should look, to demonstrate (provide evidence), summarise and define an area of study (see appendix 16). However, this style does not apply in all CS teaching materials.

Extract 6.34: A sample of the computer science teaching hand-out

Practical class for Data Structure using C language (CS-503)

Introduction to C language:
C is a poewerful, flexible language that has gained wide acceptance in recent year. C was originally developed by **Dennis.M.Rithie** in the early 70s at AT & T.Bell labs. It was an outgrowth of several earlier languages like ALGOL-60,CPL,BCPL(basic combined programming language)&B.C was not very popular and was mostly confined to Bell labs until 1978.there is no single compiler for C.(no standard).hence ANSI(American national standard institute)established a committee in 1983 to create a standard for C language.

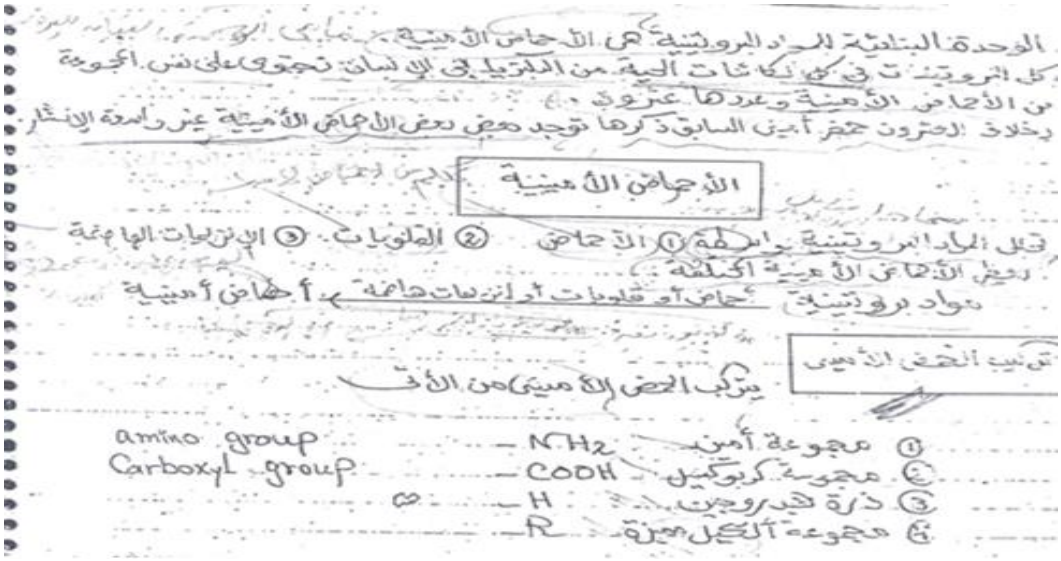
C is a **structured language** where the program is compartmentalized; a given program is divided into a number of modules, each of which would be used for a specific task. These individuals' modules are called **function.**

C as a middle level language, it combines the elements of a high language such as easy debugging, compactness etc, with the functionalism of the assembly language. Because of this special feature of the language, it is called as a **middle level language**.

Application of C:
The capability of C language to work at machine level makes it well suited for system programming. Used for (operating system, compiler, interpreter, assembler, editor, spread sheet, cad and animation etc).

In contrast, not a single text written in English was found in either chemistry or physics teaching materials, except some chemical equations and element names (see extract 6.35, 6.37 and appendices 19 and 20).

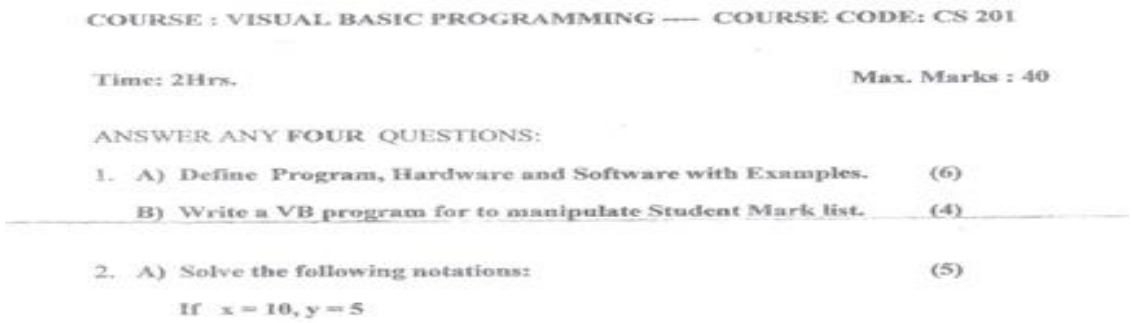
Extract 6.35: A sample of the chemistry teaching hand-out



d. Register used in science materials

As has been mentioned earlier (see Figure 6.2), four types of register are used within the science community. These are "*function, grammar structures, sentence structures* and *lexis*". In terms of function, the analysis shows that all the CS materials written in English include two types: *description* and *request*, where description occurs more frequently (see appendix 16). However, request more often occurs in exam papers in the shape of questions, e.g. Define Do-While Loop with example? (see extract 6.36 and appendices 13, 15 and 16).

Extract 6.36: A sample of a CS exam paper.



COURSE : VISUAL BASIC PROGRAMMING —— COURSE CODE: CS 201

Time: 2Hrs. Max. Marks : 40

ANSWER ANY FOUR QUESTIONS:

1. A) Define Program, Hardware and Software with Examples. (6)
   B) Write a VB program for to manipulate Student Mark list. (4)

2. A) Solve the following notations: (5)
   If x = 10, y = 5

However, such functions do not exist in either chemistry or physics materials, due to the language applied in all texts (discussed earlier under the first theme). In connection to grammatical issues, it can be seen (see appendix 16) that simple present tenses are most frequently applied in the selected CS teaching materials, whereas past tenses are rare (e.g. C is a powerful, flexible language, it makes the language simple, VB provides selection statement, etc.). Another interesting feature of the corpus is that both the present passive and the active voice are applied in these materials (e.g. True-Statement is executed, keyword is used to execute a statement or block, C was originally developed by Dennis Rithie). However, the passive is more frequently utilised. In other words, CS language seems to be more indirect and the focus is on the action rather than the agent. Thus, modal verbs, adjectives and adverbs are much less frequently applied in CS materials. It is worth pointing out that neither the first person singular nor plural pronouns have been observed in CS texts.

In terms of sentence structure, materials show (see appendix 16) that both simple and compound sentences are utilised in CS teaching materials. However, a deeper analysis of

these materials reveals that there have been attempts to avoid difficult and complicated language and expressions, for example:

> *"a programme is usually not limited, it may branch off, code or take decision, if it is false, statement is ignored."*

According to the data (see appendices 13, 15 and 16), a wide number of CS sentences are either short noun phrases/ incomplete sentences (e.g. true statement, case value, whilst condition, float radius area, model small, loop start, loop begin, two-ways IF, VP programme, Strings In C++, string text), complete sentences such as brief imperative sentences ("Solve the following notations", "*Write a VB programme for to manipulate Student Mark list*") or declarative sentences (e.g. "*The pair of statements For and Next cause the statements between them*", "*The For statement designates a numeric variable*"). In terms of lexis analysis, the teaching materials show that due to the specific nature of the field, CS subjects use highly specific technical language related to computer programming. Some of these highly technical words or abbreviations are used in specialised texts to perform specific rhetorical functions. These seem to occur most frequently within CS materials. They tend to be used by professional or qualified individuals in the field, e.g.:

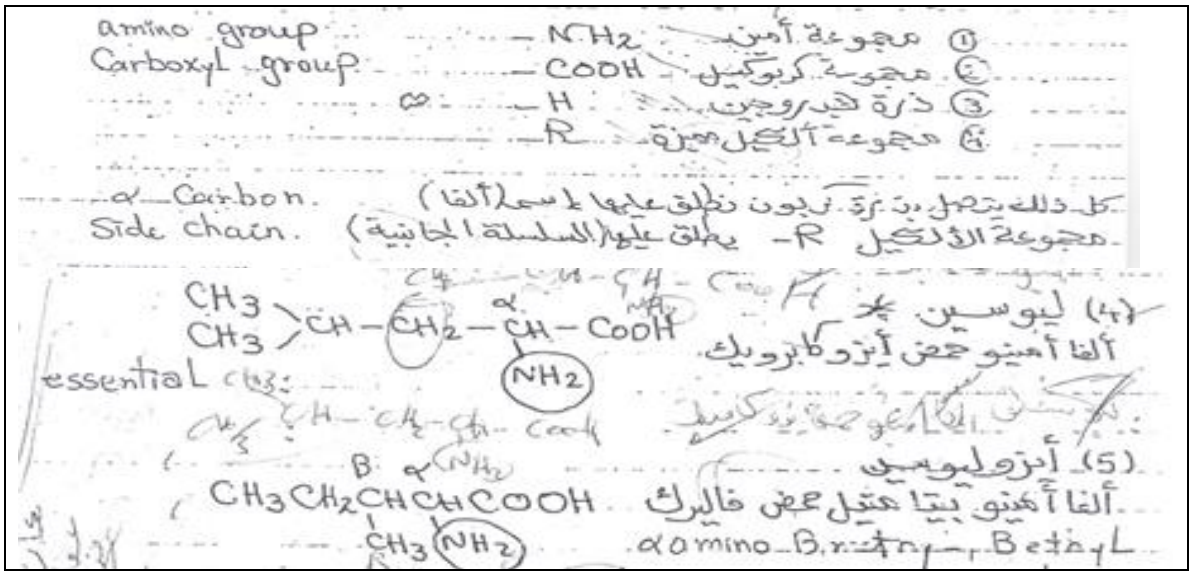
*Dim a As Intger, Do- While loop, While (a > 0), <u>text</tag>, <html>, PRINTA: MOV DL, 31H INT 21H LOOP BEGIN, /*LINE2*/ #INCLUDE<STDIO.H>*.

Sub-technical vocabulary (Trimble 1985) can also be noticed in number of CS texts, e.g. *function, programme, form, data, windows, text, table, bit, bug,* etc. (see appendix 16). This type of lexis needs to be taken into consideration in terms of meanings as some words have specific meaning in CS which varies from their meaning in other disciplines, e.g. *windows*.

With regard to chemistry teaching materials, it seems that students in this department are only required to understand specialised acronyms related to their main field. These are the only things, which are written in English (see extract 6.37 and appendix 19). These abbreviations are chemical equations that consist of chemical elements symbols, e.g. Na2O(s) + H2O(l) →2 NaOH(aq), HCN + NaOH → NaCH + H2O, or titles and chemical elements, e.g. NH2 amino group, COOH carboxyl group, Isotopes, atoms and

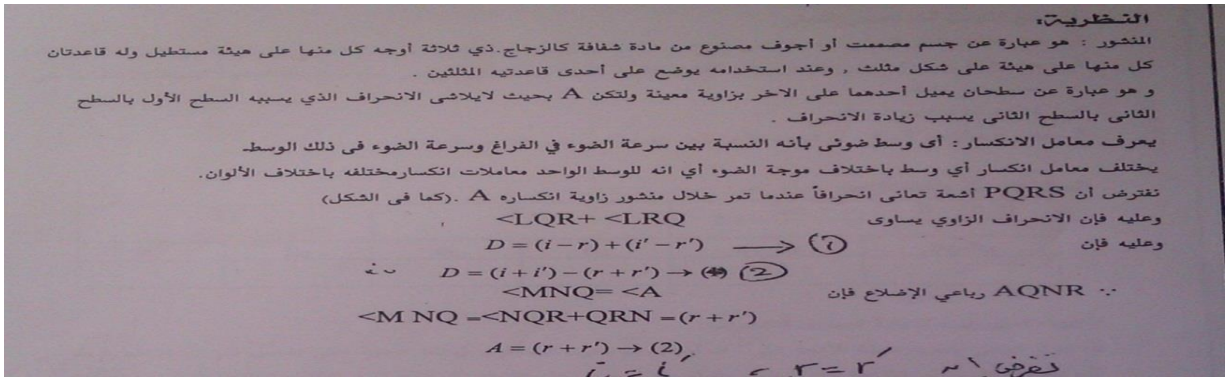
molecules (also see appendix 19). Another observation is that most of the chemical elements written in Arabic are pronounced similarly to English (e.g. protein = بروتين. oxygen = اكسجين , carbon = كربون). The limited need for English in this department is due to the nature of the teaching materials, which, as mentioned in the first theme, are nearly all written in Arabic.

Extract 6.37: A sample of the chemistry teaching hand-out.



Likewise, no English registers were found in the physics corpus. Arabic is the only language applied in these materials (see appendix 20) and physics students are not required to read, write, speak or listen to any of the English register items under investigation. Only mathematical symbols and equations, and titles are written in English in this field, and these comprise about 15% of physics texts, such as, $dW = F.dx$, $dW = F.\nu . dt = I.\ell . B.\nu . dt$, $<LQR + <LRQ$, $\lambda = d\sin\Theta/n$, $\ell = 1.2$ m , $R = 6\ \Omega$, $B = 2.5$ Wb/m^2 , absolute time, relativity principle (see extract 6.38).

Extrxact 6.38: A sample of the physics teaching hand-out.



6.4.4. Summary and conclusion

Using the samples that have been collected and analysed, it can be concluded with confidence that the ESP course seems to be unsuitable for the science students as the aims, materials and methodology have not been well-established to meet the ESP characteristics (see 3.2.1 and 3.2.3).The actual language applied in the course does not seem to be sufficiently specialised, considering the nature of the science, and is often out-of-date. In addition, the course appears to be too simplistic, and does not cover the communicative elements needed in a real life situation.

The aim of ESP courses is to help students learn the language and related skills, and overcome some of the linguistic and subject problems involved in studying in English. In such a situation, therefore, it is argued that ESP courses should be designed according to the target community needs. Materials, for example, should focus on two principles: "the specific areas in which the language will be used and the types of learners who will be learning the language" (Nababan 1993:3). These materials should also be up-to-date, relevant and reflect the target learners' real situation. Furthermore, ESP teachers should further advance their foreign language teaching by applying recently developed methods of teaching, which focus on task-based approaches to their ESP classes. This requires the integration of topics or tasks from subject matter classes (e.g. computing or chemistry) within the context of teaching the target language, as they are more relevant, motivating, and enable learners to learn the language more quickly and with more pleasure. A summary of the findings regarding ESP teaching materials is provided in Table 6.12.

Table 6.12: Summary of ESP teaching materials results

Elements	Description
Purposes	not clear
Syllabus	Unavailable
Organisation	lack clarity, poor layout
Materials	out-of-date, unauthentic materials, more general
Subject-matter areas	physics and general
Macro-skills	reading/ little attention to writing
Micro-skills	vocabulary & grammar

With regard to the science materials, it can be concluded that CS students work in a multilingual environment where English is used extensively (see Table 6.13). This environment requires them to utilise English language as a tool of communication in order to carry out their studies and work, more closely focused on developing comprehension skills than on the accuracy or structure of written English. It seems that all language skills are needed. However, reading skills are perceived to be the most important, as students are required to read and understand computer programmes and procedures; this is followed by listening and writing skills, where they are also required to listen to lectures delivered in English, take notes and write computer programmes.

The fact above has been clearly observed through all the teaching materials, texts and exam papers examined. In this situation, the language tasks that CS students would carry out are as follows: in lectures, they would need to listen for general understanding and for specific points to remember, to ask for clarification, read hand-outs and take notes. In practical classes, it is necessary, for example, to listen to computer instructions, ask for information and clarification, follow instructions, and write notes. They also need to do a large amount of reading, which involves surveying the text, skimming for a 'gist' or general impression, deducing the meaning of unfamiliar words, as well as scanning to locate specifically required information. Speaking is becoming increasingly important as some lessons are delivered by foreigners who do not speak Arabic at all; this could include asking questions and asking for clarifications.

Other communities, CH and PH, do not need to use English language as much as the CS community. It is clear that they rarely get involved with the writing of formal papers, descriptions or explanations as most of the events in these communities are written and presented in Arabic. ESP teachers should, therefore, consider such variations between these communities; they need to describe the characteristics of the target population, and then define the contextual characteristics of the setting where the actual instruction will take place. Finally, they should try to ground their courses in the target communities' events that students are likely to have to handle in their study and/or work, which will be more beneficial to them, and will also encourage them to learn the language effectively.

Table 6.13: Summary of science subjects teaching materials results

Element	Computer Science	Chemistry	Physics
Language	mostly English & less Arabic	mostly Arabic & less English	mostly Arabic & rare English
Genres	writing information report, instructions & explanations	N/A	N/A
Organisation	formal writing & specific written layout of computer language programmes	specific layout of structure of chemical elements and reactions	specific layout of mathematical symbols and equations
Register	highly technical & sub-technical words, noun group to describe cases/ complete and incomplete sentences, active & passive present tenses	jargons words often used, e.g. chemical equations & symbols	lessons titles and subtitles, and scientists names

Chapter Seven

Combination of Quantitative and Qualitative Results

7.1. Introduction

Chapters 5 and 6 have presented the quantitative and qualitative findings of the present study individually in relation to the research questions (RQs) and based on the fieldwork data (see 4.2 and 4.4). However, throughout these two chapters, each piece of data has only offered a partial answer to the RQs. In order, therefore, to develop an understanding of the study findings that could offer full answers to the RQs from different perspectives; this chapter will apply methodological triangulation (see 4.4.6). By triangulation (see Figure 7.1), it is hoped to obtain as much data as possible from different sources to shed light on a theme or perspective (Creswell 1998) and to provide a full and clear picture of the language needs of science students.

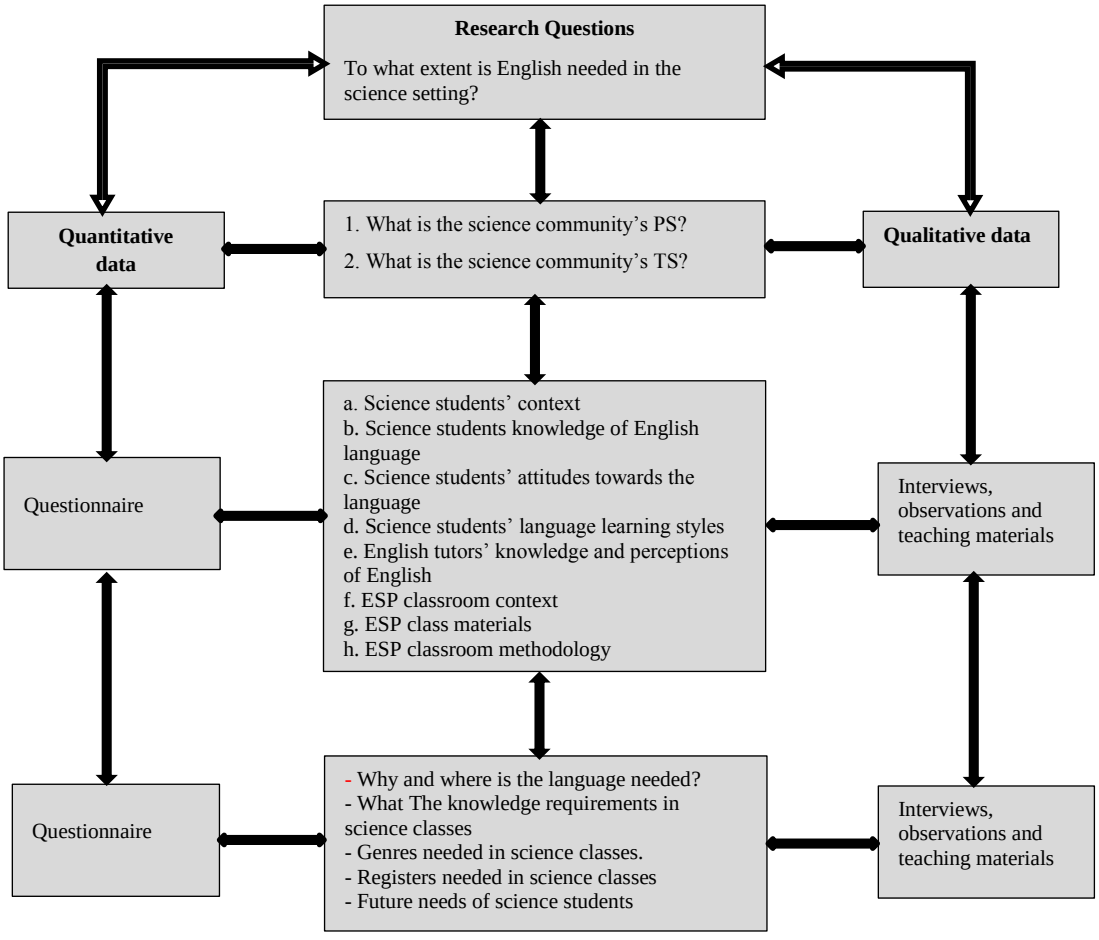


Figure 7.1: Framework for data triangulation analysis

7.2. Interpretation and analysis of results

The triangulation of the quantitative and qualitative findings obtained in chapters 5 and 6 are presented and analysed in two sections according to the two sub-research questions; PSA and TSA (see Figure 7.1). The first section deals with the present situation analysis (PSA) namely, "What is the science community's present situation?" which is divided into eight categories as follows:

a. Science students' context
b. Science students' knowledge of English language
c. Science students' attitudes towards the language
d. Science students' language learning styles
e. English tutors' knowledge and perceptions of English
f. ESP classroom context
g. ESP course materials
h. ESP classroom methodology

The second section is concerned with the target situation analysis (TSA), namely, "What is the science community's target situation?" which consists of five categories. These are:

a. Why and where is the language needed?
b. The knowledge requirements in science classes
c. Genres needed in science classes
d. Registers needed in science classes
e. The future needs of science students

7.2.1. Section 1: What is the present situation of the science community?

7.2.1.1. Science students' context

In terms of the academic staff, the majority of science teachers are from Arabic countries, and hold research degrees (MSc or PhD). Interestingly, most of the computer science teachers are Libyans (their higher education for the two degrees "MSc and PhD" was English medium), with a few foreigners who do not speak Arabic. It should be mentioned that the university policy decrees that the language of instruction is Arabic. However, in practice, English and Arabic are mixed in all computer science lectures.

All science students join the university with the minimum qualification of a Secondary High School Certificate; they are no younger than eighteen years old and no lower than beginner level in English. English classes are large and always contain students with varying levels of knowledge. Regardless of the fact that the majority of students are female and that they mostly sit separately from the males, they do still interact with each other. This is a cultural norm in science faculties in Libya as male students usually join technical, engineering and military institutions. This means that we are dealing with large and badly-defined (mixed-ability) groups. The heterogeneity found in the ESP classrooms is a consequence of a number of factors: the Faculty is the institution that regulates the enrolment and the students' distribution in groups. Furthermore, the English Department has no role in such processes, which has negative consequences for learning and teaching; even though students might share some common factors (e.g. level of English and learning styles).

In fact, offering an ESP course in such a situation diminishes one of the ESP features; specificity, as variation among students (e.g. attitudes towards language, interest, purpose, styles of learning, different course, different ages and so on) leads to difficulties in decision-making processes, and more importantly, make teaching and learning extremely difficult. Such situations, for example, might make it impossible for individual needs to be met and can cause some problems for tutors, as well as for the students themselves, e.g. what materials should be used; authentic or inauthentic, for computing or chemistry. Whereas specificity has more advantages (see 3.2.3). In ESP, it is extremely important to identify the characteristics of such groups, their needs and problems by means of a needs analysis. Not only can this contribute to achieving effective solutions, but it can also reduce and separate groups of students in terms of subjects and knowledge.

7.2.1.2. Science students' knowledge of English language

English is seen as key not only as a valuable language in its own right, but also as a language of communication in some science subjects, especially computing. However, despite six years or more of time, effort and money spent in encouraging studying English before joining the Faculty, it is rare to find a student who is able to engage in even minimal dialogue with teachers or among themselves in English at a level that can be understood. According to their faculty members, the language competence of most students was reported to be inadequate in all language skills, a fact corroborated by the

students themselves, who mostly assessed their English level as that of a beginner (see Figure 6.3). Faculty members also feel that there is a mismatch between what they expect students to be able to do and what the curriculum asks them to do, which is related to the students' language proficiency.

This appeared to have significantly influenced both the students and the tutors. Most students could not learn the language at the same time as handling their science subjects properly, especially in computing. Tutors were also unable to practice effectively what they had planned (see 5.3.2, 6.2.3.1- a, 6.3.3.1 – a, appendices 9 - 10). For example, CSL1 reported that most computer science students encounter problems in all language skills. However, they showed a stronger tendency for using English than other types of student. This could be due to the fact that English serves a variety of functions in computer science, which it does not serve in the other departments, e.g. writing computer programmes, following computer programme instructions or taking notes. One chemistry tutor also claimed that terminology is the only problem that students face in his department, but this is because chemical terminology is the only register to which such students are exposed. In contrast, physics students reported that lack of knowledge of the target language was not a problem as all teaching delivery and materials are in Arabic, with the exception of some physics laws and mathematical equations (e.g. < LQR + <LRQ, dW = f.dx, ʎ = ʎ1 + ʎ, ʎ= dsinϴ/n), which are well-known to all students as they studied them at secondary school.

In terms of communication, difficulties might be due to the fact that some science subject tutors are foreigners. In combination with the students' poor level of language this often means that although significant interaction is needed between tutors and students, such communication is virtually impossible. Some language difficulties could be related to the fact that language is widely taught simply as grammar in the country (see 2.3.2 and 2.3.4). Nevertheless, most of the students experienced satisfaction with their receptive skills such as reading lecture materials, listening to lecture sessions, and understanding semi-technical and technical words which are found in science contexts (see 5.3.2). This might be due to the amount of exposure to such skills in their study in ESP and science subjects.

Productive skills such as writing correctly, interaction with tutors, and handling language rules seem to provide the greatest challenges to their English proficiency (5.3.2). Students' writing concerns could be due to two factors found in this study. Firstly, the

quantitative data reveals that written exams are favoured by all courses which require some degree of accuracy, especially in CS, where English is widely applied. Secondly, writing skills are not practiced as part of the ESP course.

Claims about the low English competence of the science students could be attributed to a number of factors. Firstly, as discussed in 6.2.3.1-a, students are accustomed to teacher-centred learning and "spoon-feeding" which seems to prevent their involvement in fully active language learning; whilst ESP learners are considered as learner-centred (Hutchinson and Waters 1987). This means that students are not well-prepared to participate in cooperative learning activities such as pair-work. They do not engage in discussion in class as they have not experienced such tasks. Secondly, the study context shows that language learning was more focused on reading comprehension, language structures and vocabulary, which is not particularly beneficial for learning to interact in a foreign or second language (see 2.3.3 and 2.3.5). Consequently, students encountered serious communication problems, which could be due to the fact that speaking skills appear to be absent from both the students' previous study curriculum and the university ESP syllabus (Brotot 2010). The final reason behind such assessment seems to be related to the ESP course offered to science students. According to the current study findings (6.2.3.1-a) and other studies (Al-Tamimi and Shuib 2010), the ESP courses are not developed on the basis of an analysis of the English language needs of the target students. Consequently, students do not obtain the benefits that they need from such courses.

Such evaluation indicates that science students encounter serious difficulties with learning the target language in all language skills; productive and receptive, which agrees with existing research literature findings (Tahaineh 2010; Orafi and Borg 2009; Rababah 2005; Cobb and Horst 2001; Arden-Close 1993) that raise concerns about EFL students' language knowledge (see also 2.3.3). Previous research reported that most students at higher education institutions who are learning in the medium of English (which is not the learners' first language) encounter serious problems in communicating freely, writing and even dealing with general and technical vocabulary. This situation (e.g. in Libya, Jordan, Saud Arabia and UAE) has made them unable to cope with the institutions' literacy expectations (Tahaineh 2010; Orafi and Borg 2009; Rababah 2005). In Libya, Orafi and Borg (2009) found that because of students' limited knowledge of English, teachers found it problematic to organise any oral communicative or writing activities. Swales (1978)

also reported on Libyan science and technology students, noting that their writing was demonstrably very poor from their arrival, and they faced problems in their technical subject where note –taking from lectures, writing reports and writing examination answers were the main tasks required. According to Orafi and Borg (2009) and Abuklaish (2004) such problems could be due to the fact that this skill has not been practiced at an earlier stage of study where the emphasis is often on language structures and vocabulary. Rababah (2005) relates that the majority of students from UAE and Saudi Arabia lack the necessary vocabulary to communicate effectively. This lack of skills is almost certainly related to the teaching methods applied at university level and at secondary schools, which often lack analysis and development.

7.2.1.3. Science students' attitudes towards the language

As noted in this study (see 5.3.1, 6.2.3.1 - c, 6.3.3.1- d), positive attitudes towards learning English were widely expressed for use in academic work, but few participants expressed a desire to use it in the workplace or for social activities. These attitudes could be attributed to the values that students feel learning a foreign language has for them, whether it is because of a faculty requirement which will influence their final study results, or the international role that English language plays as the language of technology and science (Zughoul 2003). They might also be motivated by the teaching materials and methods, if they meet their needs (Wharton 2004; Hutchinson and Waters 1987). They may also be attributed to individual goals: "a person is motivated to succeed in order to satisfy personal goals and reach individual self-fulfilment" (Littlewood 2001). In some cases it could also be influenced by the faculty requirement for language learning and the students' desire for better skills, which will influence their final results (see 2.3.2).

In contrast, not many students reported being in favour of using the target language, academically or socially (6.2.3.1-c). In addition, this course is considered as a supplementary subject by most students and they only attend classes and take exams for such courses because they are compulsory (see 2.3.1 and 2.3.4). With regard to academic purposes, the demotivation could be connected to the students' poor performance in English language. Another reason might be the pedagogy that teachers in Libya tend to follow which is predominantly teacher-centred and traditional in its approach (see 2.3.3, 6.3.3.1-c and Orafi and Borg 2009; Abuklaish 2004). The dissatisfaction could also relate to the ESP course, in terms of course context, materials and methodology, where a

number of students reported being demotivated with the course (see 6 .3.3.1 - d). Regarding demotivation to use in social activities, English, for some of them, is also nothing but a school subject that they have to pass in order to graduate, which suggests that language is considered to be more necessary for study purposes than for use in everyday life (see 2.3.3).

Beside this, Turki (2004) reported that Libyan EFL secondary students are not motivated to invest effort in their English learning. Teaching materials and cultural norms are also other factors that might influence the students' attitudes and motivation (Gatehouse 2001). Some students might have good language skills, but they may be afraid of making a mistake in front of the rest of the class. The materials might also be difficult for them (Abu-Rizaizah 2005; Abuklaish 2004), which could cause a lack of motivation amongst students.

7.2.1.4. Science students' language learning styles

The findings of this study show that science students learn through a combination of learning styles: dependent, independent, theorist, activist, visual and physical, and every student is different (see 5.3.3). Thus, most students tended to be dependent learners (appendices 10 and 11A), working individually and sometimes in pairs, researching independently for information, working silently, being spoon-fed knowledge, and copying what they have read. This type of learner is reliant on teachers or instructors and prefers to be supervised by them as they work. They like to be told what is important to learn, what needs to be done and when. The consequence of this is that they tend to be anxious and frustrated, and have a limited ability to communicate. These learners need solid strategies to avoid or overcome such problems.

Such dependence on teachers probably arose from the structured approach that is used in secondary schools where students are expected to follow directions and instructions from their teachers closely (2.3.2). It could also explain one of the observation findings that a large number of students did not involve themselves in class activities and simply sat silently, listened and wrote notes. It could also be attributed to the lack of language ability and the use of traditional teaching methods, discussed earlier (see 7.2.1.2). Only a few learners were reported as independent learners. This type of learner acquires knowledge through their own effort and can use their own judgement about how best to learn. They

are relatively independent from teachers and instructors, are confident in their learning abilities, like to think for themselves and discover new things and enjoy research and independent reading. This style plays a role in second and foreign language learning, which is noticeable in the acquisition of linguistic competence.

With such results, it seems that a shift from traditional teacher-centred learning to learner-centred teaching in order to create "independent learners" seems to be impracticable in this context. This conclusion was supported by other researchers in Libya (Sawani 2009; Orafi and Borg 2009; Abuklaish 2004). I am not assuming that dependency is no longer valid; it is still useful in some circumstances in life, because students sometimes need to sit back and observe, passively, whilst others dictate actions to be taken.

Other students are seen as theorist learners who want to know why a particular language structure is applied in a specific situation or why a particular communication method is appropriate in a particular setting. These students were observed asking each other about specific forms and words, and writing down everything in detail because they see memorisation of the language rules and words as the basis for learning the language (see 5.3.3). Such emphasis is related to the fact that the teaching of English in Libya is mostly dominated by old methods of teaching with an emphasis on mechanical memory (see 2.3.2, 2.3.3 and 6.3.3.1 - c). These results are also compatible with the results of Elabbar (2011), Sawani (2009) and Orafi and Borg (2009) studies which found that Libyan students usually learn a language through the study of grammar and vocabulary, as there are the factors which are required for English course examinations. It is evident that the students' past learning experiences affect their learning style preferences.

Those who described themselves as activists learners (see 5.3.3) were those who were observed involving themselves in class discussions and activities, e.g. pair-work or group activities. These students might be those with good language skills who have the ability to involve themselves in such activities, or those who are motivated by any of the teaching repertoires.

Visual science students preferred to learn through the use of visual aids such as charts, graphs and data-shows, which were not observed in ESP classes. Those (see 5.3.3) who preferred such a style also expressed their preference not only for applying technology in their ESP classes but also for conducting ESP lessons at a language lab. Practical

knowledge of technology in teaching was considered to be necessary by most of these students as it can provide them with stimulating learning experiences as well as helping teachers to present the content material more effectively. The findings also show that a large number of respondents preferred teaching materials in the form of a textbook rather than a hand-out.

Finally are physical learners who tend to learn most effectively if such variables as: class size, time, class arrangement and temperature are taken into account. The findings show that most students prefer small classes held in the morning (see 5.3.3), but the experience was opposite to the students hopes as the number of students in ESP classes was found to be more than a hundred, and the classes were delivered during times when the temperature frequently reaches 40˚c.

To summarise, these findings demonstrate the importance of identifying and being aware of students' learning styles for enhancing the quality of teaching (Grenfell 2007; Griva and Tsakiridou 2006; Dudley-Evans and St John 1998; Hutchinson and Waters 1987). The result of this study will provide information about the target students' PS with regard to learning styles, which will allow them to be matched with the target demands. Previous studies have noted that "knowing the learning styles of the learners aids the designer or instructor to develop a curriculum to address various needs of the learners in a group or class" (Pallapu 2007: 34). In addition, without this knowledge, there might be a conflict between the teaching styles of the teachers and the learning styles of the students, which could affect the learning process and which in turn could lead to a decrease in student achievement. Moreover, matching the learning styles of students with the teaching style could help to improve students' learning, attitudes, motivation and behaviour (Oxford et al. 1991). For example, providing students with learning material and activities that fit their favoured ways of learning could result in them being interested and motivated. All in all, this means that students' methods of learning are an essential factor that must be taken into consideration whenever language courses are developed.

7.2.1.5. English tutors' knowledge and perceptions of English

As discussed in 6.2.3.1- d, the language teachers who are Indian are well-qualified. They have sufficient experience of teaching English. The observed teacher (EL1) has experience in ESP and good interpersonal skills, as well as being a talented, enthusiastic,

creative and dynamic tutor, who is interested in teaching grammar, reading and speaking. Whereas the EL2 was involved in this course to cover a shortage in bilingual English lecturers at the Faculty, and described it as a challenging task. He was more comfortable with teaching production skills. With such experience, they feel content with their work, are enthusiastic about their students' study and are willing to support them, but they have no experience of the Arabic language or of the educational context of the situation.

The teachers' lack of experience in some areas has created a number of challenges. One of these challenges is the problem of out-of-field teaching, as these teachers have limited experience in ESP and related science disciplines. These teachers were frequently used to make up for the shortage of bilingual language lecturers at the Faculty. One teacher claimed that he had never taught science students, and described science subjects as challenging. Such views indicate that the ESP course is currently not presented properly. Firstly, involving teachers without sufficient experience in an ESP programme is a hugely problematic issue because even highly qualified teachers could find that they are unqualified if they are assigned to teach subjects in which they have little interest or background knowledge. This is the primary issue in ESP, where teachers often find themselves having to teach with texts containing content about which they know little or nothing. Secondly, a shift from being a general English teacher to being more specific purpose teacher is also challenges. This is because the ESP teachers have more than one characteristic; they need to be course designers and to be able to select materials to provide scaffolding for students' linguistic content learning. They also need to be advisors and facilitators of student's communicative efforts (Dudley-Evans and St John, 1998), which should include reasonable knowledge in the students' target community culture, because such knowledge can be used by the target students to make sense of these structures more easily.

The second challenge is the students' limited and/or mixed ability in English. In the ESP programme, learners are expected to have at least an intermediate level of English. In practice, as it has been discussed in 2.3.3 -5 and 7.2.1.2, we are dealing with mixed-ability groups in terms of both level of language competence and professional competences. Some students are good at English, others are not; some want to practice the language of their profession; others require general English, all of which are challenges. Some students do not have a good general knowledge of English, they would

need to spend much more time studying language rules; revising tenses, sentence structures, and so on. This situation often presented difficulties for the language teachers as they have to satisfy all learners. One of the language teachers described this as very frustrating. He added that he would love to help and support these students, but it was hard, because "They need a bilingual teacher".

The final challenge for these teachers was cultural diversity. As foreign teachers, not only is the course new, but everything they encounter may be new and unfamiliar, including students, colleagues and administrators. This may result in "language shock" (realising that their colleagues and/or students do not understand them, and/or the discipline-specific language and vocabulary that they use), "academic shock" (caused by encountering different teaching and learning approaches such as the relationships between teacher and student and forms of assessment), and also "culture shock" (caused by being in a different physical environment, with new customs and practices).

The consequences of being a foreign teacher in a different context can affect the learning and teaching processes. A context mismatch between teachers and students can result in uncomfortable classroom experiences for both. Teachers find themselves, for example, having to teach students about whom they know little or nothing. Students can find it hard to cope as they adjust to different teaching styles and/or approaches. They may also feel that they are moving from one world to another as their teachers speak different languages, and have different cultural backgrounds.

The final limitation was the workload faced by the language teachers, which was seen as inappropriate by both EL1 and EL2 (6.2.3.1 – d). This large workload could also reduce teachers' potential development time, and by having a reasonable workload teaching and learning can be more successful.

7.2.1.6. ESP classroom context

As discussed in 6.2.3.1, the English department maintains control over the general implementation of the ESP course (e.g. teaching, setting goals, designing syllabi, selecting materials, setting examinations). This means that most of teaching repertoires are in the hand of the language teachers. For example, teaching materials are selected according to individual experiences. Moreover, regardless of the level of the English

department's control, and the qualifications of the teachers; neither the goals nor the syllabus of the ESP course are clear (6.2.3.1- e). In addition, the students' entry into the ESP programme is not restricted at all. In other words, there are no guidelines to allow the differences between level A, B or C to be determined, as the ESP courses have not been planned or organised in advance. Such freedom is sometimes good; however, it is not possible, for example, to teach without a defined goals or syllabus.

Although the ESP is relatively decentralised; the English department often has quite a small degree of control over some aspects of the classroom teaching environment, e.g. the classification of students, class size, seating arrangement, timing of the class and visual aids. In terms of students, the findings indicate that the ESP classes comprised heterogeneous students, meaning that students from different subjects and different semesters are taught English together in one large room, but that all were Arabic speakers. This kind of diversity contrasts with the characteristics of ESP in which all the community members share some knowledge, learning styles and communicative purposes. The similarities between members of this community are assumed to be beneficial (Hyland 2009; Gatehouse 2001; Dudley-Evans and St John 1998). However, the divergences tend to be problematic, complex and challenging for both students and teachers (Zohrabi 2011; Locastro 2001). Students, on the one hand, will meet challenges that they have not met before in their previous study, such as working in large-mixed classes and with foreign teachers (see Gadour 2006). On the other hand, they also provide considerable challenges to practitioners, particularly in terms of the selection of course content, the type of materials and overall teaching methods. This could involve difficulties in decision-making processes such as:

a. What kind of materials or activities should be selected?
b. Would these materials or activities be suitable for the majority of the students?
c. Should the materials and activities be authentic or general?
d. Are these materials and activities likely to please the students?

Large classes and seating arrangement were among factors criticised by both English teachers and students, where the number of students was often more than 100 and seats were arranged inappropriately. During the observation, for instance, the English teacher only moved in front of the class, and there was no way for him to reach many of the students, who might need help or support. This situation (5.3.5, 6.2.3.1 - f, 6.3.3.1- a) is

thought to make the learning and teaching processes difficult or even impossible (Schimin 2000). Introducing learner-centred teaching in large classes, for example, appeared to be impossible in English, as teachers could not closely monitor the students' language use or use pair or group works activities. The consequences of this are that the mobility of the students and the lecturer are impaired, and that collaborative work cannot be used in class. It might also be difficult for teachers to check and ensure individual or group contributions and to record activities in a limited time. Students in such classrooms generally have limited opportunities to practice the target language whether in oral interaction or reading activities, whereas, teachers in small classrooms are more likely to devote individual attention to all students and be able to practice a variety of teaching methods, e.g. learning-centred teaching and other active-learning approaches. Wood et al. (1974: 533) go further and outline that "foreign languages cannot be taught in large classes".

The arrangement of the seating was also seen as unfit for learning and teaching (6.3.3.1-a, figure 6.4). Such an arrangement appears to restrict the students and even the teacher from being able to move freely to conduct some activities, e.g. group-work. For example, it was noticed during the class observation that a number of students who were sitting at the back could not copy feedback from the board. In such condition these students tend to be less engaged and are more likely to be off-task (Richards 2006). Moreover, this type of seating prevents the teacher from monitoring the students' work and from contacting the students individually for feedback or support. The lecturer needs to be able to walk around the class without the students having to move their desks, and needs to make sure that students who are seated at the front, the centre or the back of the classroom can interact freely and frequently with him and with each other.

With regard to the number of hours per week dedicated to English courses, both teachers and students have different views. Some participants see two hours per week as sufficient, whilst others claimed that four hours or more would be more appropriate for ESP lessons. This means that 24hrs is the total length of the course. However, the teaching-hours are between 18 and 20 hours per semester as 4 to 6 hours are for examination and revision. As a teacher and insider researcher, therefore, I feel that teachers (especially those with a large number of students with low levels of ability in English) are often unable to accomplish tasks and plans in the limited time allocated, which leads to a constant feeling

of stress and pressure on them. The fact of the matter is that the level of language proficiency attained by students is often directly associated with the amount of time that they spend using the target language.

As a result, in a restricted number of hours, learners will be unable to learn the new language sufficiently as few of them will get the chance to use or practise it. Dudley-Evans (1984), for example, reported that for Egyptian teachers a lack of time gave little opportunity for them to expand the materials in General Science and forced them to omit parts of the course. He claimed that teachers with a small number of hours per week believe that they cannot introduce learner-centred teaching and also cover the syllabus of their courses. Another observation is that the English session is usually run in the afternoon, which is considered to be unacceptable by both teachers and students. By that time, the students are tired, as it is their third or fourth session of the day. In addition the temperature frequently reaches more than 40°c in summer, making concentration and learning difficult.

The shortage of teaching/learning aids (e.g. data-show, audio materials and language laboratory) also appeared to make the task of teaching difficult. In the observed classes, only a small-whiteboard was provided for the teacher (Figure 6.4). With such an aid, students at the back might not be able to see what it is written on the board. It may also prevent a lecturer from teaching the language effectively, and from implementing what he/she has planned. Lagga et al. (2004) also supported such claim and reported that the teaching/learning aids in some educational institutions in Libya are still inadequate.

7.2.1.7. ESP course materials

We have learned from the interviews and the teaching materials (6.2.3.1, 6.4.3.1) that there were a number of concerns about the current ESP course materials which include: no clear goals, objectives and specific syllabus or materials for the ESP course, and that the responsibility for these is in the hands of the language teachers.

In terms of setting goals and objectives, these are a necessary ingredient for any language programme, and having clear goals and objectives means that teachers can select appropriate materials, strategies, and evaluation techniques for effective teaching, assessment and evaluation. Goals, for example, will reflect what the teachers intend for

the students to be able to do with English at the end of the course. They provide a sense of direction and a coherent framework for teachers in planning the course, and help them to conceptualise their course in terms of teachable chunks. With this in mind, such findings suggest that the language teachers were given a hard job and a large amount of responsibility, and I was really wondering how one could handle such a situation. Without them, teaching would be unfocused and learning would occur by happenstance. Moreover, it becomes impossible for teachers to see how the whole programme fits together, and they will not be able to see their progress. In addition, it might be difficult for teachers to provide effective feedback. The absence of an outline and /or syllabus is also problematic. The consequence of this is that teachers and students will not have a clear idea of the learning aims and objectives, for example, the purpose of the course, regardless of the fact that the observed English teachers reported that they (head of the English Department and English tutors) meet to discuss such issues.

With regard to the materials selection, they are adopted without proper investigation and analysis, and are selected according to the language teacher's own experiences (6.2.3.1-g). The only criteria applied for selection of these materials is a brief conversation with the students and a writing test, and even then the materials are selected in terms of "register" only. In addition, they appear to be out-of-date (and often out of print) in content and pedagogy, and lack clarity in layout and usability. Furthermore, these materials (see appendix 11) are mixed in terms of subjects (scientific and literacy texts) and level (beginner to pre-intermediate), and are adopted from different sources, which may seem obvious in a situation where classes are mixed in language ability and specialist subject. They are generally designed for EGP with a greater focus on physics. They are not authentic and lack appropriate control, especially regarding the primary language activity. These activities seem to share one objective; to improve general reading comprehension abilities, language structures competence and build a better vocabulary. The lecturer, I believe, might select the materials, to a certain extent, to fit in with the students' linguistic competence.

In connection with the language macro-skills, the main emphasis was placed on student's reception rather than production, where reading is mostly emphasised with a heavy focus on words and phrases. This focus always requires students to focus on meaning, where students are required to choose the right words or phrases for a particular activity.

Skimming is also required where comprehension questions related to text are practiced. Whilst of the productive skills, short sentences are most commonly required, such as answering comprehension questions. However, there was a lack of focus on oral and writing skills as there was no specific writing, speaking or listening task in the English teaching materials.

In terms of micro-skills, the focus was on learning grammatical structures and lexical aspects rather than participating in communication activities. These two skills appeared to be an essential component for success in reading ability, and are presented in almost all texts. The lexical activities, on the one hand, endorse students' autonomy by encouraging the deduction of meaning of unknown lexis from context, and underlie their ability to understand what is being taught. The grammar activities, on the other hand, aim to raise students' awareness of language structure, giving them practice in using prepositions, adverbs and verbs. Such focus, I think, is because grammar and vocabulary are the only skills in which students are examined, and which might encourage them to learn the language. The students' levels of English, on the other hand, might be the other reason for such focus. The lecturer might notice that the students' main problems and needs are grammar and vocabulary and reading skills. Therefore, he might concentrate on developing such skills. This belief is similar to what English language teachers in the east of Libya noted (interviewed by Orafi and Borg 2009). They claimed that English language examinations only focus on grammar and reading comprehension whereas other skills such as listening, writing and speaking are passed over by both teachers and students.

Data also shows that activities such as skimming, filling in gaps, multiple choice questions, true/false statements, and matching words and definitions are included in the text (see appendix 11.B). These types of exercises seem to be designed so that learners can practice and develop new language skills, understand structure and learn new words. They are, to a certain extent, valuable as they are more general and suit all students' language levels and disciplines. They are put, to some extent, in a meaningful context, which could help the students to develop some of their linguistic competence. Surprisingly, all of the activities covered were observed as being conducted by individuals or pairs, and group work was not recorded at all. Other activities such as

writing a report or describing an experiment that match real-life situations at students' workplaces were not observed.

With such views, one can conclude that the varied content of the course is to some extent reasonable in terms of the present mixed community, disciplines and levels. In addition, most students were satisfied with some elements of this course such as the amount of information and materials they were exposed to. However, the materials are far from ideal for ESP materials (3.2.3) in which "the syllabus is based on an analysis of the needs of the students" (Basturkmen 2006:17). Moreover, dissatisfaction has been reported by students regarding the usefulness of the course content in terms of 'specificities'. Most of these students claimed that the materials were uninteresting and irrelevant to their needs (5.3.5). It was observed that the materials caused a decrease in motivation, did not ease interaction between students and did not promote learner autonomy (6.3.3.1 – c and d). This could be related to the fact that no proper analysis had been carried out (Dudley-Evans and St John 1998:173). This in turn affected the purpose of these materials as each discipline has its own specialised style of language, and each student or group of students is unique.

The fact of the matter is that the majority of the participants preferred narrow angle scoping rather than those with wide angle scoping (5.3.4). In other words, the teaching materials should be as authentic as possible, and should link the subject matter to the students' areas of specialism. Materials required in science are rather different from those needed in other fields such as history or language and literature. The job of science is to classify, describe and explain. Physics students for example are introduced to the information report, given an explanation and an argument, and the text is built on the technical naming of phenomena including sequences of activities that are distilled into a technical issue.

Such specific materials are not only beneficial for the students in terms of their future professions, but also increase their motivation (3.2.3 and 3.3.7). Basturkmen and Al-Huneidi (1996) reported that a large number of undergraduate Kuwaitis studying petroleum and engineering felt strongly that the focus of teaching materials should be on their specific areas of study. This is due to the belief that applying authentic materials that are relevant to the students will help them to develop the specific type of communicative

ability that they need, and encourage them to face the complexity of authentic texts (Grellet 1981). These materials, according to Nababan (1993:3) should focus on two factors: "the specific areas in which the language will be used and the types of learners who will be learning the language".

7.2.1.8. ESP classroom methodology

Generally, most of the students reported satisfaction regarding teaching methods (5.3.5). These students also liked the teacher's method of delivering the lesson and believed that their teacher was highly motivated. They were also satisfied with their teachers' feedback. In dealing with the classroom activities, the teachers applied a deductive or "top down" approach in conducting grammar activities, whilst with lexical items, they explained words by synonyms and antonym as well as through the text. Reading silently and skimming methods were the techniques used in developing the text comprehension exercises.

In addition, the students appeared to be accustomed to a teacher-centred learning environment and appeared to be "spoon-feeding", where the teacher had more time to talk than the students; managed classroom activities, passed on knowledge, and helped the students with comprehension and complete the lesson exercises (6.3.3.1- c). The only type of interaction that frequently occurred in the class was lecturer initiated questions followed by a student response with a few words. The responses were often restricted to a few students seated in the front row, and were usually only a result of them having been asked. However, none of the students were observed asking for details or clarification. During the lecture, for example, the teacher presented the material in a structured manner so that the students could listen, process and make sense of the lesson, but he received no immediate feedback from the students. The only discussion between these students was them speaking to each other in Arabic, e.g. asking about some language structures or answers to questions.

The reason for such methods of teaching; according to Orafi and Borg (2009:249), reporting on English language teachers in the Eastern part of Libya, is that English language teachers could not implement the communicative practices of the new English curriculum because of the students' level of English. This provided an obstacle to their participation in classroom activities, and their lack of English vocabulary contributed to

an unwillingness to practice in pair/group work. It might also be attributed to the lecturer's lack of suitable methods of teaching and knowledge of ESP characteristics (see 3.2.2).

Another important factors concerning language teaching is the language applied in English classes (English or Arabic, or both), which was described as frustrating for both students and teachers (appendix 11-A). They were unable to deal with each other adequately, and understand each other as the teachers do not speak any Arabic and the students have little English, which often leaves a large communication gap between them (6.2.3.1- b and d). From the students' point of views in this regard, the integration of both Arabic and English rather than the use of English alone is much more preferable (see 5.3.3). This could be a result of their level of English, which is between beginner and pre-intermediate. It could also be a result of the teachers' accent which might be found difficult to be understood by the participants as ASSA reported (see appendix 9). The English teachers also share the students' views, and argue that bilingual teachers are more helpful to students, because those who do not speak Arabic often fail to communicate with the students adequately (6.2.3.1- b and d). They reported that there was no problem with the class management, as the classes were running smoothly, and all students were respectful and quiet (6.2.3.1- h). The only problem with these classes was the lack of communication.

The idea of this integration is that using a first language (L1) might help students to learn a foreign language by exposing them to the similarities of the two languages. Clanflone (2009) for example, indicated that the application of L1 (in this case Italian) in EFL classes seemed to be preferred both by teachers and students because it allowed the clarification of difficult words, the explanation of grammatical rules, and difficult concepts and better overall comprehension, which saved time and increased student motivation. However, others believe that students lose the benefit of practicing the target language by being taught in their L1, and have noted that students in these classes are sometimes uncommunicative and bored, and see the lessons as pointless and irrelevant. It is possible that teaching in the L1 may, therefore, prevent learners from learning the new language (Harmer 2001). Khassawneh (2011) also found that students who were less proficient in English at Yarmouk University "always ask teachers to use Arabic in

explaining lessons and they even register their courses with teachers who use Arabic and tend to drop the course if teachers use only English in the classroom".

Finally, the students' assessment, is not only a motivating factor but also displays students' progress on the course and their level of ability, and helps teachers to provide information as to whether they have been successful. According to the findings, there have been two written tests per semester; mid-term and final, and because of the students' insufficient language capability, exam standards have been lowed to suit students' levels of English (see 6.2.3.1- h and appendix 10), if not most students will fail the course. This type of short-term action could lead to negative effects on the students' learning in the long-term. Moreover, only reading and language structures are tested. However, oral/aural, listening and written examinations are excluded from the ESP courses (see 6.2.3.1-h), because of the students' lack of English, English teachers found it problematic to organise any oral communicative or writing tests (Orafi and Borg 2009).

Apart from that, one can conclude that the teaching relied heavily on outdated methodology, which is no longer effective in language teaching and learning, especially in a context where the classroom is the only place for students to practice English. This method focused on grammatical description, and procedures of drilling. It seemed that both teachers and students consider learning English as a matter of mastering grammatical rules and vocabulary (Elabbar 2011; Orafi and Borg 2009). I am not assuming that grammar and vocabulary are no longer useful, thus, the argument is to consider both these two elements as a base for learning the language. Wilkins (1972:111) wrote that "Without grammar very little can be conveyed, without vocabulary nothing can be conveyed." Long and Richards (2007: xii) also characterise vocabulary as "the core component of all language skills".

In addition, with this method, teachers have more control over students' interaction and contributions in the classroom; the consequence is dependent-learners (see 3.3.4.5, 6.3.3.1 - c). Such use of teaching methods might be attributed to the lecturers' style of teaching or lack of knowledge of contemporary teaching methods (see Orafi and Borg 2009:249). It might also be that teachers' believe that modern methods cannot be implemented due to students' linguistic abilities, motivation levels or a lack of resources (2.3.2).

Modern methods promote real communication in the classes, which are characterised by attempts to focus on functions of the language and ensure meaningful tasks. These tasks must, therefore, equip learners with the skills necessary for communication in the target contexts. These methods also encourage participating in conversations and lower learners' anxiety. Many classroom activities such as group work, pair work, role-play and question-answer sessions are involved. Furthermore, the language teacher's role is to facilitate and guide students, not to provide all knowledge. Learners are given opportunities to focus on their own learning process through an understanding of their own learning styles. They are also encouraged to use the language, productively and receptively.

7.2.2. Section 2: What is the science community's target situation (TS)?

7.2.2.1. Why and where is the language needed?

The Faculty members perceived English as a useful global lingua franca in the scientific field, and saw it as an essential instrument in achieving study and career aspirations, even though it is not applied in some departments, such as physics (6.2.3.2- a). This is because most science sources and conferences around the world are provided and presented in English, especially computer science where most sources and tools are in English.

Within the three investigated departments, the demands of English are different in each discipline. Firstly, in CS, English is the medium of instruction (6.2.3.2- a , c, 6.4.3.2- a, b, d), as its existence in this area of science is common; because nearly all the computer applications are in English (e.g. all Computer Programming materials are entirely in English). The most likely explanation for this is that the available references in CS subjects are almost always in English and/or there is no way of translating them into Arabic (e.g. because they include computer programming codes). An Equally important reason is the fact that a number of CS subjects are taught by foreign teachers who cannot speak the students' first language. However, most explanations and discussion were delivered in Arabic. This means that, in the short-term, students are required to deal with class activities partly or entirely in English (e.g. read lecture materials, take notes). In the long-term, English is needed for work purposes, as graduate students need to design computer programmes and networks, all of-which are in English.

Secondly, in physics and chemistry where most of the textbooks and classes are in Arabic, English is also seen as the language of science. In the chemistry department, English was found to be needed, for both study and work purposes (6.2.3.2 - a, b, c, 6.4.3.2- a, b, d). For study purposes, students are required to read and understand most chemical equations, symbols and tools instructions for which are usually written in English and some students face difficulties when handling such terminologies. Nevertheless, lessons and materials are written and presented in Arabic and students are not required to read and write English material or even speak in English in the classroom. However, observed students showed no problems with such terminologies.

For work purposes, on the other hand, graduate students who will work at laboratories are required to write reports in English and deal with and understand machine instructions written in English. Physics students appeared to need English less often. It is understood that they are not required to read materials in English, write or even listen to lectures or seminars delivered in English. This is due to the nature of this department where nearly 99% of its teaching materials are in Arabic, except some physics laws and mathematical equations which are in English, and are well-known to all students as they studied them at secondary school. Nevertheless, the PHL strongly stressed the importance of learning English as it is considered the language of science.

Moreover, regardless of the fact that Arabic language is the main language used in all science subjects teaching materials, two computer lecturers expressed a preference for using English as a medium of instruction. This is because it is more convenient when teaching materials are in English and some materials have no equivalent in Arabic, e.g. computer programming codes (appendix 9). This is also due to the way they themselves received their education in Western universities. Another reason could relate to the lack of references and conflict in the Arabic Academy in Arab countries about standard translation.

Such views support the fact that English has also become central to science, not only in Libya, but also more widely (Hafner et al. 2009; Zughoul 2003; Dudley-Evans and St John 1998), and also reflect the roles that language play in education (see 1.1, 3.2.1). This means that English is not only used in teaching materials and other sources, but also at conferences and in academic journals, which is recognised by the participants in this study and by previous researchers (Zughoul 2003; Swales 2004 1990; Dudley-Evans and

St John 1998; Hutchinson and Waters 1987). Swales (1978:43), for example, emphasised the importance of English for many Libyan students. He found that "The faculties of Agriculture, Engineering and Science were English medium. In the same line, Hafner et al. 2009 outline that English "is perceived as a useful global lingua franca in the scientific world" for study and work purposes. Zughoul and Hussein (1985), who reported that some Jordanian teachers are in favour of using English in their classes as they received their education in the United States and Britain.

7.2.2.2. The knowledge requirements in science classes

As discussed in 6.2.3.2, 6.3.3.2 and 6.4.3.2, the knowledge of the English language required by the science community is varied. Computer science students need English for both study and work purposes, and their English language proficiency is required to be at least intermediate level (Dudley-Evans and St John 1998), in order to cope with the events applied in this field. It is essential for these students not only to pass an ESP course, but also to function effectively when carrying out typical computer tasks, e.g. writing and designing computer programmes. Without such knowledge, it would be challenging for both teachers to teach effectively and students to learn adequately.

Chemistry and physics students also need some English to pass examinations (because ESP is a mandatory module), but not for communication. As mentioned in 6.2.3.2 and 6.4.3.2, chemistry students are exposed to a large number of English words. It might be hard to advise what level of proficiency in English is required, but as university learners, these students should be at least at intermediate level (Dudley-Evans and St John 1998).

To summarise, it can be said that an intermediate level of proficiency in English, especially for computer science, is assumed to be acceptable to allow these students to cope successfully with the specific needs of science subjects. The lesson to be learnt is that students should be prepared to obtain knowledge of English that will help them in their specialist field.

7.2.2.3. Genres needed in science classes

Referring to the target community factors discussed in 6.3.3.2, b and 6.4.3.2, b, a number of activities were noticed in science settings including listening to lectures, taking notes,

understanding and reading lecture hand-outs and writing laboratory reports which are all needed for academic and work purposes to varying degrees among the three multiple disciplines (see Table 6.4). Beginning with CS, most tasks are done through the medium of English in this field, where all receptive and productive skills are required. Reading and writing are the most important skills needed because most of the texts are written in English, followed by listening and speaking, accordingly. At the study stage, students are required, in the lecture, to read hand-outs, write notes, ask for clarification, and generally understand and remember specific points. In examinations, reading and understanding examination questions, writing relevant answers, asking for clarification and listening to instructions were all necessary skills. In private, students need to skim and scan books and references; take notes and practice theory and instructions. Whilst at the work level, reading and writing computer programme structures and designing a computer programme are the most common activities.

Not surprisingly, these texts have particular characteristics that distinguish them from other texts (Dudley-Evans 2000). They have different structures from traditional text layouts (IMRD: introduction–method–results–discussion). Three systematic layouts were found: *introduction*, *method* and *implementation*. The introduction was short, and gave a summary of a programme; the method presented the structure (s) of a computer programme, whilst the implementation showed how a particular programme was conducted (see appendix 16). In addition, all the English written texts had a title, followed by an introduction and a list of points or short paragraphs. Of course, they have specific applications which can only be understood by specialists in this area, e.g. *If else If, pow < x,y> , x= rand (…) % +1→ (1-6*), (see appendices 13, 15 and 16). However, there are several ways of representing knowledge in each text. Images, for instance, are used as an authentic sample to show what such a program looks like, and to make it easier for learners to comprehend.

The need for the language tasks and skills applied in CS appear to be largely limited for students in the fields of chemistry and physics fields. The genre needed include listening to lectures and taking-notes of chemical equations and symbols written in English, nearly all of which are known to the majority of students. Writing a lab report, and reading and understanding some chemistry equipment instructions are the only genres required for work purposes (6.2.3.2- c and Table 6.4). Surprisingly, students are not provided with any

examples of how such reports are written or prepared. However, there have been no English texts produced in this field. Finally, English is clearly not urgently needed in the field of physics, as no specific genre was found; nearly all of this department's discourse is in Arabic, with the exception of a few symbols and mathematical equations (6.2.3.2- b and 6.4.3.2- a).

It can be concluded that each community has particular characteristics, demands and focus that distinguish it from others, which is one of the features of the ESP application (Johns and Dudley-Evans 1991 and Swale 1978). The genre analysis approach, for example, assumes that language is used differently within different cultures, and the students' success in understanding the target community culture effectively is through their mastery of the target language genre structures (see 3.2.2). Furthermore, these kinds of genre studies have two major motivations: (a) finding the relationship between language and the target community context where the language is used, and (b) improving students' literacy education in societies by introducing them to the written authentic text (Hyland 1999).

7.2.2.4. Registers needed in science classes

The structural elements (*lexis* and *syntax*) which form the backbone of science texts seem to be exhibited in the computer and chemistry fields, but to different degrees (6.3.3.2- c and 6.4.3.2- d). Within the field of computer science, data suggests that students are required to comprehend highly specific *technical* and *sub-technical lexis* that can only be found in CS, and which is different from other science texts (e.g. computer codes). Such lexis forms a large area of CS literacy texts, but not as much in a professional oral context. However, several sub-technical words existed in this field, which can also be seen in many texts, and in everyday social contexts, sometimes with the same meaning (e.g. open), and sometimes with a different meaning (e.g. windows) in CS contexts. In addition to this lexis, acronyms and prefixes are also widely applied in the CS context, e.g. *ROM, Max, in* and *out: input* and *output,* which were observed to be well-known to most students. However, it was noticed that CSL2 translated most of the English words that he came across into Arabic, which did not often happen in the other class, CSL1. This might be due to the teacher's belief/findings about students' lack of such English vocabulary.

In terms of *syntax* items, it seems that CS has some grammatical focus. *Passive forms* are more frequently used. The idea behind the frequent use of the passive voice in scientific writing is to create an impersonal scientific text. In other words, scientific writers choose it in order to remain objective and impersonal. Such emphasis on the passive could be because the language of CS, and other sciences, is more indirect and the focus is on the action rather than the agent. **The** p**resent simple tense** is also frequently applied in all CS teaching materials. In this regard, Glasman – Deal (2009) reported that the present simple tense is often applied in science contexts, especially in the introductions of scientific research articles to state accepted facts and truths, whereas the simple past is used in the methodology section. **Modal verbs**, **adjectives** and **adverbs** were found in CS teaching materials, but were much less frequently applied in science contexts. However, none of the first person singular or plural pronouns were found in either written or oral contexts. It is also worth mentioning that typical phrases such as "end of file", "repeat statement", and "variable case" were commonly utilised in this field.

With regard to *function,* CS texts appear to include two types of function: *description* and *request*. Description occurred more frequently, whilst request was more often used in exam papers in the form of questions. In terms of *sentence structure*; simple and compound, complete and incomplete sentences were all seen in this field. Simple, short and incomplete sentences were noticed in two locations; in lectures and within computer programme structures, e.g. "This is wrong number", "if it is false" and "statement is ignored". Such sentences reveal that there have been attempts to avoid difficult and complicated language and expressions, which might be the nature of this field of language.

Moving on to chemistry and physics, only one register was found in these written/oral contexts which was lexis. Not a single English sentence was written or pronounced in either discourse. In chemistry, only a few technical words and a huge number of chemical elements symbols were noticed, which all appeared to be understandable to students, as no questions arose during the class observation. This could be due to the fact that little English was found in this field. Quite similarly, the physics materials show that English was not used, except for a few mathematical symbols and equations, which as has been mentioned, are well-known to all students. Again, the reason for this is due to the nature of this field's teaching material, as only Arabic language is applied. This is to say that

chemistry and physics students are only required to comprehend a number of technical words and symbols related to their field, but not to read, write, speak or even listen to any of the English register items under investigation and mentioned above.

As discussed in 3.2.2, it can be argued that the principle behind such an approach is that the desired language in one scientific discipline (e.g. physics or chemistry) was composed of a specific register, which is unlike the language of others (e.g. computer science). What one can conclude is that the needs of the three target communities differed significantly between specialist areas. What is essential in the CS community and to a limited degree in CH is not necessary in PH.

7.2.2.5. The future needs of science students

From the point of view of the Faculty members and some students' viewpoints (5.3.1, 6.2.3.2 - a), English is recognised as essential for communication in all areas of science, from obtaining higher education and/or knowledge of current science research, to designing a computer programme, writing a lab report, or presenting a paper at a conference. Such recognition supports other researchers' views that English is a major language of education around the world; in English speaking countries and non-English speaking countries (Upton 2012; Paltridge and Starfield 2011Swales 2004; Tardy 2004; Zughoul 2003; Dudley-Evans and St John 1998; Hutchinson and Waters 1987). It is largely considered to be the lingua franca of the scientific community because most of the journals around the world are published in English. It is also used in scientific research. For Hutchinson and Waters (1987), English is required not only *as a subject* but also *for service* in all scientific situations (Hutchinson and Waters 1987). In addition, English is the language of the modern era, where people use it in various areas of life such as, medicine, aviation, economy, travel and tourism.

For example, students who want to pursue a higher education, such as master's degree or doctoral studies must take one of the internationally recognised tests of the English language (e.g. IELTS or TOEFL). By learning English, students will be equipped with the proper tools to enhance their knowledge of the subject they teach and will be teaching. For science researchers, the simple fact is that English will allow Libyan researchers to consult and use high quality textbooks and other related materials which are very limited in Arabic. It will also provide them with opportunities to consult international research in

the areas they are involved in and also to present their research and work on an international platform.

7.3. Conclusion

This chapter aimed to look at the research findings from different perspectives by triangulating both quantitative and qualitative findings in an attempt to answer the study research questions (RQs). With regard to RQ sub-questions 1:

- What is the science community's present situation (PS)?
  - What is the science students' present situation?
  - What do the science students learn in the ESP course?

In answer to RQ1 the results demonstrate that the present situation of the target community was complex. Firstly, the participant students demonstrated similarities and differences in attitudes, motivation and beliefs towards English language use. Secondly, they also demonstrated varieties of learning styles (most students appeared to be dependent-learners) and level of English language proficiency. Most of these students came with inadequate knowledge of the target language (most were beginners), a fact which was indicated by the students themselves and also expressed by the faculty members. It seemed that communicating freely is the greatest challenge for most students. Finally, they were also mixed in terms of subject knowledge (computer, chemistry, and physics).

The participant students have also called for a highly narrow ESP course to be implemented on the target discipline. With such views, the students desire a flexible ESP syllabus, which provides practice in both the receptive and productive skills, but greater focus on reading and writing, preferably implemented by a bilingual teacher. Even though the students expressed satisfaction about the current ESP course, the course still lacks relevant materials, tasks and teaching methods, and appropriate environments.

In terms of sub-questions 2:

- What is the science community's target situation (TS)?
  - Why and where is the language needed?
  - What type of genres are used in science classes?

- What type of registers are used in science classes?

The findings of the three research questions offer a perspective from which to identify the science students' target situation. First of all, English is considered as an essential tool of communication for all disciplines to varying degrees. It is also important to note that some students were motivated by social contacts in their use of English, e.g. travelling. Beginning with the CS (see 6.2.3.2- b , c, 6.3.3.2-b, 7.2.2.3, and table 6.4, Table 6.5 and Table 6.13), the academic staff considered English as a medium of instruction in most of the computer tasks (e.g. designing computer programmes). Although they perceived reading, and writing to be most frequently used, they considered almost all the language skills to be important to acquire. It is also understood that language skills such as describing processes and reading hand-outs, reading and writing notes and scanning for specific information, writing examination answers, asking for clarification and listening to instructions are among needed skills applied in the CS. The possible explanation for these needs is that these students are generally required to study mainly from the English material for their computer subjects rather than from other sources. They, therefore, need to deal with this type of language function in their learning situations.

The findings of this study also strengthen the case for examining the lexical and linguistic structures used in a particular science subject as they reveal (see 6.3.3.2 – c) that some lexical (e.g. high technical words: "*Rand, Abs, if else if"* and sub-technical words: "windows, read file, repeat") and linguistic structures (e.g. simple present tense, present passive voice, and rather long complex sentences with many dependent clauses) are frequently used in computer science, which distinguish the CS discourse from other science areas. These lexical and linguistic structures are perceived to be important to learn in ESP courses. In this field also, such findings reveal the participants' awareness of the importance of English, which has become the dominant language used in science education. These findings are similar to the studies by Rababah (2005), Cobb and Horst (2001), Lam (2000), Jordan (1997), Strevens (1988) and Trimble (1985) who reported that lexical and linguistic structures, such as compounding, articles, nominalization, modality, tenses and passives are frequently found in EST.

However, in other subjects; chemistry and physics, English seems to be a secondary demand need (see 6.2.3.2 – b and Table 6.4). Within chemistry, only technical terms and

lab reports writing were perceived as being important by the teacher participant. This finding is in agreement with Trimble (1985), who states that two essential lexical areas frequently used in science are technical and sub-technical vocabularies. In terms of the department of physics, the use of English language skills is very limited as only a few symbols and mathematical equations are found in its discourse (see Table 6.4). This means that in the short term, students do not require English for any purpose. Nevertheless, both chemistry and physics participants still consider English as an important lingua franca in the scientific fields. This is because " Most of the scientific, technological and academic information in the world is expressed in English and over 80% of all the information stored in electronic retrieval systems is in English" (Crystal, 1997:106). This means that learning English is wholly needed (e.g. for studying abroad, engaging in international research projects or conferences), as it grants someone the ability to obtain international recognition and to access to relevant publications.

The next chapter presents the implications for practice in ESP and recommendations based on these results. It is hoped that these implications and recommendations could serve as guidelines to what should be done in the review and re-development of the ESP curriculum offered to the science community at the Faculty of Science. Finally, the limitations of the study and implications for further research are explained.

Chapter Eight

Implications of the study

8.1. Introduction

This chapter, first, presents the implications of the study for the ESP approach. Then, recommendations and limitations of the study are provided. Finally implications for further research are explained and conclusions are drawn.

8.2. Implications of the study for ESP pedagogy and curriculum design

Although the current study addresses the language needs of undergraduate science students, which is an area that has been little researched in Libya, the findings of this research can have several implications in pedagogic practice and curriculum design in ESP in Libya, as follows:

Firstly, since the use of the English language is growing rapidly in different fields, in Libya and more widely, and it is considered as lingua-franca in many aspects, including science, in the country (Upton 2012; Donesch-Jezo 2012; Bhatia et al. 2011; Hyland 2009; Sawani 2009; Swales 1978), university practitioners will need to consider such increasing demands from the community. Working in the context of the sciences, El-Haddad (1984:19) observed that EGP courses in the Maghreb Arab countries (Libya, Tunisia, Algeria, Morocco and Mauritania), and more widely (Bhatia et al 2011) "cannot cope with specialties such as science and technology". They concluded that specific courses are more appropriate.

In Libya, ESP has just seen the light as discussed in (1.2 and 2.3.5), in which it is suggested that practitioners are still lacking the competence in English required in a professional context (Bhatia et al 2011; Hyland 2009; Belcher 2009; Bhatia 2004;). From my study findings, therefore, Libyan practitioners should reconsider ESP courses, in particular, and English language, in general, and should find ways to develop them in the light of recent ESP applications (Bhatia et al 2011). I suggest that aspects such as methods of teaching, language curriculum and even teaching environment should all be developed according to the ESP characteristics (Bhatia et al 2011; Basturkmen 2010; Hyland 2006/2007; Jordan 1997; Dudley-Evans and St John1997; West 1997/94;

Hutchinson and Waters 1987), if possible. For example, each area of science, where possible, should be provided with a specific course as such courses will present the students and teachers with skills appropriate to their field. This is because each community has specific practice events that are different from others, even though some communities share some events. A computer student, for example, does not need to; for example, know how a chemistry lab report is written. Through such an approach, the development of English will be seen as having a direct relevance to their studies and will result in interested and motivated learners. Moreover, this course should present the discourse genre/register of the variety of language used in the discipline. The courses should be subdivided into different tasks and skills which may be emphasised according to learners' purpose. This also, I believe, will enhance the students' involvement because they will find that topics of discussion are meaningful to their studies.

Secondly, the findings reported in this study also have implication for pedagogy in ELT at university and secondary levels. The methodology used in teaching ESP has not been updated, and it is still conventional as a product of a teacher-centered approach, which is not suitable either to ESP or EGP. It is understood that students' lack of skills in the English language is more related to traditional methods applied in both settings and especially at secondary level. Moreover, some language teachers have gone further by rejecting the validity and usefulness of the new teaching approaches (e.g. Task-based Instruction and Task-based Learning) in the Libyan context, because of students' low level of English and negative attitudes towards learning English (Orafi and Borg (2009).

Nevertheless, such attitudes towards the current language teaching approaches created by some language teachers could result from misunderstanding and misinterpretation of these approaches. I argue that such attitudes towards communicative activities could not be used directly in the classroom unless they are adapted to the students' situations. This is because communicative approaches emphasise communication and encourage independency. They also empower students to participate in communication by helping them to not give up in the conversation (Richards 2006; Kyiv 2003; Richards and Rogers 2002; Rost 2001).

From the study findings and researchers viewpoints (e.g. Richards 2006; Kyiv 2003; Richards and Rogers 2002; Rost 2001; Cannon and Newble 2000; Hutchinson and Waters 1984), I, therefore, argue that the old style of teaching should be replaced by more

communicative methods, which have been applied and recommended for language teaching. These communicative methods can motivate and encourage students to use the target language in order to overcome their lack of self-confidence. They are more effective than previous traditional methodologies, and can gradually stress a more student-centred approach in the English classroom setting. This is because a student-centred approach is seen as the cornerstone of successful learning. Furthermore, it involves a variety of communicative tasks and cooperative learning techniques in the target language. With a cooperative learning method, students can increase their interaction and enhance their interest in learning the language.

As far as the teaching methodology is concerned in this study, CLT can be very helpful. Therefore, teachers should apply such an approach, and should pay attention to those skills that help students to be more independent, and encourage negotiating meaning and interacting with others in the group. They should also use effective and active learning strategies that will reinforce the value of student-to-student interaction. Activities such as group discussion, cooperative learning and problem solving can be used in the English classroom to improve students' listening and speaking abilities.

The findings have an implication for Libyan ESP teachers, whose jobs seem to be critically significant in many aspects. First of all, the fact that the language teachers are GE teacher and have limited knowledge for teaching ESP classes has greatly influenced their way and style of teaching ESP (e.g. a teacher-centered learning). Such a method, according to Orafi and Borg (2009) has been limited to specialised lexicon and sentence structures and ignored communicative ones. They further argue that this method often demotivates students to learn. Second, these teachers claimed to have no adequate knowledge in the subject matter of the students' context.

Such facts indicate that ESP teachers are not professional enough and seem to work against the nature of ESP instruction. First, ESP focuses more on language in context, thus not on teaching vocabulary and language rules in isolation. Instead, English is integrated into a subject-matter related to the learners' interests which it has been suggested, leads to high motivation, because learners can then apply what they learn in their English classes to their specialist area of study, whether it be computing, chemistry or physics. Secondly, skills emphasis in ESP differs from that in ESL where all four language skills; speaking, writing, reading and listening are stressed equally. In ESP,

needs analysis is used to determine which language skills are most needed by the students. For example, emphasis might be on development of writing skills for students who are preparing for graduate work in a chemistry laboratory. An ability to use the target skills in a meaningful context reinforces what is taught, and increases student motivation. However, this does not mean that other skills are ignored completely.

The fact that the ESP teachers do not have enough knowledge of ESP and the subject matter might not enable them to express the ideas that contribute to understanding the intended learning outcomes. This argument may be supported by the fact that ESP teaching is basically built on the assessment of purposes and the functions for which English is required. In addition, ESP teaching focuses more on language in context rather than on teaching the aspects of language (i.e. grammar, vocabulary, sound system, etc.). In this regard, Dudley Evans and St. John (1998: 1) point out that the purpose of an ESP course should satisfy the needs-related nature of teaching and sort out the specific nature of the texts that learners require knowledge of. The opinion of Hutchinson and Waters (1987: 53) is that "all courses are grounded on a perceived need of some sort" in other words, it is important to understand what the learner has to know in order to function effectively in the target situation.

Therefore, I argue that ESP teachers should be specialised in ESP or should be given intensive and direct strategy training in ESP. They should also acquire some knowledge of the special subject matter. With this, teaching processes will go more smoothly and effectively, and teachers can choose appropriate teaching methods and learning materials that meet the needs of their students.

The final pedagogical implication is the role that L1 plays in teaching the L2/FL. The findings of this study suggest that bilingual teachers would be more suitable in a situation where the students' language level is too low. Research in EFL (e.g. Cianflone 2009; Khassawneh 2011), has provided evidence for the methodological value of using the L1 in teaching the FL, especially in in communicating meaning and content, but should not be over-used. Nevertheless, the L2/FL should be used as much as possible and should be the goal in every classroom.

A third implication has to do with the NA and course design, which are always related to each other and are not isolated. NA is seen as a core in ESP practice and considered as a

central part of the curriculum design for which teachers, learners and institutions are the main sources. Based on the study findings and literature context of the study, we have found that there are no ESP courses in undergraduate studies based upon the language NA in the university. The fact of the matter is that the English department which is in charge of the ESP courses at the Faculty does not regulate and supervise the ESP teachers in designing the material and just lets the teachers decide the ESP material on their own. Simply, these teachers make use of commercial textbooks available in bookstores or online as a main source of material, which is designed by outsiders. Consequently, it is not possible to ensure that the material and course content match the students' needs. Still according to the language teachers themselves, most of the science students appeared to be demotivated by the ESP course. Moreover, the science students also claimed that most of the ESP course teaching materials and activities did not meet their needs.

Based on literature in language needs analysis (see 3.3.2 and 3.3.3), such criteria mentioned above do not meet the ESP characteristics which emphases use of NA in any ESP programmes (see Basturkmen 2010, 2006; Long 2005b; Dudley-Evans and St. John 1998; Robinson 1991; Johns 1991; Hutchinson and Waters 1987). With this in mind, I must state that such an approach is appropriate, and would be applied at both levels; secondary and university, to investigate students' needs and other pedagogical issues. The reason is that it is seen as "the corner stone of ESP and leads to a very focused course" (Dudley-Evans and St. John 1998:122).

This discussion leads us to the second issue related to NA, which is course design in which NA is considered as the first step (Johns 1991). Although most of ESP materials used during the study are not up-to-date and lack a part for strategy instruction, the findings of this study have demonstrated implications for ESP materials that can be very useful for course design. I, therefore, argue that new materials must be designed for science students that should consider the role that NA plays in ESP materials. These materials must be as communicative as possible, authentic and up-to-date, as they can create an authentic English learning environment so that students will be immersed in the use of English. The selection of these materials should above all depend on the needs of the learners in relation to their future or present study: that is, materials should focus on the appropriate "tasks and activities that practise the target skills areas" (Ellis and Johnson 1994: 115). Such focus would not only encourage, but also push learners to learn

the language effectively. Because the purpose of ESP courses is to enable learners to function adequately in a target situation in which they will use the language they are learning (Hutchinson and Waters 2001).

The study findings provide a set of conclusions that can be utilised as an aid to the curriculum development of ESP at universities in Libya and other areas in deciding on the English language needs of science students and improving the existing ESP programme to better meet the needs of both students and institutions. For example, the information gathered on the way CS professionals make use of English can be an example of the usefulness of genre analysis in course design. In other words, language researchers have to some degree shifted the pedagogical purpose of ESP approaches away from the genre-based teaching to a more pragmatic pedagogy aimed at helping foreign students acquire "knowledge of relevant genres so they can act effectively in their target contexts" (Hyland 2003). In 6.4.3.2 – c, we noted how the CS written pattern is staged or moved, which varies from those in, e.g. the conventional structure of the lab report (IMRD). We also noted that most communicative events practiced in CS included reading hand-outs, writing notes, asking for clarification, reading and understanding examination questions, writing relevant answers, asking for clarification and listening to instructions, which are not required by physics students. Differentiating and describing such genre that students need to practice or follow is an important step towards explicating the tactical knowledge that the initiated possess. Moreover, the gathered genres can be regarded as a list for a common core in CS that can serve as a starting point for a genre-based approach to teaching English for study purposes. They can also help create authentic types of tasks for the ESP classroom, in general, and for course and materials design, in particular.

Beside this, specific lexis found in the computer corpus can be applied as templates for writing, which can be applied in the teaching practice providing meaningful tasks for the ESP classroom. Some words are only specific to the CS field, whilst others are used in a wide range of texts. We also saw in chapter 6.4.3.2 - d how the language of written discourse in CS is influenced by the predominance of present tense, with its extensive use of the passive voice and absence of the first person. Therefore, it can serve as a reference for course and materials design for teaching English for study/work purposes. With the help of this corpus, the CS specific elements can easily be selected and can be used as the basis for traditional lexis teaching exercises.

With such identification, ESP teachers will be able to recognise and explore disciplinary differences and how they influence the way knowledge is expanded and communicated." Most of the ESP classes that we teach include students from different disciplines. Such focus on the language needed in CS, would help students function effectively in their target domain (Abu-Rizaizah 2005). I think that most students will benefit from acquiring explicit knowledge of the genres and register they are attempting to produce, in terms of their functions, their components, and the way they differ one from the other. They also can help language teachers to create more relevant materials and diverse tasks, especially written tasks. In the same line, Halliday (1993) noted that what defines something as 'scientific English' is not just the use of 'terminology' but the combination of features that cluster together in consistent relationships. These combinations of genre are a "class of communicative events, the members of which share some set of communicative purposes" (Swales 1990:58).

The study findings also provide some support for the idea that a more adequate teaching environment can have powerful effects on learning under certain circumstances. Therefore, course designers should consider facts such as time, seating arrangement and visual aids. Course designers should include graphics, language laboratory and/or videos that meet the preferences of visual learners, sound recordings to meet the preferences of auditory learners, and textual information to meet the preferences of verbal learners.

Finally, this study provides useful implications for ESP practitioners in an area where research is limited. The knowledge that might be gained from reading this thesis, especially by local researchers might encourage them to carry out further investigation to tackle relevant aspects in the ESP context. In addition, the instruments employed here can be replicated in similar contexts.

8.3. Recommendations

From the study findings, the following set of recommendations has emerged:

- In the Libyan EFL context in which learners do not have much contact with native speakers of English, the focus of language teaching should be placed on changing the classroom practice from the traditional passive lecture to more active group learning so that learners can be more easily exposed to target language use.

- The students perceived needs should be translated into pedagogic terms. In other words, when designing the English language course, ESP teachers should take into consideration learners needs. It is suggested that English language should be used extensively in computer science contexts and considered as the main tool of communication to carry out a variety of different activities. This is less important in the fields of Chemistry and Physics. It is not enough to design only one generic ESP courses for all science purposes; they should be designed specifically for each prospective field. They should also match what the students learn with what they will face in their academic and professional domains.
- Second, the criteria which define English language courses for computer science in particular and any specific area should be based on the target communicative situations representing the communicative use of language rather than formal linguistic categories that represent the language rules and vocabulary. The study also suggests that reading and writing skills are perceived as more important than speaking and listening in a wide range of activities in the computer science context. However, both receptive and productive skills are needed and should be treated equally as the differences in percentages are not too wide. Therefore, language skills for computer science in particular and other areas of science should be based on activities driven by the actual communicative situation demands by their professions.
- The students' difficulties and motivation should be given much more attention when ESP courses are prepared and developed.
- Finally is the teaching environment. Class size was revealed to be a widespread problem at the University and this impacted on language teaching and learning as the current study indicated. Without reducing the number of students in language classes, teachers and students time and efforts are significantly impaired. In addition, the classroom seating arrangement also needs to be changed as it was observed that the current arrangements (class seats and size) hide student- student and teacher-student interaction. Such a change (in arrangements) would encourage collaborative learning. Therefore, decision-makers should find an urgent solution for these two problems, if they want to improve academic outcomes.

8.4. Limitations of the study

Although the limitations of the instruments and techniques used are presented in 4.4.9, it is still worth reflecting on the limitation of the study as a whole. The major limitation of this research is common to all applications of the mixed methods approach applied. Regardless it provides an in-depth focus and broad information; it was time consuming, especially during data analysis. The audience should bear in mind that some of the findings of this study might not be fully the representative of all science students in the target context. The reason is twofold: individuality and number of participants. It is known that every student is unique, and what is desirable or challenging to one person might not be the same to others. The number of participants was restricted by the small number of faculty members as there were only three departments involved in the study. In terms of English tutors, these were the only language teachers who were in charge of ESP courses. With regard to the science faculty, there were only five members who accepted to be interviewed and observed, and the rest rejected the idea. However, I tried during the data collection to obtain all the information needed, especially teaching materials to support other data findings.

The findings might not be generalisable because the study is fundamentally concerned with one faculty. In relation to the limited information gathered from science students, it can be said that more evidence is needed to establish their wants, lacks and necessities. Finally the process of conducting the instruments employed in the study was also another limitation. This was an interruption during interviews which caused some problems but was sorted. Although this research has limitations, the results can still serve as reference points for the English for science curriculum designers and ESP educators in general. This has the following implications for further research.

8.5. Implications for further research

Based upon the findings of this small scale study, exploring the English language needs of science students in Libya has suggested interesting aspects for further research. Investigation of English language needs is still new in university settings, In turn; such work could be a starting point for reconsidering and developing the ESP curriculum at Libyan universities. It could also be used to develop other research tools to investigate language use or other areas of ELT at universities. Furthermore, to understand and

evaluate the use of English in the sciences, there is a need for more focused investigation of each discipline's language requirements as this study has only investigated the general needs of three departments (CS, CH and PH). This was impossible in this study due to the fact that some science teaching staff were not happy to be interviewed and observed. They simply claimed that English is not applied in their departments. Such directed investigation can provide suggestions and methods for how related needs of each community can be put it into their real world practice. In other words, curriculum planners should acknowledge the language needs expressed by stakeholders in their contexts, and they must provide suggestions on how these needs better match the actual language used.

The results also suggest that collaboration between English departments, concerned disciplines and students should be encouraged as it provides a more complete picture of what should be taught in such contexts. Another relatively under-researched area is science student's language deficiencies, which have not been clarified in this study. It is suggested that such lacks should be investigated, identified and dealt with.

Further research is also needed with regard to the specific language situation in science which presents a lingua franca environment. In turn, it would be interesting to investigate how non-Arabic science professionals interact with Libyan science students in the absence of code switching. It could also examine what kind of communicative strategies can be used to help these students to communicate freely in such situations. A final thought is that if the study findings are used as an input for the selection of text materials and teaching methods for computer science students, an evaluative study would be recommended to test how the new courses meet the intended communicative needs.

8.6. Conclusion of the study

This Needs Analysis thesis has been an attempt to describe the perceptions that undergraduate science students and their faculty members; teachers and academic administrators, have of the English language needs of science community. The study focuses attention on the target practitioners; subject and language teachers, academic administrators, to not only equip students with the right language skills, but also with appropriate teaching methods and suitable resources. They have shown that there are a number of components for each department that should be incorporated in the syllabus for

each English module that students would find interesting and relevant to their specialists. From this, ESP teachers can select interesting and subject-related material for the students, as this will have an important influence on their motivation.

Based on this research, evidence has been provided that NA is a critical method in identifying language needs which has also been stated by a great number of researchers in the field of ESP (Jabeen and Mahmood 2011; Ghenghesh, et al. 2011; Basturkmen 2010; Hyland 2006; Long 2005; Jordan 1997). In focusing on science, the findings of this study share the literature findings which highlight the role English language plays in science contexts.

Finally, reflecting on this study, the selected area of investigation has been chosen not only because of an interest, but also to gain more experience and knowledge of ESP. As soon as the processes of data collection and analysis were completed, I realised the richness of such work. Even though I have experience in this area, this research at the University of Southampton means a lot to me. It has provided me with access to rich knowledge about the nature of educational enquiry and interpretive research which in turn developed my quantitative and qualitative skills.

Furthermore, the four-year process of research towards this thesis has offered me abundant knowledge of ESP. This long journey has provided me with a lot of study skills, including improving my academic reading and writing, presentation skills, finding relevant sources, engaging in intellectual discussion with my tutors and colleagues inside and outside the university and thinking of diverse methods of solve problems as well as managing working under pressure. These in turn, will/ make it easier for me to produce such work and to carry out further academic research. However, the completion of my thesis means the beginning of my academic research to think about what could be done to develop my profession and the field of ESP in Libya.

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Appendices and Tables of the Thesis
Appendix 1

Permission letter

Permission Letter

Date: 09/10/2009

Assistant Secretary for Scientific Affairs
Sebha Uinversity, Sebha - Libya
Tel No. +218 71 2626012 or 712621575-76
Fax: +218 71 2627019
P.O. Box: 18758
Email: info@sebhau.edu.ly

Dear Sir

I am currently in the process of carrying out my PhD research degree in Applied Linguistics (Teaching ESP) through an action research project. The University of Southampton requires that permission be obtained from the Sebha University. This letter is to request your permission to conduct my research at the Faculty of Arts and Science – Traghen. The target population will be science students and English and science teachers. This research will be conducted in two stages. The first stage is planned for November 2009 which will focus on collecting data on the language needs of the students using questionnaires, interviews and observation. The second stage of this fieldwork is the action research which is planned to start towards the end of February 2010.

The objective of my research is to create a survey to gather data about the science students' needs that I hope will help me to discover their needs, and what works and what does not in the English course and then design an ESP course that matches their needs.

The benefits of this research will be far reaching. However, with the teachers' and students' participation and engagement in this research, the objective can be achieved. It is my hope to offer students more choices related to their disciplines. And it is my belief that a more realistic and authentic syllabus would help motivate students to succeed. However, this will not interfere with the mastery of the university standards and benchmarks, but rather enhance the skills the students are expected to learn.

1

I thank you for the opportunity that your permission offers and appreciate your contribution to the success of our students and our university. I also undertake that all information related to the teachers and students will be anonymous. If you have any questions, you may contact my supervisor or me at any time.

Yours Sincerely,

Abdelhafied S. Abuklaish
Researcher
+44 7510373893
asa1c08@soton.ac.uk

Mr. George M. Blue
MPhil / PhD Supervisor
+44 2380 592222
G.M.Blue@soton.ac.uk

If this request meets with your approval, please sign this letter where indicated below and return it to me in the enclosed return envelope.

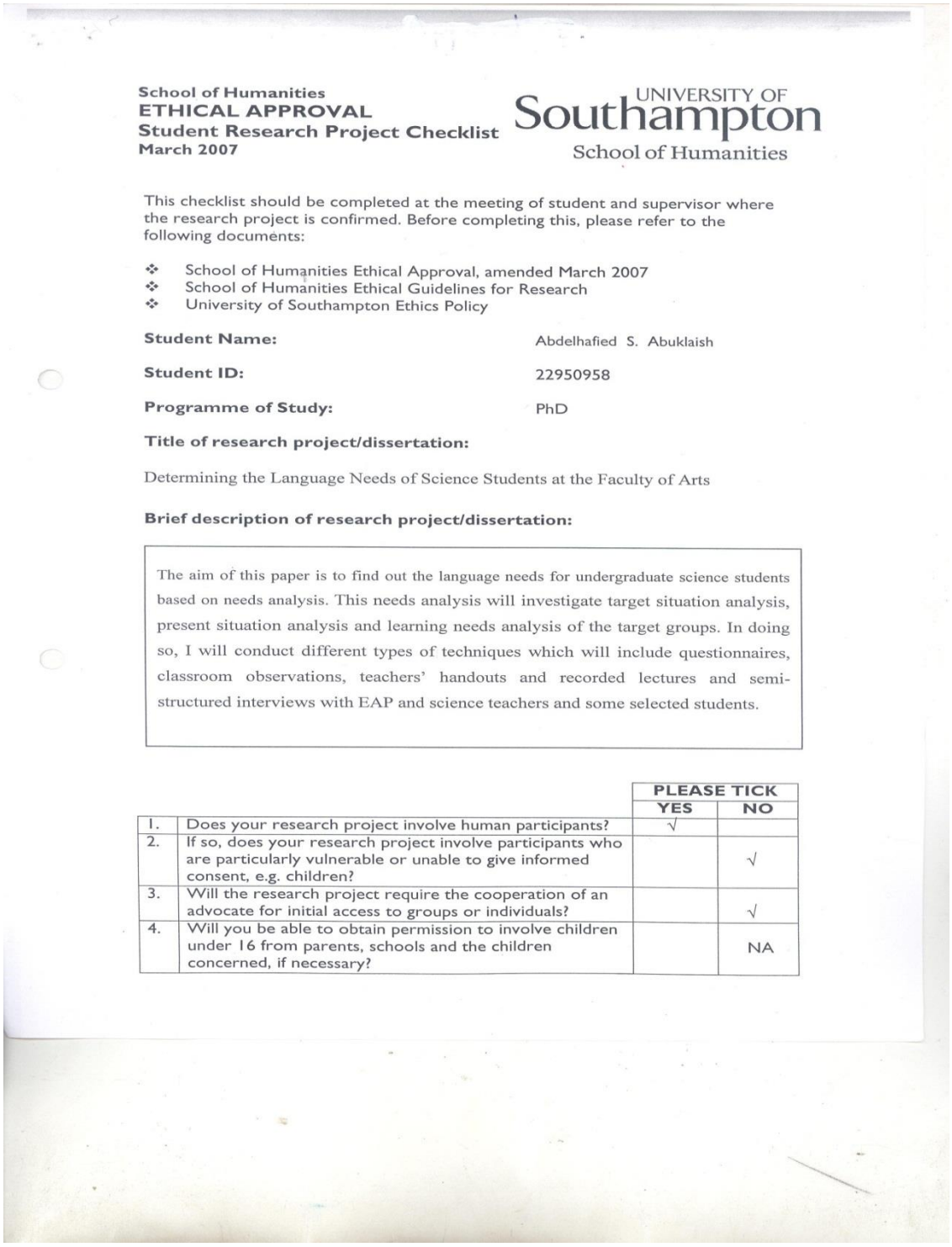
I give permission for this research to be carried out at the University of Sebha, Faculty of Arts and Science- Traghen.

Consent granted by:
Signature
Date 26-10-2009
Professor M. Rahouma
Title Vice-Chancellor
Address Sebha University / Sebha
Tel No.: 00218-0925417991

2

Appendix 2

Ethical Approval



School of Humanities
ETHICAL APPROVAL
Student Research Project Checklist
March 2007

UNIVERSITY OF Southampton
School of Humanities

This checklist should be completed at the meeting of student and supervisor where the research project is confirmed. Before completing this, please refer to the following documents:

- School of Humanities Ethical Approval, amended March 2007
- School of Humanities Ethical Guidelines for Research
- University of Southampton Ethics Policy

Student Name: Abdelhafied S. Abuklaish

Student ID: 22950958

Programme of Study: PhD

Title of research project/dissertation:

Determining the Language Needs of Science Students at the Faculty of Arts

Brief description of research project/dissertation:

The aim of this paper is to find out the language needs for undergraduate science students based on needs analysis. This needs analysis will investigate target situation analysis, present situation analysis and learning needs analysis of the target groups. In doing so, I will conduct different types of techniques which will include questionnaires, classroom observations, teachers' handouts and recorded lectures and semi-structured interviews with EAP and science teachers and some selected students.

		PLEASE TICK	
		YES	NO
1.	Does your research project involve human participants?	√	
2.	If so, does your research project involve participants who are particularly vulnerable or unable to give informed consent, e.g. children?		√
3.	Will the research project require the cooperation of an advocate for initial access to groups or individuals?		√
4.	Will you be able to obtain permission to involve children under 16 from parents, schools and the children concerned, if necessary?		NA

5.	Does your research project involve the collection and/or storage of sensitive/personal data on any individual?		√
6.	Could your research project induce psychological stress or anxiety, cause harm, or have negative consequences for the participants, beyond the risks encountered in their normal lives?		√
7.	Will deception, e.g. Covert observation of participants be necessary?		√
8.	Will the research project involve discussion of topics which participants may find sensitive?		√
9.	Will financial inducements, other than reasonable expenses or compensation for time, be offered to participants?		√
10.	Are there any problems with participants' rights to remain anonymous, or to have any information they give not identifiable as theirs?		√
11.	Is the right to freely withdraw from the research project at any time made explicit?		√

If you have answered NO to all of the above questions and you have discussed this form with your supervisor and had it signed and dated, you may proceed with your research project.

If you have answered YES to any of the above questions, please complete PART TWO of this form and discuss with your supervisor. This should then be signed and dated as above.

Please keep a copy for your own records. A copy should also be held by your supervisor and the Research and Finance Office.

Only in exceptional circumstances will cases need to be referred to the School of Humanities Research and Ethics Committee.

Appendix 3

School of Humanities

Modern Languages

Consent Form (Version 2)

Participants Consent Form

Study title: Investigating the English Language Needs of Undergraduate Science Students

Researcher details:

Name: Abdelhafied S. Abuklaish

Tel. : +44 7510373893 or +218 925353558

Email : asa1c08@soton.ac.uk

Please initial the box(es) if you agree with the statement(s):

1. I have read and understood the information sheet (Consent Form version 1) ☐
2. I have been given full information regarding the aims of the research ☐
3. I have had the opportunity to ask any questions about the study. ☐
4. I understand that my participation is voluntary and I may withdraw from the study at any time without giving a reason and without any effect on my education. ☐
5. I have a choice of not answering any specific questions. ☐
6. I have been told that my personal information will be kept confidential and no information that identifies me will be made publicly available. ☐
7. I agree to take part in this research project and agree for my data to be used for the purpose of this study. ☐
8. I agree to take part in the interview. ☐
9. I agree to the interview being tape recorded. ☐
10. I agree to be observed. ☐

****

Name of participant : …… Date / / Signature ……

Appendix 4

UNIVERSITY OF Southampton

School of Humanities
Modern Languages
Consent Form (Version 1)

Participants Information Sheet

Study title: Determining the Language Needs of Science Students at the Faculty of Arts and Science, University of Sebha -Libya

Researcher details:
Name: Abdelhafied S. Abuklaish
Tel. : +44 7510373893 or +218 925353558
Email : asa1c08@soton.ac.uk

Introduction:
You are being invited to take part in a research project titled above. Before you decide whether or not you wish to take part in the research, it is important for you to read and understand why the research is being done and what it will involve.
Please take time to read the following information carefully and discuss it with others if you wish. And do not hesitate to ask any question that is not clear or if you would like more information about this research. Thank you in advance for your collaboration.

What is the purpose of the study?
This study is being carried out as part of an Applied Linguistics PhD degree in English for Specific Purposes (ESP) at the University of Southampton. It concerns the science students' language needs. The purpose of the study is to determine the language needs of science students at the Faculty of Arts and Science, Traghen. In doing so, I have undertaken a survey to gather data about the science students' needs that I hope will help me to discover their needs, and what works and what does not in the English course and then design an ESP course that matches their needs.

This survey includes three kinds of methods; questionnaires, observation and interviews. The questionnaires will be completed by the students which will approximately last 20 to 30 minutes. The interviews will last between 15 to 30 minutes. The observation will be focused on English language lectures and a number of selected science lectures.

Why have I been invited?
You have been inviting because the study is about your English courses that you are taking and will take in the future, and because your information will be more appropriate to this study because you have already complete the first English course (A) and you are now taking the mid English course (B). This means that you first provide us with the required data which will help us to design the new course according to the information you will provide. You second might be one of the students who will have the chance to take this new course and tell

us whether it meets your needs and requirements comparing with previous English courses. We really anticipate that you will be one of science students who will take part in this study.

Do I have to take part?

It is entirely up to you to decide whether or not to take part. If you decide not to, we will entirely respect your decision and, of course, it will not affect your education in any way. If you decide to take part, you are still free to withdraw from the study at any time and without giving a reason.

What is required of me?

During the study, we will be directly involved in two kinds of data collection techniques: questionnaires and interviews. All you need to do is to complete the questionnaire or answering the semi-structured interviewer questions (if you are selected and agreed to take part in the interviews).

In the questionnaires, we are interested in gathering information about your English language level, your attitudes towards English language course that you are taking, and then your interest and the English language needs at the university. These questionnaires will last about 20 to 30 minutes. All the questions are multiple-choices where you are just required to tick all that apply to you.

The interviews will last 10 to 15 minutes, and just a small number of students will be interviewed. The interviewees who will be selected and agreed to take part in this study will be recorded. All the questions will be about their English course they are taking and how they wish this course would be according to their interests. Be aware that you have a choice of not answering any specific questions, and you are free to withdraw from the study at any time and without giving a reason.

What if there is a problem?

Any complaint about the way you have been dealt with during the study will completely be welcome to rise and discuss.

Will my taking part in the study be kept confidential?

Yes. Any information that is obtained in connection with this study will be kept strictly confidential and will be stored and later destroyed. In addition, your information will not be used or made available for any purpose other than for this research.

What if I change my mind about taking part?

Participation in this study is completely voluntary. Therefore, you could stop participating at any time and there will not be any negative consequences.

What will happen to me if I agree to take part?

If you decide to participate, your co-operation will be highly appreciated in taking part in the study, and remember, you are still free to discontinue participation at any time without penalty.

Finally, if you have any questions regarding to this study, please do contact me on the address mentioned above.

Thank you for your assistance.

Appendix 5

UNIVERSITY OF Southampton

School of Humanities
Modern Languages

Classroom English Teacher Interview

Teacher: _____ Faculty: _____

Interviewer: _____ Date: _____

Part: 1. Personal information

What qualifications do you have?
How long have you been teaching English?
What subjects have you taught?
Which of the language teaching skills do you feel more comfortable with?
How did you become involved in ESP?

Part: 2. Your students

Who are the learners?
How many students were in each of your English classes?
What levels of students are you teaching?
Who will the learners use the language with?
Where will the language be used?
How would your students describe you?
Are you happy about the level of the students?

Part: 3. General information

When does the English course take place?
Approximately how long does each lesson last?
Who decides what should be taught?
Does the institute play any role in specifying the course syllabus, or any other related issues?

Part: 4. Knowledge of the subject

What has led you to teach English courses?
Describe your teaching experience related to ESP teaching?
Which discipline have you felt you are particularly strong in?
Which discipline have you felt you are particularly weak in?

Part: 5. The subject content

How do you balance between EGAP and ESP?
What kind of materials would you need to teach ESP students?
What resources are available?
Have these resources/materials/activities been designated for this course or have you chosen to use them yourself?
How many minutes/hours do you need to prepare one lesson?
What kinds of methods have you used to select the learning materials?
To what extent do the materials help the learners to achieve connections with their own discipline?
Are the materials sufficiently authentic?
What sort of activities have you used?
Have the activities worked?
Have there been any problems in getting the materials you needed for this lesson?
Are there any materials you have used that you find are more accepted by the students?
In which disciplines (e.g. chemistry; computer; math) do you feel particularly strong?
What was the most challenging lesson you have had to teach, and how did you overcome the barriers?
Why would you use textbook / in-house materials in your teaching?
What kind of assessment have you used?

Part: 6. Classroom management

How do you begin each class?
What is your classroom management plan/style?
How would you create and promote a save atmosphere in your classroom?

Part: 7. Teaching strategies/ skills

How would you identify the special needs of your students?
Describe the teaching techniques or strategies that are most effective for you?
What activities would you do on the first day of class when you have no background about the students?
How do you teach reading?
What techniques do you use to keep students actively involved during a lesson?
What kind of motivational strategies do you use to get students excited about English?
How do you deal with unmotivated students?
What teaching strategies do you use to address the different learning styles of the students in your classes?
How would you deal with a class of students of mixed abilities?
What methods do you use to assess student learning?

Part: 8. Technology skills

What are your computer skills?
Are you comfortable with the use of technology in the classroom?
How would you apply technology to increase student learning?
What activities has this technology replaced, if any?

Appendix 6

UNIVERSITY OF Southampton

Questionnaire

The purpose of this questionnaire is to help us in determining the language needs of students at the Faculty of Arts and Science, and then design an English course that matches your needs. By gathering and then analysing this data, it will be easy for us to discover these needs, and what works and what does not in the English course which will benefit all English and science teachers, students, and the college itself, too. Therefore, your co-operation will be highly appreciated for completing this questionnaire which will help to achieve our aim. Thank you in advance for your collaboration.

Part One. Background

1. Sex …….

2. Do you speak a language other than Arabic and English?
If yes, ……. (Please specify)

3. For how many years did you study English at school? …… years

4. Where did you study English?

primary School ☐ *preparatory school* ☐ *secondary school* ☐ *private School* ☐

5. English language is very difficult to learn? *Tick all that apply to you*

strongly agree ☐ *agree* ☐ *neutral* ☐ *strongly disagree* ☐ *disagree* ☐

6. Which of these activities do you do in your free time? (Put a cross "x" in the relevant box)

watch English news/music/films	☐	*listen to English new/music*	☐
watch English TV channels	☐	*listen to English channels*	☐
practise English with native speaker	☐	practise English with non/native speaker	☐

7. What is your plan after you have finished your course? *Tick all that apply to you*

complete my study abroad	☐	*establish own business*	☐
look for professional job	☐	*I do not know*	☐

8. Is it useful to study English along with your mother tongue?

Yes ☐ *No* ☐

9. Are you attending any language class outside the university at the moment?

Yes ☐ *No* ☐

10. If 'Yes' for what purposes, if 'No' please go to question 13.

important language ☐ *work purposes* ☐ *study purposes* ☐

leisure purposes ☐ *other purposes* ☐ ……

Part Two: Language self-assessment

11. How fluent would you say you are in English language?

Native ☐ advanced ☐ intermediate ☐ beginner ☐

12. Please assess your level in the following skills:

	Reading	**Writing**	**Speaking**	**Listening**
Excellent				
Very good				
Good				
Poor				
Very poor				

13. How much do you agree with the following statements? Rate them 1,2,3,4 or 5.

1= strongly disagree 2 = disagree 3 = neutral 4 = agree 5 = strongly agree

-I find the following language areas difficult:

Writing correctly …

Reading text …

Listening to lecture …

Speaking …

Grammar …

Vocabulary …

Pronunciation …

Spelling …

14. How good you are at recognising scientific words in English?

very good ☐ *good* ☐ *poor* ☐ *very poor* ☐

15. How good you are at recognising general words in English?

very good ☐ *good* ☐ *poor* ☐ *very poor* ☐

Part three: Students' styles of learning

16. Which language do you prefer to be used in the English class?

Arabic ☐ *English* ☐ *both* ☐

17. How often should English classes be held?

once a week ☐ *twice a week* ☐ *more* ☐

18. What is the best time to offer English classes?

morning ☐ *afternoon* ☐

19. Which of these items are important to you for learning English? *Tick all that apply to you*

Elements	Yes	Partly	No
Textbook/hand-out			
Number of students			
Language Lab			

20. How much do you agree with the following statements? Rate them 1,2,3,4 or 5.

1= strongly disagree 2 = disagree 3 = neutral 4 = agree 5 = strongly agree

a. I prefer lessons where chance of discussions is offered to us. …

b. I prefer lessons where I can do something practical …

c. I prefer lessons where diagrams/pictures are offered. …

d. I prefer the teacher to explain everything to me. …

e. In English class, I prefer to learn reading. …

f. In English class, I prefer to learn grammar. …

g. I prefer to study English by talking to foreigners. …

h. I prefer to learn by watching, listening to native speakers of English. …

21. Do you wish to study?

general English ☐ *scientific English* ☐ *or both* ☐

22. How do you like learning?

individually ☐ *in pairs* ☐

in small groups ☐ *in large groups* ☐

Part Four: English Language Skills and activities

23. Which of the following macro-skills are more important to you? *Tick all that apply to you*

Elements	Unimportant	Important	Essential
Writing			

Speaking			
Reading			
Listening			

24. Which of the following micro-skills should the English course focus on? *Tick all that apply to you*

Elements	Unimportant	Important	Essential
Reading scientific texts			
Reading general texts			
identifying main idea/predicting, guessing			
skimming content and meaning			
scanning for specific			
Identify the topic of lecture			
Recognise key lexical items			
Writing summaries			
Writing experiments			
Writing reports			
Practice presentations			
Listening to reports/ instructors			

25. Which of these skills and activities should the English course focus on? *Tick all that apply to you*

Language structures ☐ vocabulary ☐

Speaking fluently ☐ pronunciation ☐

Punctuation ☐ fill in the blanks ☐

matching ☐ multiple choice ☐

crossword ☐ comprehension activities ☐

Part Five: Attitudes towards the Current English Language Course

26. Indicate you typically think. *Tick all that apply to you*

a. - I enjoy the ESP course.

agree ☐ *neutral* ☐ *disagree* ☐

b. The English class size is

Small ☐ *medium* ☐ *large* ☐

c. The English lesson takes place in the

morning ☐ *early afternoon* ☐ *late afternoon* ☐

d. Which language is frequently used in delivering the English lessons?

English ☐ *Arabic* ☐ *English/Arabic* ☐

27. How much do you agree with the following statements? Rate them 1,2,3,4 or 5.

1= strongly disagree 2 = disagree 3 = neutral 4 = agree 5 = strongly agree

a- The English course covers the right topics …
b- This English course is relevant to my professional needs …
c- The English course's activities work towards my needs. …
d- The content of the English course is arranged so that it is easy to follow. …
e- The amount of information the teacher presents is too much. …
f- The content of the English course is arranged so that it is easy to follow. …
g- The amount of information the teacher presents is too much. …
h- The amount of the information the teacher presents is too difficult. …

28. How much do you agree with the following statements? Rate them 1,2,3,4 or 5.

1= strongly disagree 2 = disagree 3 = neutral 4 = agree 5 = strongly agree

a- The teacher creates a warm atmosphere …
b- The teacher creates time for the students to talk. …
c- The teacher encourages the students to use their own words. …
d- The teacher's questions are clear. …
e- The teacher uses feedback to focus the student' attention on lesson issues. …

29. Indicate your view to the following statements. ***Tick Yes or No***

a. The English course applies language structures activities. …
b. The English course applies sentences structures activities. …
c. The English course applies vocabulary activities
d. The English course applies pronunciation activities. …
e. The English course applies spelling activities. …
f. The English course applies punctuation activities. …

30. Indicate your view to the following statements. During the course, I involved in.

Tick Yes or No

a- reading scientific texts. …
b- reading general texts. …
c- writing summaries activities …
d- writing scientific reports activities. …
e- writing experiment instructions …
f- writing exam question answers …
g- lecture take notes activities …
h- asking question in class …
i- answering question in class …
j- following lecture …

Appendix 7

UNIVERSITY OF Southampton

School of Humanities

Modern Languages

English Class Observation Schedule

Name of the teacher: EL1	**Nationality**: Indian	**Discipline**: English for Science
Topic: **Gravity**	**Number of the students**: 104	**Observer**: Abuklaish, A.
Date: 11.11.2009	**Time**: 16:00 – 18:00	**Length**: about 2hours

1. Introduction

The tutor has …	**1**	**2**	**3**	**4**
established a warm atmosphere				
secured the students' attention				
introduced subject				
provided link to the previous lesson				
The tutor has offered … materials	textbook	journal	Hand-outs	others

2. Organisation

The tutor has …	**1**	**2**	**3**	**4**
made good use of science materials				
provided alternative explanations				
introduced/explained tasks effectively				
provided good activities/skills				

3. Presentation

The tutor has …	**1**	**2**	**3**	**4**
made appropriate use of the target language				
shown enthusiasm				
show humour and personalise				

controlled place of delivery				
spoken clearly				
introduced activities & exercise in context				
used the audio-visual effectively				
the appropriate talk time				
The tutor has used	Data-show	**board**	CD/DVD	others

4. Participation and Interaction

The tutor has used	**1**	**2**	**3**	**4**
employed small group/ pair-work				
clarified understanding				
handled questions appropriately				
kept students involved				
used feedback to focus on the students' attention on lesson issues				
given support and guidance				
clarified difficult words				
Students are	**1**	**2**	**3**	**4**
given time to talk				
helped to overcome language difficulties				
encouraged to use their own words				
feel confident to answer questions				
actively participate in the learning				
willing to answer questions				
having difficulties of reading with the text (s)				
having problems of understanding the text (s)				
having problems of dealing with the class activities				

1 = agree, 2 = disagree, 3 = neutral, 4 = NA

Appendix 8

UNIVERSITY OF Southampton

School of Humanities

Modern Languages

CLASSROOM OBSERVATION SCHEDULE

Name of the teacher:		Discipline: PC / ZY / BT / CH / PH / Math	
Topic:		Number of the students:	
Date:	Time:	Observer:	Abuklaish, A.

How often does English language use in…?	frequently	sometimes	rarely	never
PC / ZY / BT / CH / PH / Math classroom.				
How often do Arabic language use in…?	frequently	sometimes	rarely	never
PC / ZY / BT / CH / PH / Math classroom.				
Students have problem with English in general.	frequently	sometimes	rarely	never
Students have problem of dealing with scientific English terms.	frequently	sometimes	rarely	never
Teacher translates English words into Arabic	frequently	sometimes	rarely	never

Observer Comments

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Computer (PC), Zoology (ZY), Botany (BT), Chemistry (CH) Physics (PH) Mathematics (Math)

Appendix 9

Interviews Transcriptions of science teachers and ASSA

Participant: CHL

R (..)Which language (Arabic/ English) is more used in chemistry classes?

CHL Of course, Arabic. Arabic is more used than English

R What is ratio?

CHL (..) 20% is English. However, all the chemical equations symbols are written in English

R Alright, do students face any problem of dealing with chemical terminology?

CHL Yes.

R Like what?

CHL For example, they do not know what these terms mean in Arabic. However, this depends on their background. I mean whether he/she has been taught these terminologies probably at preparatory and secondary schools or not.

R Do you mean that these terms are taught by English in those stages?

CHL As far as I remember, all the chemical terms, chemical equations and even the periodic table are written in English not in Arabic. The curriculum has been changed.

R So, how do you deal with this situation?

CHL Actually, we translate these scientific words into Arabic. It is a word-by-word translation.

R (..) like alchemy (..)

CHL Chemistry (..)

R So how can you deal with such situation? (..)

CHL Actually, we are offering new syllabus which might be introduced next year. One of these is named as English Terms which should be taken by all chemistry students. This course will support them with most chemistry terms they might face during their study.

R We can understand that students face some problems.

CHL Of course, yes. That is why we do recommend this course, "Terms

R So, chemistry terms are the only challenges they face.

CHL Yes.

R Alright. Do you translate these terms from English into Arabic?

CHL Just the meaning.

R Right (..) do all students have problems with these terms? (..)

CHL Not all of them. These depend on their science background. Some terms sometimes do not need to be explained, because as I have said more likely have the same pronunciation or students may have an idea or heard about them. Take for example "Ammonia" which has the same Arabic pronunciation امونيا. This does not need to be translated into Arabic. However, term such "mechanism". We try to simplify it for them (..) this means ميكانيكية التفاعل.

R Right. Is there any other place where English could be used? For examples, are students required to use English resources. Let us say,

when they are writing their assignments, for instance.

CHL References

R Yes.

CHL This depends on the books available at the library. A number of references are available in Arabic, but others are in English.

R So, how students could deal with English books. I mean, their English is not that good enough. How (..)

CHL Yeah. Actually they have no other choices. If they could not understand them, they should translate them into Arabic. Not all, but what they need. Translation costs a lot, but we help them. Their supervisors will help them.

R Okay. Where else do you think English is needed accept terminologies?

CHL Possibly, you know. Of course, all the chemical equations are written in English.

R You mean when things are explained in Arabic, the chemical equation is written in English.

CHL Yes, all chemical equations are in English (..)

R How? Could you give me an example?

CHL For example, acid + Base = salt + water

R It is a mix; Arabic and English.

CHL Yes. We will write it in English but we explain it in Arabic.

R This means that students should know what these English letter "symbols" mean in Arabic: like H2 or

CHL Of course.

R Plus HN. How do you say this: + or plus?

CHL Plus, of course. This is reminding me with the Periodic Table. All the elements "103" that we have in chemistry are written in English. Each student should know all these elements. Not all, it is not compulsory to memorise all of them, but he/she must know most of these elements.

R Alright.

CHL Teachers are not required to explain every single letter (symbol). Students should know it. Let us say, for example, Carbon. We do not write carbon. No, we just write the symbol C, and students should know what this symbol means (..)

R Okay. Do you or other lecturers ask students to read texts written in English or part of them written in English? Or do you refer them to English references?

CHL Well, we wish to have English references, but what we have are all in Arabic (..)

R Ok, to what extend do you think English language is needed in your department.

CHL Well, it is various. I can say 40% is English (..)

R Finally, what is/are the purpose/s of learning English language, if there is?

CHL Well, this reminds us to look at the subject itself. I mean (..) to enrich your chemistry knowledge you should know English, because English is the language of science. I cannot say all, but most of the resources available are written in English. And it is also important for high studies; if someone wants to carry out his/her study abroad.

R So it is for study purpose, all (..)

CHL Not only for study purposes. It is also essential for work purpose.

Reports and equipment are all in English (..) I mean, people, for example, who work at laboratories should have good writing skills, because all the Lab test reports are written in English (..) And the equipment instructions are also written in English. In other words, we are surrounding by it.

R This means that chemistry students are not only need to understand the chemical terms but also should have a good writing (..)

CHL Yes,

R Okay. Thank you very much.

CHL You are welcome.

Participant: CSL

R (..) which language (Arabic/ English) do you think is more used computer classes?

CSL English language is more used than Arabic (..)

R (..)as English is more used in this department, what kind of challenges computer students face? (..) Do they encounter any problems?

CSL Of course, yes.

R Like what?

CSL They do not have the basic of the language.

R (..) What do you mean? [Do they have problems in some language skills such as writing or reading]

CSL They are weak in all language skills (..)

R What is the reason behind this?

CSL It is related to their English background.

R (..) so how you are dealing with such challenges that students encounter as far as %70 or %90 of the course is in English?

CSL We apply both Arabic and English in these courses. We also translate not only term words but also sentences.

R (..) it's time consuming and efforts.

CSL Of course

R (..) what else do computer students need?

CSL Reading is more important because they are acquired to go online and read references in English.

R (..) so these references are in English (..) does this mean that students are required to study materials written in English during their course, or both Arabic and English?

CSL In fact, there are no references written in Arabic, it is very rear specially advanced subjects.

R Like what?

CSL Take for example Operating System and Compilers System. You could not find any reference written in Arabic (..)

R I see. So students should be very good in reading!

CSL Of course.

R Do students face any problem of getting these references?

CSL These references are available, but students nearly use them.

R If students do not use these references, what they do? (..)

CSL Actually, it is the teachers responsibility of offering materials that suit

		the students level.
	R	Right, is there any other purpose of using English at your department in the future regardless that 50% or 75% is English.
	CSL	Surely, there is.
145	R	Where?
	CSL	At work. Take for example, programming. It is completely taught by English. They need English for both studying and working purposes.
	R	(..) You have mentioned that students encounter many problems. In you point view, what other challenges students face.
150	CSL	They cannot translate; they get nothing from these courses written in English.
	R	Alright, as English language department is responsible for all English language courses taught to computer students, what do you recommend to be focusing on that might help computer science students in their
155		specialist?
	CSL	Technical English.
	R	(..) just technical terms (..) do you think this can solve the problem?
	CSL	Of course, no, but this can help.
	R	What else? (..)
160	CSL	(..) I would say that reading and writing are the most important skills which need to be focused on.
	R	Writing and reading skills. What about speaking and listening?
	CSL	I don't think they need these skills unless they wish to study abroad.
	R	I think they do need listening as some lectures are taught in English.
165	CSL	No, we just teach computer terms in English and we explain these subjects in Arabic. I wish if we could have taught these courses in English. These courses are taught in Arabic and each lecturer depends on his own translation, because there is no standard translation in the Arabic world.
170	R	So there is no standard translation, and that is why you focus on using English.
	CSL	Yes. Every Arab country has its own translation (..)
	R	(..) I have noticed that there are number of Indian lecturers in your department. Is this going to be for long-term?
175	CSL	No, it's just for short-term.
	R	Can we say that computer programming subjects will be taught in Arabic and English in future?
	CSL	Yes. But computer programming subjects could be taught in English if students' English levels have improved
180	R	(..) How do students feel as some of these subjects are taught in English at the moment?
	CSL	(..)
	R	Do you mean that students have no benefit from these lectures taught by Indian?
185	CSL	I think so, may be 5% of these students may get benefit from such lectures.
	R	This is serious problem.

Participant: PHL

R (..) to what extend do you think English language is needed by physics students (..)

PHL This branch likes any other scientific fields. In fact, American and English scientists are the pioneers of this era. In addition, most of researches, e.g. journal, books, if not all are written and published in English in all round the world. Therefore, students should learn and understand English language, not just the scientific terminologies, but also the English language itself. Consequently they can be connected and up-dated with this information, especially science students. We are researchers, and the researchers should be updated with this huge of knowledge.

R Right.

PHL Therefore, researchers must be familiar and up-dated with whatever is new related to their specialist area.

R Right.

PHL Accordingly, you have two choices, whether to translate these materials which are really difficult and cost lots of money. And I think we are just in the midst of a knowledge explosion, which means that is impossible to translate everything. Even Chinas' researchers are now publishing in English. English language is now the language of science. As a result, students must study English: not only using and understanding it, but also reading and writing it.

R Right. Again (..) to what extend English language is needed at the physic department. In other words, are physic students required to read, for example, science articles written in English, are there any taught by English?

PHL At the moment, we do not use English in any of physic classes. This is, of course, according to the education system. As a teacher I have to read and translate whatever I feel is relevant and needed to them.

R Okay. Are there any terms given in English? Or you just keep teaching in Arabic.

PHL No, no. But all the physic some symbols and mathematical equations "X, Y" are in English. But we explain this in Arabic. It is mixed; Arabic and English. English use is limited at the physics department, and just symbols and mathematical equations are given in English. And I suggest that English could be taught to science students through introducing the biography of famous scientists such as Newton and Einstein(..)

R (..) we can say that only terms and physic symbols are taught in English

PHL Just as symbols, X, Y and Z.

R Right. What about final year students. Are they requested to use English resources to write their assignments?

PHL This is one of many problems. We actually asked students before they choose the topic to check first whether Arabic references are available at the library or not. And unfortunately, there are no enough and up-dated resources at the library (..) Therefore, we have to use English resources, because some advanced subjects are just available in English which mean that we have to help them [students] to translate what they

need in their assignments (..) Again this is a time consuming and costs lots of money, and the students' benefit will be limited..

R Okay. So what do you think or suggest science students should be given in the English classes?

PHL I would say that scientists' bibliographies are really helpful to science students or science fiction (..)

Participant: ASSA

R Tell us about the English course

ASSA it's a compulsory course which is divided into three modules A, B and C, and must be passed. All science and Arabic departments' students should complete these three modules within 4 years.

R Who are teaching these three modules?

ASSA (xxx) Two Indians lecturers (xxx). You know them

R Who is responsible for this course?

ASSA English department, of course. The department organises anything related to these units; lectures and examinations.

R Do you know the syllabi of these modules?

ASSA I don't know to be honest. It is the department responsibility.

R What are the purposes of applying English language to science students?

ASSA English has grown to become one of the most important languages not just in Libya but also all around the world. It is used as a vehicle for communication in different subjects, and technology is mostly a western product. So English is needed in most of disciplines, not for study purposes but also for career purposes.

R Do you mean that most of science subjects apply English?

ASSA Of course, but it is various.

R What do you mean?

ASSA Take for example, computer science where all subjects are mixed with English especially Languages Programming, networks and other which are written in English not in Arabic. I hope that English course would be designed in a way that fit each discipline, especially computer. Chemistry and physics also need English as far as I know.

R Ok, what about the students? I mean are they interested in learning English?

ASSA (..) our students' English background is really poor. To cope with such situation, we brought lecturers who speak English. However, they have got nothing. The course that they have thought was not intensive. They just offer basic things that can cope with the students' English language level, and the best example is the Indian lady lecture. From this point, we have come to conclude that there is no benefit of having such lecturers. For example, I have observed the two (xxx) lecturers and just found out three or four female students who were interested and motivated in learning English. I also asked these female students whether they understand the lecture delivered in English or not. They said, yes. The other (.xxx) lecture (..) I have noticed that he has difficult accent (..)

R Sure.

ASSA This is very important point which it should be taken into consideration (..) (xxx) I haven't observed him.

R Also (xxx) and (xxx).

ASSA For example (xxx), I myself couldn't understand him (his accent) (..) Accent also plays an important role in learning language. Ok, you design a course. Who is going to teach it, and in which way this course will be delivered. Does he/she able to present this course in a good manner that enable students to understand it? (..)

R (..) Okay. From your experience, to what extend English language is needed at the Faculty of Science, especially computer science.

ASSA From my point view, computer science and physic departments are one of fields that are developed frequently. They are updated, and you know science, and other sources of technology are Western products. References, journals and tools are all in English.

R Okay!

ASSA For example, I am teaching a course called "digital communication" to postgraduate (..) It is impossible to find any Arabic reference regard to this course. You might find one, but it does not give the right explanation as it is in English. That is why I have insisted to be taught in English.

R Ok.

ASSA With regard to translation, we have come across a number of problems. Take for example "Digital Communication" which I am teaching. It is impossible to find a reference in Arabic language. You might find one, but you could not find that good quality of information as you would expect. I have insisted to be taught in English rather than in Arabic. For a number of reasons, for example, we do not know what the translation reliability of this book is. Other thing is that we do not have standard translation in the Arabic world. Nevertheless, Arabic Language Academy has been trying to standardise these foreign terminologies, but it failed. Every Arab country, not all, has its own translation. For example, we say الدائرة الكهربائية and the Syrian lecturers called الدارة الكهربائية which is not accepted by students and even myself, because we have learned as الدائرة الكهربائية and it does not give the same meaning (..) That is why, as I can see, I have insisted of using English in computer science. When I say, e.g. micro-process, it will be understood what this means. One calls it (..) . This term is given number of meaning in Arabic because it does not have equivalent meaning in Arabic. In addition, one Arabic word sometimes has number of meanings (..)

Appendix 10

Interviews Transcriptions of English teachers

Participant: EL1

R What qualifications do you have?
EL1 MPhil + DE in English language
R Form India
EL1 Yes, from India
R What is DE?
EL1 A diploma in education.
R How long have you been teaching English?
EL1 About 13 years
R Back home
EL1 Yes, back home and here also.
R How many years have you been teaching English in Libya?
EL1 Libya? Now this the third year
R Three years (..) What English language subjects have you taught? (..)
EL1 I have taught literature, second language acquisition, semantics, spoken English and grammar.
R (..) Which of these subjects do you feel more interested in? (..)
EL1 Grammar (..) Now I feel more comfortable of teaching grammar, of course spoken English.
R What about language skills? (..)
EL1 I would say speaking and reading.
R How have you become involved in ESP? I mean, have you got a qualification or an experience in ESP? (..)
EL1 Of course, I am interested in teaching ESP, especially computer science.
R Computer science! Good. Have you got an experience of teaching science students?
EL1 Yes, back in India. I have taught EIL students "English as an International language" (..)
R (..) What are the levels of the students?
EL1 It is various
R (..) Can we say, beginners to intermediate or more?
EL1 To my knowledge, computer students are little better than other students.
EL1 So, I think because they deal with English more than others.
EL1 I have found it easy to deal with them.
R Who will the learners use the language with? (..)
EL1 (..) they speak the language with me, of course and sometimes, I have found them speaking with themselves(..) They speak with teachers in English, of course (..) but some other I have found talking in English with others, but not all.
R Okay (..) when does the English course take place? (..)
EL1 (..) Usually in the evening (..) From two to four and four to six.
R Why (..)
EL1

		Because during the morning time they have to take their main sessions.
45	R	So they will be free only in the afternoon.
	EL1	Do you think it is a right time?(..)
		To be frank, it is not the right time learning particularly English,
		because after their main lessons they become very tired. So English
	R	needs activities. It requires activities(..) They should be fresh(..)
50	EL1	Do the students share you this feeling? (..)
		(..) most of the students do not like to take classes in the afternoon.
		(..) Approximately, how long does each English lesson last?
	R	nearly two hours.
	EL1	Do you think it is enough? (..)
55		For a session, it is enough (..). it depends on the materials. Sometimes it is enough, and sometimes you may needs a little bit more. It is various.
	R	It depends on the materials you are giving in the class.
		Who decides these materials? I mean the materials (..) Do you have
	EL1	specific syllabus to follow? (..)
60		(..) the teacher is free to choose. According to their needs, teachers can choose the syllabus (..) Teachers are free, according to his
	R	understanding level (..)
		(..) Who decides what should be taught? (..)You, the institution or the
	EL1	English department (..)
65		Of course there is always an interaction with the head of English department (..) regarding the materials what it should be taught. Sometimes (..) we choose some passages related to the students' main
	EL1	subjects, for example, computer.
		So you can choose a passage relates to the computer. Sometimes,
70		chemistry, sometimes physics. So it would be easier for them to
	R	understand if the materials chosen in this way (..)
		Does the institute (..) play any role in specifying the course syllabus, or
	EL1	any other related issues? (..)
		(..) We discuss among ourselves and with the English department, and
75	R	we decide course in that way (..)
	EL1	Okay. How do balance between ESAP and EGAP?
		First of all, they should be given an idea as EGAP from that you can
	R	move in then to more specific.
	EL1	How? (..)
80		In every area there are certain elements regarding the language are the same. Take for example, computer, biology, physics and chemistry.
		Basically, it is for communication, of course. (..) First of all, they should be given a general idea about the academic purpose relating to English.
	R	So from generality to particularity.
85	EL1	(..) What kind of materials would you need to teach science students?
		In my opinion, it is better to choose the topics and passages that related
	R	to (..)
	EL1	What about now?
	R	Reading comprehension, for example.
90	EL1	(..) is it authentic material or general materials?
		You can say it's a mixed book, you know, you have to deal with at
	R	the time with students from different faculties.
	EL1	Can you give an example?

(..) in the classroom you can find some people from chemistry some students from computer some from biology (..) the teacher responsibility is to satisfy all those people.

EL1 Can you give an example of materials that you've already used? (..)

For example, in the course that I have begun this year, I have given a materials relating to college library (..) It is a reading comprehension passage. Because college library is common to all. As I have told you earlier, form EGAP to ESAP. So first of all, I gave them a topic related to college library. College library is very common to and it is easy to teach them from general point view.

EL1 (..)What resources are currently available to you?

R We depend on books and E-materials (..)

EL1 Are there any materials you have used that you find are more accepted by the students?

Not really. As I have mentioned earlier, it depends on the situation. So there are no specific materials for any of ESP classes. Materials selection is left to the teacher's choice.

EL1 What about the course aim?

R Aims left the teacher's choice and according to general knowledge.

EL1 What sort of activities have you used?

R (..) I give everyone a hand-out and

EL1 And then?

Some are writing and some are copying and some are doing nothing, and they understand nothing.

The difficulties are that we do not know how to explain it in Arabic (..) Take for example, "beginning". In English I can say start. Apart from that I cannot give another word for them. If we give them an Arabic word instead they'll understand

EL1 I know, it's very difficult (..)

R (..) especially in a class (..) they will be a hundred, 95.

EL1 Even 50 students it's too big.

But, you know, there is no classroom (..) the things you know even to announce exam, suppose I fix an exam tomorrow. I'll tell them tomorrow is the exam. They will not understand it (..).what I do. You know (xxx). Will be there. I call her to the class. I explain things to in Arabic (he meant in English), and she translated it into English (he meant Arabic). (الامتحان غدا The exam will be conducted tomorrow), and still even after that they come and argue (..) I like those people, but (..) we can't help them because they need bilingual explanation(..)They like English class. Everyone is present, no single person is absent.

R It is really problem.

EL1 It is not just in our college, in Sebha, in Benghazi, in Alkhomoas, everywhere, that is the problem. They understand nothing (..) Can we start teach them from ABC(..) it is the semester system. You get nearly six or seven classes. What do you think? Can we teach six classes with huge number?

R You're right.

EL1 (..) this year, (xxx) classes are okay, and their classes are ok. (xxx) can explain things in Arabic, I think (..)

R (..) It is difficulty.

EL1 It is not difficult to do the job (..)You see, I give you this hand-out. Some write, some not, others write, summarise, and we then pick one of the papers. We take six or seven passages and we will pick one for the exam. So they know. So they learnt by heart and everybody gets mark, because they learnt by heart.
If you give a different passage, they will be able to do nothing (..) I teach and explain, but they do not understand.

R (..) let us move to methods of teaching and classroom management. What teaching method do you commonly use?

EL1 I apply different methods, reading silently, drill, of course some structures, I mean grammar (..), it depends on the hand-out to be given in each class.(..) I use different methods. I sometimes explain the whole passage, sometimes certain words; sometimes I might even discuss certain questions, and help them understand the things in an easier way by giving the meaning and explanation (..) it dependence. Not a particular way (..) It is depending upon the situation and the materials.

R (..)What is your classroom management style? How do you manage the class [..]
(..) since the students are from different departments, and they come to same class [..] different level(..) the class management, I have not face any kind of difficulties regarding the class I handling here. Most of the students are obedience, and when they come to the class they are normally talk. They are all silent. Classroom management has not become problem to me.

R (..) How do you identify the language needs of your learners?

EL1 According to the faculty they belong to. That means; some are from the computer. So I select some materials for computer students in one class, and (..) So all in class, you cannot give all of them the materials that are required in their field. So it is various.

R Have you done any kind of analysis to find out the language needs of the learners? (..)

EL1 (..) According to general knowledge, that means, you know, you naturally have a general idea about the language uses, for example, in chemistry, physics and in computer. Okay, based on this notion I select the materials.

R (..) What are your computer skills?

EL1 General not specialised (..) I can use Excel and Word

R (..) Are comfortable of using technology in the classroom?

EL1 Yes, of course.

R Have you implemented this technology with the science students? (..)

EL1 No. Not in ESP classes (..) because we have not had the opportunity to use it.

Participant: EL2

R (..) What qualifications do you have?

EL2 MA in English Language and Literature, (..) and BA in Education(..)

R (..) Can I say your major area is literature?

EL2 (..) Yeah literature.

R How long have you been teaching English?

EL2 Seven years (..)
R (..) What subjects have you taught?
EL2 Of course I have taught subjects related to linguistics like phonetics, grammar and (..) poetry in India.
R Which of the language skills do you feel more comfortable teaching?
EL2 Writing and spoken skills, of course.
R Have you got any experience in these two skills? (..)
EL2 (..) Yeah, I taught in India.
R (..) How did you become involved in ESP?(..)
EL2 To be frankly (..) this responsibility come here for some reasons (..) because there is none availability of bilingual English teachers.
R Okay.
EL2 Of course (..) we like to go to teach different subjects like ESP. It came to me as a challenge, especially here when I was teaching students here who are not English students. So this is how I have been involved in this. This year, I am also taking one paper for department students (..) that's also ESP (..)
(..) Let us move to the second part of this interview.
R Do the students have similar level?
EL2 No. They do not have similar level. Very few of them are okay. I can say.
R What do you mean by okay?
EL2 They manage. Nobody to my knowledge so far, nobody is up to the mark (..)
R What are their levels?
EL2 I would say, something between beginners and pre-intermediate. So far what I have understood because I am teaching them for one and a half year (..)
R Do you have any idea who will the learners use the language with?
EL2 (..) Of course they will use the language they have learned (..) in this course in the work field (..) with the people(..) their colleagues but hardly they are not going to use this language in the society here, in the Libyan context.
R (..) Approximately how long does each lesson last? (..)
EL2 (..) Approximately two hours per week. I don't think it's sufficient (..) there should be three lectures for them.
R Every week.
EL2 Yes. So they might be improved by given three lectures three times week. That's what I feel better for them. Considering their level.
R (..) Who decides what should be taught?
EL2 Actually, we find, we make the syllabus according to our department Head. We sit together and decide on the syllabus what to be given to them.
R With (xxx)
EL2 (..) we decide together. Accordingly, we give them the syllabus.
R (..) What kind of syllabus?
EL2 Generally we use paragraphs, passages in different subjects. We read the passage and this is how we teach them, of course with grammar and vocabulary drill activities
R So I can say that the institution has played a role on the syllabus, not the

teacher? Can you decide by yourself?

EL2 Yeah, sometimes, we have freedom to decide what we should teach them (..) but mostly we decide on according to the authority.

R Can we say, you are teaching different thing? You and (xxx)

EL2 Not exactly, as I have told earlier, we sit together and we decide what should be given to them (..) It is almost the same (..) themes may be different, but the frame that is given them passages; paragraphs(..) the frame is the same. We take passages in different things which are related to their majors (..). Some passages we take from computer area, sometimes we take from biology, physics, zoology, so that it would corporate to that field (..)

R (..) What has led you to teach ESP course?

EL2 (..) it would be a new experience for me, also I would get the promotion to get to know the students from other department so that I could, something new I would learn in this adventure. It is something like an adventure for me. So that's how I have decided to take this course (..)

R (..) Can you describe you teaching experience related to ESP?

EL2 (..), the problem to teach ESP to the students from other departments who are not doing their majors in English language is that sometimes students need explanations in their mother-tongue, but I have been a foreigner. I failed to explain certain concepts which were difficult for the students in their mother-tongue. So bilingual aspect is something I have felt teacher what I feel important sometimes, but I could not teach them in the way they want me, okay, certain explanations, certain descriptions which the students sometimes do not understand because they are not native. So they want some descriptions and explanations in their own language (..) so that is the area which I have found difficult to deal with.

R So the difficult with the students not with the content

EL2 (..), the difficulties with the students, of course, because they failed to understand certain things.

R (..) Again have you taught ESP before?

EL2 Not exactly. This is a particular new area for me.

R That is fine. Which discipline have you felt you are particularly strong in?

EL2 Of course it is language. Specially, I like to teach subject like phonetics.

R What I have meant by disciplines, e.g. computer, (..)

EL2 I feel that students from computer department. They can understand the subject matter, and they can understand the lecture well than other departments.

R (..). Which disciplines have you felt are particularly weak in?

EL2 I can say that Biology and to certain aspect Zoology students. I found it difficult. They are very slow in picking the language.

R I'm not asking about the students. I am concerned about the difficulties you might face in certain subjects. I am talking about physics and mathematics, (..)

EL2 I can say computer is rather much easier to teach, and something like physics and mathematics I feel difficult because they are very technical

(..) There're many technical terms that I do not understand, sometimes (..)

R What kind of materials would you need to teach science students

EL2 Materials, of course, we have materials regarding especially when we are dealing with these students, we are giving them passages as I have told you. Paragraph, we are providing them materials. So that is the only thing we are doing here.

R From where?

EL2 Of course, sometimes we are referred to books. We go to the library and find relevant materials

R Science books?

EL2 Yes (..) science books. Some passages we are taken from computer, and sometimes e-materials. We are referred to online-materials.

R Can I say that materials are available to you? (..)

EL2 (..) Online materials, yeah. We much rely on online materials.

R (..) I can understand that there is no specific materials for this course. I mean the materials you are teaching aren't designed for this course, it's just a kind of collection, or (..)

EL2 Collection, yeah.

R (..) To what extent do the materials help the learners to achieve connections with their own discipline?

EL2 (..), as I have told you, we select materials. Now, we have in the class students from different departments. They are not divided; they are not separated in groups according to their majors. Okay, say in one class, we have students from physics; we have students from zoology, computer science. So what we do here in each lecture, every week we select a paragraph. This week, for example, we are selecting paragraph in computer. Next week, we will select paragraph something from zoology. The following, we select paragraphs from physics. So this how we teach them.

R What kind of activities have you used with these materials? (..)

EL2 Activities especially in the class, it is regarding reading comprehension. (..), reading comprehension, we read the paragraph listening and drilling work is there (..) after the teacher reads the paragraph in the class, once, twice. So, we read the paragraph to the students. The students listen to that, and then sometime there are some words which many students don't find comfortable. They don't know the meaning of them. So we explain those words, personally. We write the meaning of those words on the board, and after finishing reading, the students read that, and we give them some time so that they can understand the content, the themes of the paragraph. And after that we ask questions them about given the passage.

R (..) As far as I know, the number of students is so big, so how can you manage this?

EL2 No, no, they read it to themselves. We give them some time; three, five, ten minutes, depending on the length of the paragraph. They read, they understand and they can ask questions if they cannot understand something in the paragraph. So they can ask questions to the teacher, and the teacher will explain the concept to them. Okay, when the teacher thinks that, okay, they have read and understood the paragraph;

		on that basis, we ask questions (..)We take some grammar activities, some vocabulary activities which is depending on the paragraph which is related to the paragraph. So we try to cover the four skills: reading, listening, writing, of course and speaking (..)
345	R	Which of the activities have worked best?
	EL2	(..) I would say, of course listening.
	R	Listening?
	EL2	Listening (..) emm (..) to some extend writing.
	R	Writing (..) What kind of assessments have you used?
350	EL2	(..) We are taking written tests after a month or one an half test (..) only that things we are doing here. There're no oral/aural examinations for these students.
	R	Just a written test. Once or twice per semester?
	EL2	Twice
355	R	(..) Let us move to the teaching strategy. How would you identify the language needs of your students?
	EL2	Emm (..) it is too difficult to answer (..) we interact with them, we ask them questions, we encourage them to speak, we give them assignments, so through that we understand their requirements. I mean
360		with these activities we come to know their levels. (..), after knowing them, through speaking, writing, okay, we give them Assignments (..) we come to know their writing ability. So these methods give us the idea about their requirements (..)
	R	Do you think just by talking to the students and giving them
365		assignments can tell you what their needs?
	EL2	(..) not exactly. It needs intensive interaction with the students It should be some methods adopted for this purpose, and I think these methods are not available here. I mean, so far we have not used these methods, advanced methods.
370	R	Have the aims of the course been clarified?
	EL2	(..) Aims left the teacher's choice and according to general knowledge
	R	What are your computer skills?
	ELS	(..) I would say okay, I know how to operate computer. I do not have taken any special course in computer science, I mean computer
375		application, but I manage (..)
	R	(..) How do you apply this application to science students?
	EL2	Technology application to students (..) there are many ways that a teacher can apply technology to help the learning (..) but to be honest in ESP classes (..) we have not, I have not adopted any kind of methods so far in the classes.

Appendix 11

English Class Observation Field-notes

Observer: The researcher | Teacher Observed: English Language Lecturer (EL1)

Date: Nov11, 2009 | Teacher Nationality: Indian

Number of Students: 104 | Language of Delivery: English

Title of Lecture: Gravity | Time: 04:00 to 06:00pm

Length of Lecture: 2hrs per week | Length of Observation: about 2hrs

Participants: Science students 2nd, 3rd and 4th semester CS, CH, PH., NH and Math

Age: 19/23 years old | Sex: Male/Female

A. The Observer Reflection

Before the lecture started, we had a small talk with regard the class and students; number of the students, the students' disciplines, years of study and their English language levels. I was told that the class is held once a week where more than one-hundred students joined this class. They came from all science departments; chemistry, computer science, physics, mathematics and natural history and were in 2nd, 3rd and 4th semester who most of them were studying at natural history department as it was proved in the attendance register. Their English language levels were beginner and few pre-intermediate. He also mentioned that most of computer students as well as two or three physics students are the best. As the lecturer and I came in the classroom, the first thing it was noticed that the students were all waiting for the lecturer to come in and start class. The lecturer introduced me to the students and told them that I serve as a non-participant in any classroom activities. The students were genuinely interested and asked me a few questions, such as: Where and what do you study? Which town do you live in? What is your family name? Are you married? Then I took a place at the back of the class.

At first glance, it appeared that the theatre was big which is about 450 metre. It is an air-conditioned theatre with reasonable light, and a small whiteboard located at the middle, behind the lecturer. There was only one walkway which was divided the theatre into two sides where each three single seats are stacked to each other which hinder mobility of the students and the lecturer from reserving collaborative work for lessons held in class. Most of these students were female who were sitting close to each other, because of limited places, and separately from male students who were setting at the back. All, female and male seemed to be enthusiastic. Of course, they come with different interests, purposes, motivation, attitudes to language and learning style as well as an individual range of English level. Most of them were having hand-outs in front of them which are one A4 paper long consists of two short reading comprehension texts titled *Gravity* and *The Erath's Rotations*. The texts are followed by some grammar exercises which the class works through with the lecturer.

The lecturer, EL1, was standing at the front of the students. First, he spent approximately 10 minutes checking the attendance. Then he asked the students whether they had already bought the

hand-outs. After that, he wrote the title of the text and starting reading it slowly. While reading it for the second time, he repeated some words, I think, to improve the students' pronunciation. During this time, nearly all students were following the lecturer where some were writing down some words pronunciation in Arabic. After that, he went over some vocabulary that were in the text by writing them on the whiteboard and explained their meanings, of course in English that the students might not familiar with, which all took almost 10 minutes.

While, he was reading, writing (on the whiteboard) and discussing meaning of some vocabulary, it was noticed that most of the students were consulting each other regarding what the lecturer was saying and writing. I witnessed that they did not understand what the lecturer was presenting and they could not see exactly what was written as the board is small and far for some of them. Then, the students were given five minutes to read it silently, and asked to raise any problem while he was moving in front of the class. "*What word is a synonym for the word spin*?" the lecturer asked. No respond. Then he asked, "*Another word means or is similar to spin*". It seems that the students mostly did not understand what he was talking about. Therefore, he pointed to some female students seated at the front of the class and said, "*Just look at the text*". "*Move*", another two female students at the front line in the class shouted while other students were looking at each other and some were asking what the lecturer wants.

"*Ok. "What is the opposite of push*?, the EL1 asked while he was writing three words on the board. Again, two female students at the second line raised up their hands. "*Yes, please"*, the EL1 requested one of them to give the answer. "*Just one, push is pull*, she replied. "*Good*", he responded. "*Yes*, …" the EL1 pointed to another student and called her by her name. "*Yes, pull."* "*Thank you. Are they right*?", he asked. No comment. "*You are right. Does particle mean big or small?*, he asked again. *It's also in the text"*, he explained. No respond. "*Of course, it's small"*, he answered. Once the questions were answered, most of them wrote them down in their hand-outs and few were still consulting each other, because they do not know what is going on, I think. (About 10 minutes)

This situation repeated in different occasions, even with general words, e.g. *surface, contain, space*. This situation became more complicated when the EL1 asked the students to give a brief definition of Gravity, which most of them should know, but it was not included in the text. There was no respond, however, many were observed telling each other the answer in Arabic, but no one volunteered. Finally, a female student said "*It is force, I don't know. In…in earth*". "*He is a scientist. That's good. What else?*", the EL1 commented, but there was no respond from the students. During this time, he kept an eye contact with the students while he was moving. *"Ok, Gravity is a field force pulling together all matter"*, the EL1 later answered. At this time, most of the students did not seem to catch the answer, as they were just staring at the paper and looking around, so the teacher noticed this behaviour and wrote the answer on the board. After the students copied the answer, they were asked to read the text voluntarily where few (less than five) were agreed to do so, who all were female sitting at the two front lines. Indeed, two of them were good in reading, whereas, the rest were really straggling in it. One of their problems noticed was related

to pronunciation. For example, they pronounce *surface* [ˈsɜːfɪs] as [sörfæs], *other* [ˈʌðə (r)] as [ʊðær], *space* [speɪs] as [sbæc] and *mas* [mæs] as [mæss]. (About 15 minutes)

Then he moved to answer the text exercises. He read question1, and without explanation he gave the students five minutes to fill in the gaps. As the time passes, a few students raised their hands and engaged in filling in the gaps, which appeared to be not too hard for the participants. Without any feedback to the previous exercise, the EL1 introduced exercise two which was about number of propositions and then wrote number of examples on the board that illustrate when each of these propositions can be used.

"*Have you finished*", he asked. (He meant copying the examples into their notebooks.)

"*Yes"*, they replied.

"*Ok. Are they clear*?", he asked again.

"Yes", the students replied.

"*Now, read it and try to fill in the gaps. Look back to the text and the examples. They might help you*", he ordered.

The EL1 asked for volunteers to answer the exercise and waited for response. After about two or three minutes, few of the students raised up their hands asking for participation and the rest of them did not show any sign of engagement or understanding. Indeed these students have always participated and showed high aptitude for language learning and learnt more easily and quickly than others. Parts a, c and e of this exercise were answered correctly which seemed to be easy for them. However, the rest of the exercise (b & e) did not go smoothly and appeared to be confused than others mentioned above:

a) The earth spins *in* space.
b) There are 365 days ***on*** a year.
c) A fly can only walk *on* a tennis ball.
d) Different kinds ***from*** plants grow ***in*** the surface ***in*** the earth.
e) The distance *from* the moon *to* the earth is about 233,500 miles

While the students were carrying out the exercise, the lecturer clarified the right answer and explained why those two, b & e, were wrong. Once the students checked their own answers, the lecturer explained the importance of understanding propositions. (About 15 minutes)

Next, the students were asked to answer the following exercise 3 (See appendix …) where the participants are required to mark whether statements are right or wrong. The EL1 read the statements and asked for volunteers. As usual, nearly the same female students raised their hands up to participate. This exercise did not take long as the lecturer read the statements and the participants confirmed whether they were right or wrong. While I was observing, I noticed that some students were still asking each other in Arabic about number of vocabularies (*fly, each, particle*).

"*What does the word **fly** mean*?", she asked. "***يطير***" (It was translated as a **verb**), she answered.

"*What about **each** and **particle***?", she asked. "*I don't know*.", She replied.

"*Each "كل" but I do not know what particle means*", A student behind them commented. After this exercise, which took about ten minutes, the EL1 asked the students to go to exercise 4 which is a comprehension exercise related to pervious text discussed before. It requires students to go back to the lesson (The Sun's Family) taken in order to work it out. After he introduced the exercise and then read the first question (What are the names of the other planets beside the earth), he asked and induced the students for participation. A student at the mid part of the class answered the question where many students were raising their hands up to participate. It was noticed that number of students were ready to volunteer in working out this exercise which seems to be prepared and answered it before.

However, most of their answers were short-answers (e.g. Jupiter, Mars, Neptune; thousands) with short comments from the lecturer, e.g. that's right, yes. After about ten minutes of conducted exercise 4, the EL1 moved to exercise 5 which require students to match words to corresponding meanings from list of phrases available. First, the EL1 explained to the students what this exercise is required from them, and then read the whole words and phrases, and asked them to work it out. After some minutes of silence and while the students were doing the exercises, "*Meaning of enormous*", a female student seated at the back of the class asked. "*Massive, huge, vast, big*", the EL1 answered. This exercise took about 10 minutes to work it out. The lecturer drawn attention to the whole class and then called some students by their names for participation. Just three female students gave the answers voluntarily.

During this period of time, it was noticed that the EL1 was using his own clock to monitor the class while moving just in the front of the class. In addition to this, he used the whiteboard as a means of keeping the students focused on what he presented. His passion, high energy level, and desire to help, I believe, gave some students motivation, self-confidence and persistence to work hard, to learn, as well as to participant in the activities**.** He tried his best to explain things clearly and to encourage student response and participation in the activities regardless the demotivated of a large number of students who were sitting silently and showed any sign of involvement in the class activities. In addition, he broke the hand-out syllabus routine by incorporating a variety of activities in this lesson (e.g. asked for a definition of the gravity).

This kind of enthusiasm showed by the lecturer, on the one hand, was also shared by few students between time and time who showed no hesitation of participation and asking for clarification in the activities with a respectful manner. A few students (motivated ones) were noticed working together, sharing ideas and checking in their bilingual pocket dictionaries. They seem like the course, respect their lecturer, and seemed to work hard to please him. It was also clear that these students felt very comfortable with the lecturer which apparent in the way they interacted and joked with him. Their linguistics levels seem to be weak in terms of reading and speaking skills. Even the text content is inauthentic and short; students still encounter difficulties in reading, for instance. On the other hand, the lecturer set a respectful attitude by speaking directly to the students in courteous manner during the discussion.

However, the time allocated to this course appeared to be suitable and enough to enable them to

use the language efficiently. It was noticed that number of students was inactive, bored and looking at the time. This is because the lecture is located in the afternoon time which is a period of rest for all people which due the country atmosphere, especially in summer where the temperature reaches 45 C. Students will be unable to focus on lesson and feeling of being sleepy, tired and exhausted. And it is not enough because two hours a week and with huge number of heterogeneous students seem to be difficult for language teacher to offer high quality of teaching and benefit all students. This is what it was observed that few students had chance to participate and few had chance to get help and support. There will also be little opportunity for the lecturer to expand the materials as he was observed doing his best to complete all the hand-out activities. Additionally, most of students' linguistic levels seem to be weak in all language skills. For examples, technical and sub-technical terms and grammar are one of the students' major problems as well as communicative skill, as it was noticed during the class activities.

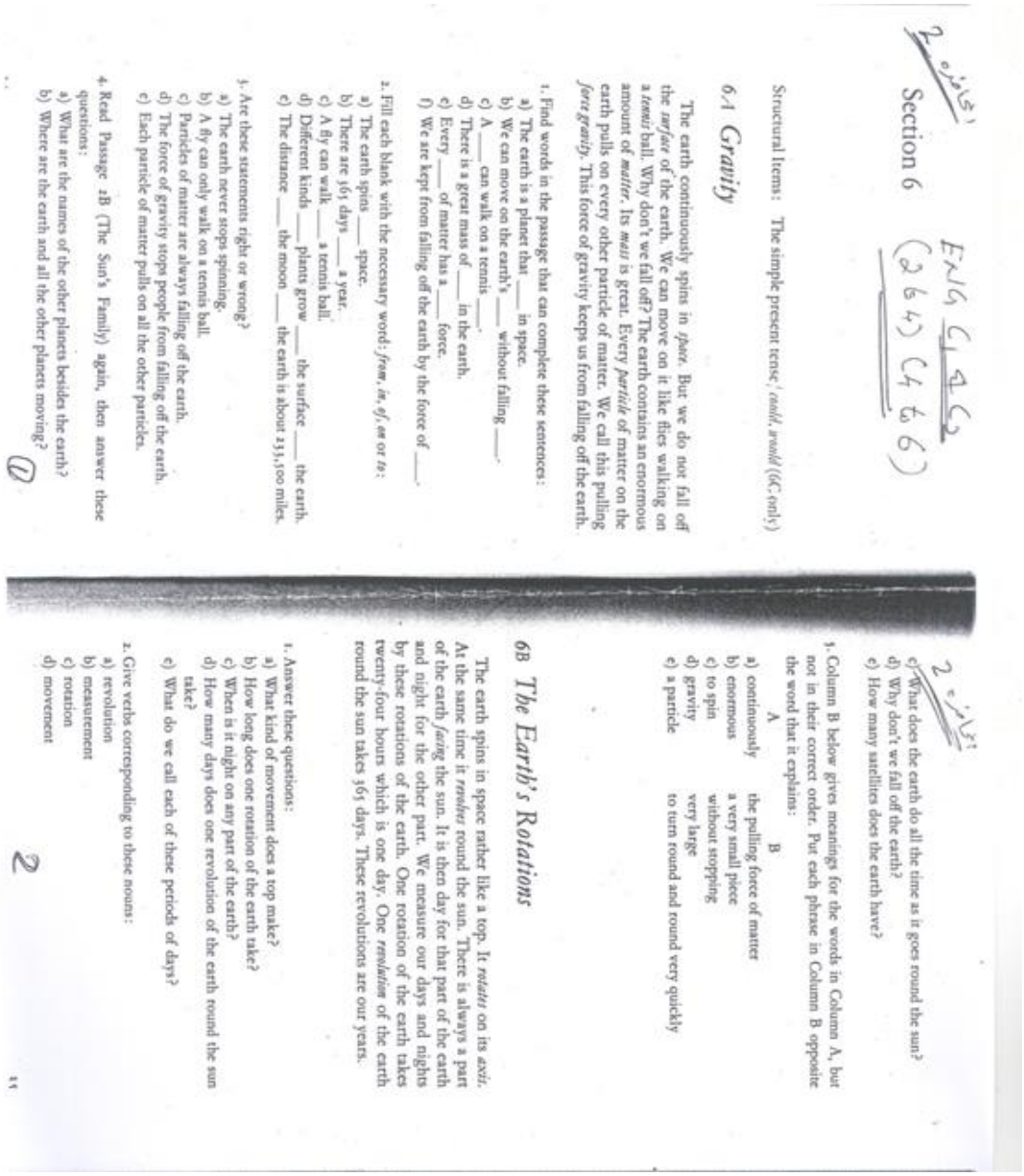
With regard to teaching methods, the EL1 took more time than the students. It was noticed that a substantial amount of time was given to answering exercises questions and explaining and clarifying the meanings of all types of words, rather than encouraging students in more activities, such as pair/group works. This in turn made most of the students, spent most of their time looking confused, chatting to each other in their mother-tongue. Moreover, the teaching method, in somehow, appeared to be teacher-centred as he intent on delivering than on engaging students in meaningful ways to answer questions and discuss issues. In turn, most of the students were not very active and most of their talk was not generally done in English. It also observed that these demotivated students seemed to be ignored and have not been supported or even encouraged involving in the lesson, in general. For example, it was noticed that number of students showed desire for participation and were ready to volunteer in working out this exercise which seemed to be prepared and answered it before. However, he did not give them a chance to involve in it as he pointed to the same students seated at the front of the class to participate. I thought, he will ask for more clarifications or give comments or feedback rather than content to what these students say and just comment by saying "yes, that's right". Because the only type of interaction pattern that frequently occurred in the class was that the lecturer initiated questions and the students responded. Therefore, it would be more useful if he created other interaction techniques that encourage the students to say more. For instance, instead of having short answers (e.g. Jupiter, Mars, Neptune; thousands), he would ask for full answers (e.g. "They are Jupiter, Mars, Neptune…or The names of the other planets beside the earth are…" or "The earth has thousands of satellites") or apply another questions. , the analysis showed that these two skills took most of the class' time.

Apart from that, it was noticed that he paid more attention to active students while activities were carried out who all were female. In addition, he nearly gave students fully feedback and allowed little time for discussion. I also observed that he never milled around neither the motivated students nor the weaker ones to check their degree of achievement in reading or written answers. He was just walking in the front of the class and more interacted with those siting at the front

lines, because of seats arrangement and big number of the students, I think. It seems that the seats arrangement was obstructed him to see every student equally, or to reach every students, especially those who were sitting close to the wall and those who were at the back of the class, e.g. to monitor their work or provide help. It might also prevent him of carrying out pair/group work activities and others such as role-play which all has not been applied.

190 Furthermore, it was observed that lexis and structures skills took most of the class time, whereas speaking and writing skills were completely ignored. Surprisingly, I noticed that the main grammatical focus of this lesson, as it is marked at the top of the hand-out, is on to discuss the simple present tense of "could/would" forms was completely ignored. Also, visual tools, e.g. data-show, and pair or group activities have not been applied in this class.

B. English class teaching materials



Section 6

Structural Items: The simple present tense; *could, would* (*if* clauses only)

6A *Gravity*

The earth continuously spins in *space*. But we do not fall off the *surface* of the earth. We can move on it like flies walking on a *tennis* ball. Why don't we fall off? The earth contains an enormous amount of *matter*. Its *mass* is great. Every *particle* of matter on the earth pulls on every other particle of matter. We call this pulling *force gravity*. This force of gravity keeps us from falling off the earth.

1. Find words in the passage that can complete these sentences:
   a) The earth is a planet that ____ in space.
   b) We can move on the earth's ____ without falling ____.
   c) A ____ can walk on a tennis ____.
   d) There is a great mass of ____ in the earth.
   e) Every ____ of matter has a ____ force.
   f) We are kept from falling off the earth by the force of ____.

2. Fill each blank with the necessary word: *from, in, of, on* or *to*:
   a) The earth spins ____ space.
   b) There are 365 days ____ a year.
   c) A fly can walk ____ a tennis ball.
   d) Different kinds ____ plants grow ____ the surface ____ the earth.
   e) The distance ____ the moon ____ the earth is about 239,500 miles.

3. Are these statements right or wrong?
   a) The earth never stops spinning.
   b) A fly can only walk on a tennis ball.
   c) Particles of matter are always falling *off* the earth.
   d) The force of gravity stops people from falling off the earth.
   e) Each particle of matter pulls on all the other particles.

4. Read Passage 2B (The Sun's Family) again, then answer these questions:
   a) What are the names of the other planets besides the earth?
   b) Where are the earth and all the other planets moving?
   c) What does the earth do all the time as it goes round the sun?
   d) Why don't we fall off the earth?
   e) How many satellites does the earth have?

1. Column B below gives meanings for the words in Column A, but not in their correct order. Put each phrase in Column B opposite the word that it explains:

A	B
a) continuously	the pulling force of matter
b) enormous	a very small piece
c) to spin	without stopping
d) gravity	very large
e) a particle	to turn round and round very quickly

6B *The Earth's Rotations*

The earth spins in space rather like a top. It *rotates* on its *axis*. At the same time it *revolves* round the sun. There is always a part of the earth *facing* the sun. It is then day for that part of the earth and night for the other part. We measure our days and nights by these rotations of the earth. One rotation of the earth takes twenty-four hours which is one day. One *revolution* of the earth round the sun takes 365 days. These revolutions are our years.

1. Answer these questions:
   a) What kind of movement does a top make?
   b) How long does one rotation of the earth take?
   c) When is it night on *any* part of the earth?
   d) How many days does one revolution of the earth round the sun take?
   e) What do we call each of these periods of days?

2. Give verbs corresponding to these nouns:
   a) revolution
   b) measurement
   c) rotation
   d) movement

d) The glow-worm feeds on (flies, earth-worms, a kind of small snail).
e) Glow-worms live on (solid food, water, solid substances that they turn into liquids).
f) The back of the glow-worm is coloured (dark brown, light green, pink).
g) The glow-worm has divisions in its (head, body, tail).
h) When water freezes it becomes (oily, liquid, solid).

3. Put *a* or *an* before these words:
insect, library, animal, island, zoo, area, mile, continent, hour, encyclopedia

2B *The Sun's Family*

Planets are not *stars*. They have no light of their own. They can only *reflect* the sun's light.

There are nine planets in the sun's family of planets. They are Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune and Pluto. The sun's family is called the *solar system*.

Mercury is the smallest planet of the solar system. Venus is a beautiful planet. It has a soft light. It is often called the 'evening star' and sometimes it is also called the 'morning star', although of course it is not really a star.

Mars has a bright red light. Are there people on Mars? Perhaps we can find out now, with our modern *space rockets*. Jupiter is the next planet. It is a *giant* planet, and its light is very bright. Saturn has a lot of rings around it, and Jupiter has four moons. Uranus, too, has four moons around it. Earth and Neptune have only one moon each. A moon is a *satellite*.

(163)

1. Find words in the passage that can complete these sentences:
a) The sun has light of its own and so do the ____, but a ____ has no light of its own.
b) A mirror can ____ light.
c) The group of planets around the sun is called the ____ ____.
d) 'The ____ tree rose high above the other trees in the forest.'
e) The moons are ____ of the planets.

English B.

Section 7

Structural Items: *still* in affirmative sentences / *yet* in negative and interrogative sentences / *too...to* + infinitive / *enough...to* + infinitive

7A *Martin Baker and his Family*

Martin Baker is a *bus driver*. He lives in a small town with his wife and four children. His wife's father, Mr Butcher, lives with them too. He is too old to do any work. He sits in his chair by the *fireside* all day; but in summer, when it is warm enough to sit outside, he sometimes takes his chair into the garden.

Mr Baker has been very ill for over a month. He has been too ill to go to work. He cannot go to work yet. He is not well enough to go to work. He is still too *weak* to drive his bus.

Martin's *eldest* son is twenty-five. He teaches in a village school. He lives in the village because it takes too long to travel there every day from his father's house. The other children are not yet old enough to go out to work. They still go to school—*except for* the *youngest* daughter. She is only four and a half. She is still too young to go to school.

1. Find words in the passage to complete these sentences:
   a) Martin Baker has been ill and is too ____ to go back to work.
   b) Old Mr Butcher sits by the ____ all day to keep warm.
   c) Martin's ____ son teaches in a village school.
   d) The other children are too young to ____ ____ ____ ____.
   e) The ____ daughter is only four and a half.

2. Answer these questions:
   a) How many people are living in Mr Baker's house?
   b) How many of Mr Baker's children go to school?
   c) How long has Mr Baker been away from work?
   d) Why does his eldest son live away from home?
   e) When does old Mr Butcher go out and sit in the garden?
   f) What was Mrs Baker called before she was married?

3. Fill the blanks with *enough* or *too*:

a) The children go to school by bus because it would take ____ long to walk there.
b) We haven't ____ money to go to the cinema.
c) Mr Baker is not strong ____ to drive his bus.
d) Nine o'clock is ____ early to go to bed.
e) This tea is ____ hot to drink.

4. Fill the blanks with *still* or *yet*:

a) Mr Baker is ____ too weak to go to work.
b) The tea is too hot. I can't drink it ____.
c) My sister ____ goes to school, but I am old enough to go out to work.
d) You can't go to bed ____, because you haven't finished your homework.
e) You ____ have quite a lot to do.

5. Look at these sentences:

This girl is *too young* to go to school.
This girl is *not old enough* to go to school.

Now rewrite the following sentences in the same manner:

a) Mr Baker is *too weak* to drive a bus.
b) He is *too ill* to go to work.
c) Mr Baker is *too poor* to own a car.
d) You are *too small* to wear these clothes.
e) Those bananas are *too bad* to eat.

7B *The Eskimos*

Modern ideas are beginning to *influence* the Eskimos, but not enough to make much difference to their way of life. They still spend the winter in *igloos*, the round *huts* that are built of snow *frozen* hard. They still travel on *sleds* that are pulled by dogs. The winter is too cold for hunting, so during that *season* they live on the stores of *seal* meat that they have killed in the summer. But seal meat is not the only kind of food that they eat. In summer they *hunt reindeer* and *bears*. They also fish *all the year round*. The Eskimos who are *hunters* in summer are *fishermen* in winter. In winter they make holes in the ice and catch their fish through the holes that they have made.

Structural Items: Direct and indirect objects

13A *Anne's Birthday Presents*

Anne Wilson was a *keen* student of science. On her *birthday*, she wanted her family to give her useful presents. So almost all their presents had something to do with science. Mr Wilson bought her a *set* of *dissecting instruments*. It cost him a lot of money, but he did not *mind* the expense. He wanted Anne to do well in her studies. Mrs Wilson gave her a box of *weights*. It was quite expensive, but it did not cost as much as the dissecting set. Anne's uncle gave her a microscope and a *magnifying glass*. Her sister gave her a set of *slides*. But Anne's little brother Tom bought her a big box of chocolates. He said he liked that better than anything else. Anne agreed with him. She was getting a little tired of her useful presents, after all.

1. Complete each sentence with the correct phrase from the three in brackets:
   a) Anne Wilson was a student of (Science, History, Mathematics).
   b) She wanted (beautiful, useful, amusing) presents for her birthday.
   c) She had a rich (uncle, father, brother).
   d) Anne's mother gave her a present that cost (as much as, more than, less than) the one from her father.
   e) Anne's brother gave her a box of (chocolates, slides, weights) for a birthday present.

2. Rewrite these sentences, adding *not* and the words in brackets:
   i)
   Example: Jane gave Mary the book (Pamela).
   Answer: Jane gave the book to Mary, not to Pamela.
   a) Tom gave Anne a box of chocolates (Jane).
   b) She sent her cousin the letter (aunt).
   c) I will lend Jack my bicycle (Jim).
   d) Anne has shown me her presents (my sister).
   e) The teacher taught the girls a new song (boys).

Keen. very interested, eager

(1)

ii)

Example: Jane gave Mary the book (magazine).

Answer: Jane gave Mary the book, not the magazine.

a) Will lent me his bicycle (car).
b) Mother read us a story(poem).
c) Anne's brother bought her a box of chocolates (set of slides)
d) The child drank a cup of milk (glass of water).
e) The bridge crosses the river (railway line).

3. Rewrite each sentence, using a phrase with *for*:

Example: I have brought you some flowers.

Answer: I have brought some flowers for you.

a) Mrs Wilson made her daughter a dress.
b) Tom's father bought him a bicycle.
c) I shall build my brother a house.
d) Mother is cooking you a meal.
e) Buy Anne a box of chocolates.

4. Choose the correct word from the three in brackets to complete each sentence:

a) My father gave (me, my, mine) a new dissecting set.
b) It is (me, my, mine) birthday, not (you, your, yours).
c) Anne's brother bought (her, hers, she) a box of chocolates.
d) Those are Tom's football boots, not (mine, me, my).
e) Anne showed (we, our, us) all her birthday presents.

13B *Christmas*

Christmas is only a few days away and the two children in the Robinson family are very excited. Their mother has *baked* them a very large and rich Christmas cake. She has shown them how to make colourful decorations for their Christmas tree. Tomorrow she will take them out *shopping* in the High Street. She is going to buy them new clothes for Christmas. Mr Robinson gave them some money last week. Tommy and Irene have already bought themselves lots of *balloons* and *streamers* with it.

People usually give each other *gifts* at Christmas. Mr and Mrs Robinson have already bought gifts for their children. They will give them their *parcels* on Christmas morning. Tommy and Irene have presents for their *parents,* too. Their eldest brother, Jimmy,

2. Are these statements right or wrong?
   a) Planets are stars.
   b) Planets have light of their own.
   c) Planets reflect the moon's light.
   d) The sun's family is called the solar system.
   e) Jupiter's light is very bright.
   f) Mercury is a giant planet.
   g) We have found life on Mars.
   h) The earth has one moon.
   i) Neptune and Uranus have four moons each.
   j) A planet is also known as a satellite.

3. Make the sentences in Question 2 into questions.

4. Complete this paragraph with words from the passage:
   Planets ____ ____ sun's light. There are ____ planets in the solar system. ____ is ____ smallest planet. ____ is a beautiful planet with a ____ light. It is often called the ____ ____ or the ____ ____. ____ is ____ very big planet. Mars has a bright ____ light, and Saturn has a lot of ____ around it.

2C *Universities*

Students working for their first *degree* at a university are called *undergraduates*. When they take their degree we say that they *graduate*, and then they are called *graduates*. If they continue studying at university after they have graduated, they are called *post-graduates*.

Full-time university students spend all their time studying. They have no other *employment*. Their course usually lasts for three or four years. Medical students have to follow a course lasting for six or seven years. Then they graduate as doctors. In Britain, full-time university students have three *terms* of about ten weeks in each year. During these terms they go to *lectures* or they study by themselves. Many students become members of *academic* societies and sports clubs and take part in their *activities*. Between the university terms they have *vacations* (or holiday periods). Their vacations are long, but of course they can use them to study at home.

Some universities, like Oxford and Cambridge in England, are *residential*. This means that during the university terms the students live in a university college or hostel or in *lodgings* chosen from an

Education

1 Put each of the following words or phrases in its correct space in the passage below.

state terms seminar degree co-educational private primary tutorial graduate nursery school grant secondary lecture break up compulsory fees academic

When children are two or three years old, they sometimes go to a (a) nursery school, where they learn simple games and songs. Their first real school is called a (b) primary school. In Britain children start this school at the age of five. The (c) academic year in Britain begins in September and is divided into three (d) terms. Schools (e) break up for the summer holiday in July. (f) Secondary education begins at the age of about eleven, and most schools at this level are (g) co-educational, which means boys and girls study together in the same classes. In Britain education is (h) compulsory from five to 16 years of age, but many children choose to remain at school for another two or three years after 16 to take higher exams. Most children go to (i) state schools, which are maintained by the government or local education authorities, but some children go to (j) private schools, which can be very expensive. University courses normally last three years and then students (k) graduate, which means they receive their (l) degree. At university, teaching is by (m) tutorial (an individual lesson between a teacher and one or two students), (n) seminars (a class of students discussing a subject with a teacher), (o) lecture (when a teacher gives a prepared talk to a number of students) and of course private study. Most people who receive a university place are given a (p) grant by the government to help pay their (q) fees and living expenses.

2 Explain the difference between . . .

(a) to sit an exam and to set an exam
(b) to take an exam and to pass an exam
(c) compulsory and voluntary
(d) to educate and to bring up
(e) a pupil and a student

3 Put one of the following words in each space in the sentences below.

up to of at by from in into

(a) Which school do you go to?
(b) He left school at the age of 18.
(c) The summer term ends in July.
(d) She's not at home, she's at school.
(e) She goes to Sussex University.
(f) His lecture was divided into four parts.
(g) School breaks up next Friday.
(h) He is now at university.
(i) She is in the same class as her brother.
(j) Students usually receive a grant from the state.
(k) They're given a grant by the state.

4. Put one of the following words in each space in the sentences below: up to of at by from in into

a. Which school do you go ------?
b. He left school ------ the age ------ 18.
c. The summer term ends ------ July.
d. She's not at home, she's ------ school.
e. She goes ------ Sussex University.
f. His lecture was divided ------ four parts.
g. Schools break ------ next Friday.
h. His is now ------ university.
i. She is ------ the same class as her brother.
j. Students usually receive a grant ------ the state.
k. They're given a grant ------ the state.

5. Now, answer these questions:

a. When do children in Britain start their primary school?

.....

b. Which education level do English students begin at the age of eleven?

.....

c. Why do most English children go to state schools?

.....

d. What are the types of teaching used at the university level?

.....

e. What is the whole text about?

.....

Appendix 12

Computer Science Class Observation Schedules and Reflection: CSL1

Name of the teacher: CSL1 **Nationality**: Libyan **Discipline**: CS				
Topic: Pascal: Language 2 **Number of the students**: 12 **Observer:** Abuklaish, A.				
Date: 08.11.09 **Time**: 11:45 **Length**: about 30min				
How often does English language use in…?	**frequently**	sometimes	rarely	never
CS / ZY / BT / CH / PH / Math classroom.				
How often do Arabic language use in…?	**frequently**	sometimes	rarely	never
CS / ZY / BT / CH / PH / Math classroom.				
Students encounter problem of dealing with scientific English terms.	frequently	sometimes	**rarely**	never
Teacher translates English words into Arabic	frequently	**sometimes**	rarely	never
What kind of language do they use?	Reading: course hand-outs, reading computer programme instruction, Writing: taking notes in lecture, writing short computer programme, Listening: following lectures, following question/answer sessions in class, listening to computer programme instruction, Speaking: participation in discussion			

The Observer Reflection

The lecturer began the class with some small talk about a topic which appeared to be introduced before, but it seemed to me unclear and I frankly did not understand what they were talking about. As he started it, I noticed that the majority of the students were listening attentively and brave enough to play a part actively. What was delivering was a computer programming language called Pascal where both Arabic and English languages were used in presenting it. However, the majority of the programme instructions were written in English except the numbers (e.g. 1,2,3…) mathematical symbols (e.g. -, **=, >, <)**, and **punctuations** (e.g. comma, brackets slash) which are the same in Arabic; but they are reversed (from right to left). This case of integrated both languages was also applied when the lecturer posed a question and wrote it on the board "Factorial n اكتب برنامج يحسب" which means "Write a programme that calculates the Factorial n?".

What was not clear to me in this session, seemed to be well-known to the majority of the students. No one was observed asking the lecturer for meaning of any of English words or terms appeared in the lecturer. In many occasions I observed the students participating confidently and freely, but most of their interaction was done in Arabic. Interestingly, one of the female students suggested of using "zero" in one of the computer programming activities which was accepted and applied in that exercise. This shows that the students are familiar and understand what they are doing. In this regard, the lecturer was once noticed asking the students for the meaning of an English word "*repeat*" which was known to some them.

In addition, nearly all the students were observed reading the hand-outs which seemed to include computer programming instruction, following the lecturer. They were also taking notes from the board and designing programming which was done in English with specific codes.

Appendix 13

Computer Science Class Observation

Field-notes: CSL1

Field-notes

Discipline : Computer Science (CS) — Lecturer: CSL1

Subject : Pascal: Language 2 — No. of Students : 12

Time : 11:15 — Place : CS Lab

Date: 08/11/2009 — Lenght : 25 min

00:00 UAR (xxx)

N, I = interer (xxx)

قلنا end of file = -1 (xxx) [xxx]

طبعا قلنا احنا بنقرا رقم، ولكن اذا وجدنا الصفر نطبع صفر
واذا ما لقينا الصفر نطبع عدد النجوم، فثلاث متغيرات
بين متغير N بنقرا فيه الرقم اللي بنقراه - المتغير الاخرى
نطبع [xxx]

file قلنا [xxx]

begin وبعدين

read N

طبعاً اول شي نقراء الـ N
وبعدين عندي حالة خاصة N = 0
نطبع صفر ولكن N هي الصفر، فنطبع عدد
النجوم

01:49 طبعا zero [write zero] If (N = 0) Then write (0) نقول
نطبعها زي ما هي قيمة، وتكون بين اقواس وهذا
كويس، هو نفس الشي لان بنطبع قيمة صفر
كل ما لقينا N = 0
اذا كان لا يساوي الصفر، فهنا بندير S الـ
while قبل ما ندير while بنحط I = 0
وتقول while (I<=N) Do شي اندير N < I (xxx)

- 1 -

write star بنطبع نجمـــــة

(xxx) while (xxx)

while N not equal end of file

Do begin (xxx)

Read N (xxx)

end (xxx)

while (xxx) end

4:00 [xxx] (xxx)

Do begin

write (*) I + 1

End; (xxx)

4:40 (xxx ?) نأخذ مثال (١ ، ٣ ، ٥ ، -١)

4:50 [xxx ?] (xxx)

End;

I (xxx)

RAM	الناتج
N * 3	*
I ⊗ ⊗ ⊗	* * *

(xxx)

(xxx)

Read N=1 (xxx)

while N ≠ end of file =1

do begin

N = 0 (xxx) S

I = 0 while 1 < 0

write * نجمة

I تجمع 1 (xxx) I (xxx) 3 [xxx] N = 0

(xxx) N = 0 (xxx) [xxx]

-2-

Read N=1 (xxx) N=0 (xxx) I (xxx) I=1 (xxx)

I = 2 (xxx)

10:00 N=1 (xxx)

والان If مرينا while مرينا

Repeat (xxx)

10:27 Repeat Repeat شو معنى [تكرار] (xxx)

Repeat Statment (xxx)

Repeat until (xxx)

while (xxx) if (xxx) do بعدين begin <end>

(xxx) repeat (xxx) [xxx]

while , repeat (xxx) while (xxx) repeat (xxx)[xxx]

شو بختلف بين repeat و while [xxx]

12:28 ممكن نكتب البرنامج بالشكل هذا ؟ (xxx ?)

Repeat

write * نجمة

while I I=1 <until I < N> (xxx)

while (xxx) repeat (xxx) repeat repeat (xxx)[xxx]

while (xxx)

14:28 (xxx ?) "Factorial n" اكتب برنامج يحسب

For n

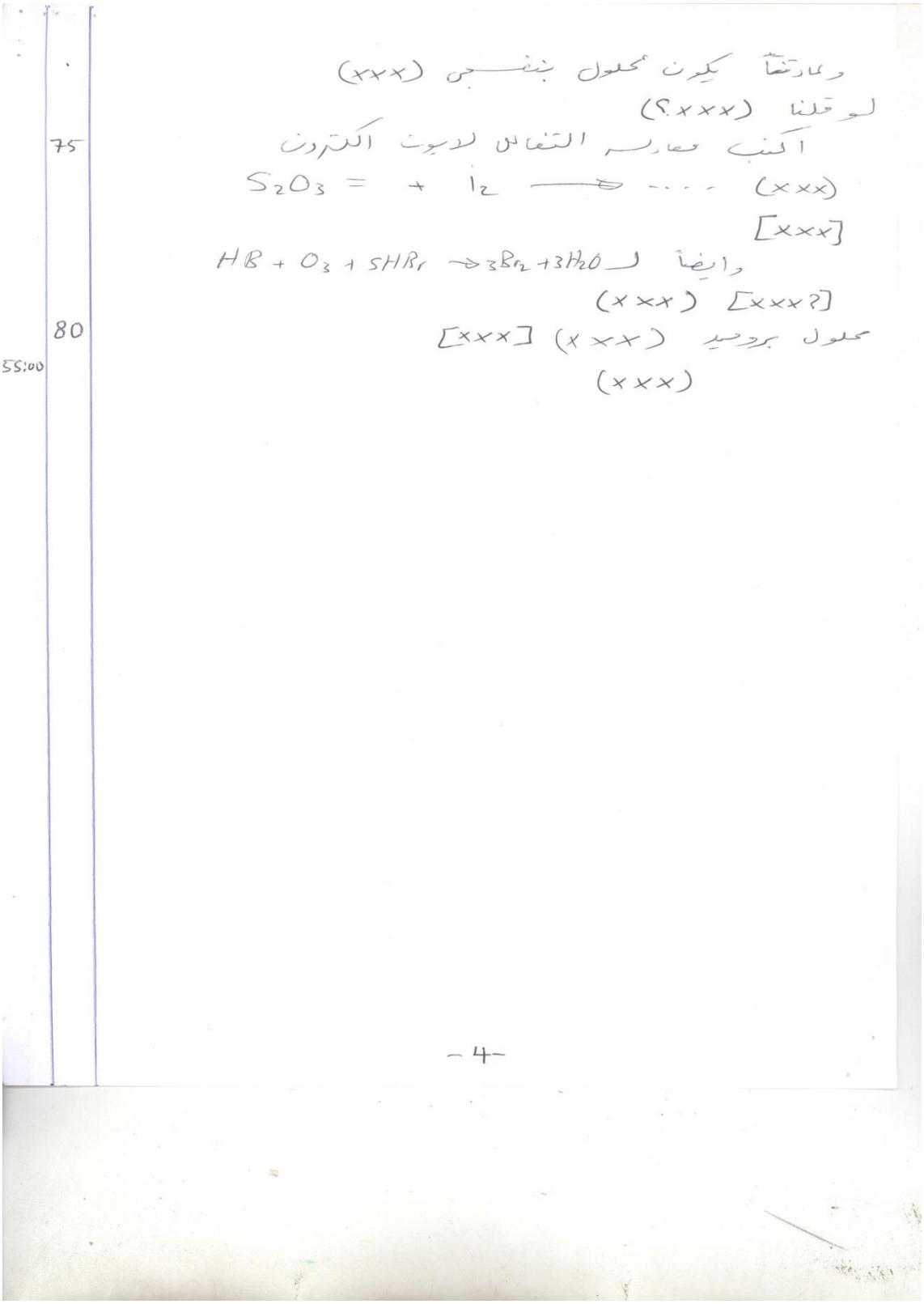
n = 1x2x3x...n

(xxx) repeat او while (xxx)

15:00 xxx

23:00 The students are answering the question

-3-



(xxx) continuation of lecturer's explanations and discussions of the session in Arabic, [xxx] students' voice of participation in Arabic, [highlighted] meaning of English words given in Arabic by a students

Appendix 14

Computer Science Class Observation

Reflection: CSL2

Name of the teacher: CSL2	**Nationality**: Libyan		**Discipline**: CS	
Topic: C++	**Number of the students**: **9**		**Observer**: Abuklaish, A.	
Date: 09.11.09	**Time**: 09:00		**Length**: about 45min	
How often does English language use in…?	**frequently**	sometimes	rarely	never
CS / ZY / BT / CH / PH / Math classroom.				
How often do Arabic language use in…?	**frequently**	sometimes	rarely	never
CS / ZY / BT / CH / PH / Math classroom.				
Students encounter problem of dealing with scientific English terms.	frequently	sometimes	**rarely**	never
Teacher translates English words into Arabic	**frequently**	sometimes	rarely	never
What kind of language do they use?	Reading: course hand-outs, reading computer programme instruction, Writing: taking notes in lecture, writing short computer programme, Listening: following lectures, following question/answer sessions in class, listening to computer programme instruction, Speaking: participation in discussion			

This class was started and ended with an introduction of C++ Language codes and instructions which all were written in English except the numbers, mathematical symbols and **punctuation**s which are similar to Arabic; but they are written from right to left as it was observed in lecture CSL1, too. Surprisingly, what it was written on board were just the Language codes and instructions, but not all the conversation which was integrated both Arabic and English. I can say that all explanations procedures of these codes and instructions were made by Arabic. Noticeably, it seemed that what it was delivered were understandable and interested as all the students appeared following the lecture, writing notes and participating actively and confidently in this session. I did not notice any kind confusion or boredom. Surprisingly, it was observed that nearly all English words, phrases presented in this session were translated into Arabic which has not been noticed in the previous lecture. Nevertheless, just one student asked for the meaning of the Language code “Abs” which was explained to him immediately. However, it is worth to mention that some terms cannot be translated into Arabic as C++ which it was presented like this “ لغه السي بلص بلص ” where “ لغه ” means “language” but “C” and “ ++” keep their own English pronunciations (السي means C, بلص بلص means ++) , even though that the sign “+” is found in Arabic language which means “add” as in English in some cases.

It can be concluded that what it was written in this session was English, but the way it was presented and discussed was marked by language switching: Arabic and English were used. As a research, I can say that I did understand part of this session as most of it was translated into Arabic.

Appendix 15

Computer Science Classrooms Observation

Field-notes: CSL2

Field-notes

Discipline: Computer Science (CS)
Subject: C++
Time: 10:00am
Date: 09/11/2009

Lecturer: CSL2
No. of Students: 9
Place: CS Lab
Lenght: 45min

0:00 (xxx) مو تعني هذه Cn ، Cn تعني شنو ، جاية من كلمة شنو
لغة C لغة الـ C و N تعني ادخال (xxx) input ادخال واضح
[نعم] وبالتالي اى لغة برمجة ، طبعاً عندها كلمات (xxx) مثل
اى لغة ذكرناها لغة البرمجة الخاصة بالحاسب الالي لها كلمات
خاصة (xxx) عادةً يتم التعامل معها باللغة الانجليزية ، وبالتالي يتم
تعريفها بهذا الشكل (xxx) نستخدم كلمات انجليزية ذات
معنى مثل Max (xxx) هذا البرنامج يقوم باستقبال قيمتين ،
واختيار ايهما اكبر . واضح (xxx)
وبالتالي استخدم متغير يفرق بين المتغيرات X - Y - Z (xxx)
الدالة الشرطية معناها If (xxx) اى اختيار من الـ
condition هنا الـ condition يعني الشرط ، واضح [نعم]
(xxx) expression الدالة الجاهزة في لغة C++ (xxx)
لتضمين الملفات نستخدم كلمة include (xxx)
02:00 الدوال الرياضية لايمكن استخدامها عشوائياً مثل لغة
الباسكال Pascal (xxx)
include يعني يتضمن ، تضمين الملف ، واضح (xxx)
هنالك مكتبة خاصة بـ C++ Library وبالتالي اذا كان نبي
نستخدم قنوات الادخال والاخراج اللي اتفقنا عليهم
input and output stream ، واضح ، شن نستخدم ، نستخدم
مكتبة سميناها input and output stream معناها قنوات الادخال والاخراج
(xxx) square او square root اللي هو الجذر التربيعي

-١-

(xxx) نستخدم power التي هي قيمة Cx (xxx) باشكال

نعم math من شن include math (xxx) Max (xxx)

نفسه ، mathematical معرفة ضمن الدوال الرياضية للبرنامج

05:00 البرنامج (xxx) math (xxx) لغة C++ يسموها لغة اجرائية

(xxx) library (xxx) include (xxx) Max (xxx)

Int main : input

اول دالة هي Abs(x) هذا ترجع القيمة المطلقة للدالة

(Abs) (xxx) [Abs شنو هي] (xxx) للعدد كسري

Abs , Fabsx

labs

(xxx) لعدد صحيح long طويل (xxx)

Abs (x) <stdLibih>

10:00 <tan (x) , Cos (x) , Sin(x)

(xxx)

log 10 (x)

log (xxx) <stdLibih>

square sqrt e^{10} exp (x) (xxx) ex

(xxx) pow (x,y)

power هو الجذر التربيعي sqrt(x) root

15:00 (xxx) Rand = 1-6 Rand دالة (xxx) دالة (xxx)

pow (x,2) (xxx) Rnd 1-0 (xxx) memory of computer داخل ذاكرة الكمبيوتر

(xxx) X = rand

T- function (xxx) rand (xxx) 2-0 الناتج (xxx)

X = rand ( ) % + 1 → (1-6)

20:00 (0-5) (xxx) one to six (xxx)

1 زيادة (xxx) (1-0) (5-0)

الدالة sin , sin(x) (xxx)

-2-

selection function (xxx)

select cas معناها اختيار، حالة من حالات (xxx)

<case> (xxx)

switch (xxx) If else If (xxx) switch (xxx)

expression (xxx)

switch (test-variable) (xxx) switch (xxx)

case (xxx) variable (xxx) x+1 (xxx) (x+1) (xxx)

break معناها وقف break (xxx) case (xxx)

variable case معناها حالة المتغير (xxx)

break (xxx) case variable (xxx) case , case

case2 , case3 (xxx)

defult معناها افتراضية

< switch (xxx) defult (xxx)

switch

statment (xxx) defult (xxx) defult (xxx)

yellow معناها Y اذا اوفان [green] green معناها G

yellow واضح (xxx)

<If else If>

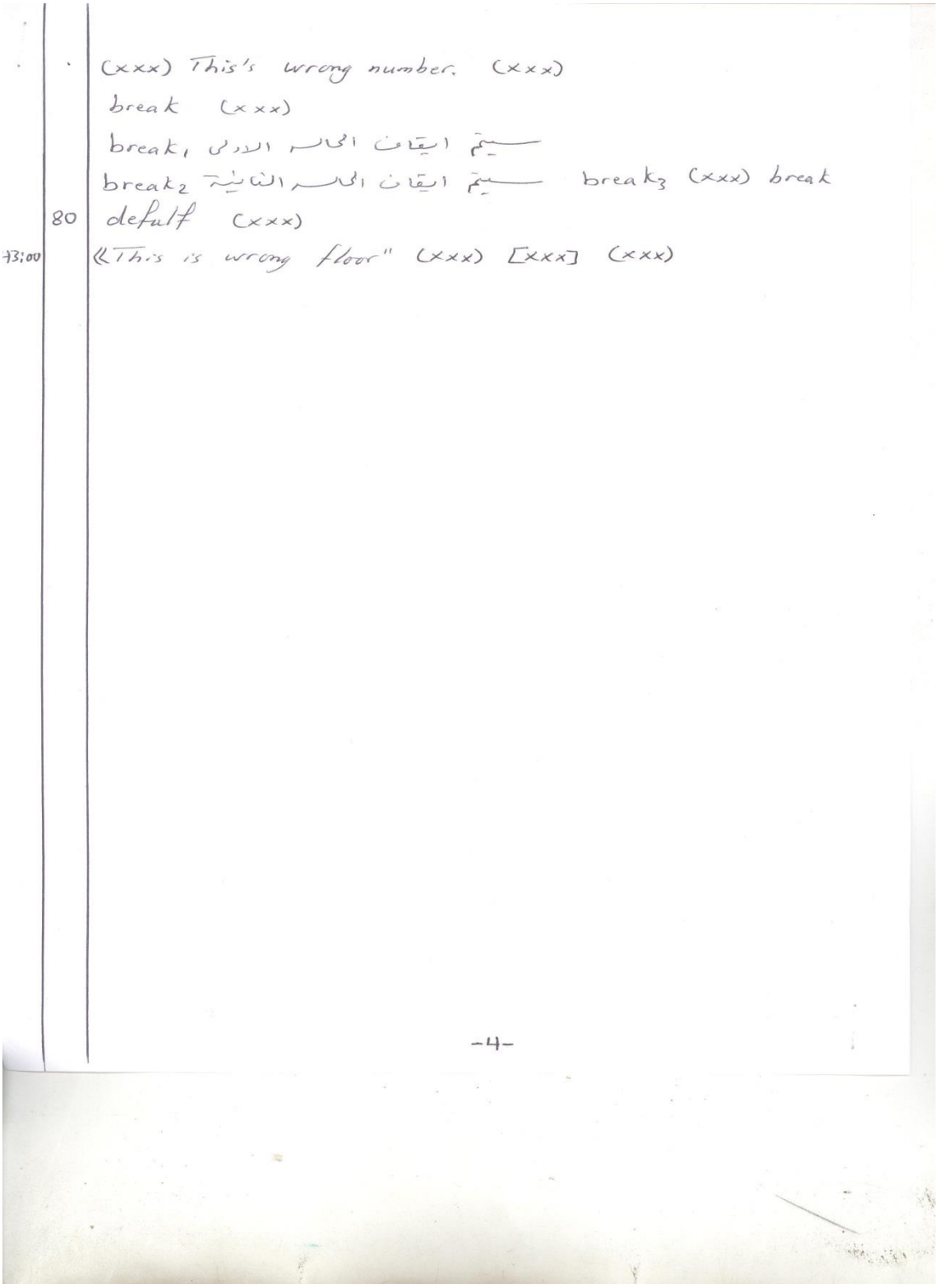
[... يابين] (xxx) building (xxx) (xxx?)

This ... wrong floor number (xxx) C++ (xxx) building (xxx) This is wrong number. (2,1) (xxx) include stream (xxx) cin >> x ; char: Intx Int main ( ) (xxx) switch (x)[xxx] متغير اذا فيها (xxx) If statment (xxx) character حرف او حروف (xxx) [xxx]

Cout << 'This is first floor' >> (xxx) case1 [xxx]

Cout << This is second floor' >> (xxx) [xxx] case2

واضح << This is fifth floor >> (xxx) case3 [xxx]



(xxx) continuation of lecturer's explanations and discussions of the session in Arabic, [xxx] students' voice of participation in Arabic, highlighted meaning of English words given in Arabic by the lecturere, [_____] a student asked for a meaning of an English term

Appendix 16

Samples of computer science classes teaching materials

CS 201 – PROGRAMMING IN VISUAL BASIC

UNIT – 6

CONTROL STRUCTURES

Control Structure is represents looping statements. A loop, one of the most important structures in Visual Basic, is used to repeat a sequence of statements a number of times. At each repetition, or pass, the statements act upon variables whose values are changing.

The types of Loop are

i) While loop
ii) Do – While loop
iii) For ... Next

While Loop

Syntax:

```
While (Condition)
        Statement_1
        Statement_2
        ----------
        Statement_n
Wend
```

Its functionality is simply to repeat statement while the condition set in expression is true.

Ex:

```
Dim a As Integer
a = 10
While (a > 0)
        Print a
        a = a - 1
Wend
```

Result: 10 9 8 7 6 5 4 3 2 1

Do - While Loop

Syntax:

```
Do While (Condition)
        Statement_1, Statement_2, .....,
        Statement_n.
Loop
```

Ex:

```
Dim a As Integer
a = 1
Do While (a <= 10)
        Print a
        a = a + 1
Loop
```

Result: 1 2 3 4 5 6 7 8 9 10

The **Do loop** repeats a sequence of statements either as long as or until a certain condition is true. A Do statement precedes the sequence of statements, and a Loop statement follows the sequence of statements.

FOR .... NEXT

Syntax:

```
FOR Var_name = Initial_value to Max_value STEP  Step_value
        Statement_1, Statement_2, .....,
        Statement_n.
NEXT
```

Ex:

```
FOR i = 1 to 10 STEP 2
        Print "My Name is Ali"
NEXT i
```

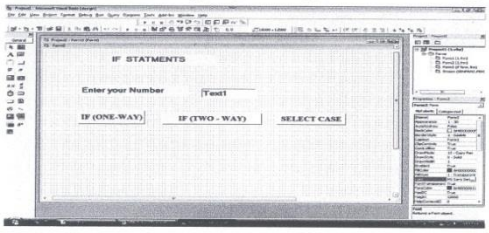
i --> Control Variable

Result:

My Name is Ali
My Name is Ali
My Name is Ali
My Name is Ali
My Name is Ali

The pair of statements For and Next cause the statements between them to be repeated a specified number of times. The For statement designates a numeric variable, called the **control variable,** that is initialized and then automatically changes after each execution of the loop.

Program-8: To manipulate if(one-way), if(two-way), Select Case using Controls.



If (One-way) Button

```
Private Sub Command1_Click()
        Dim A As Integer
        A = Val(Text1.Text)

        If (A > 0) Then
          MsgBox " This is Positive value"

        End If

End Sub
```

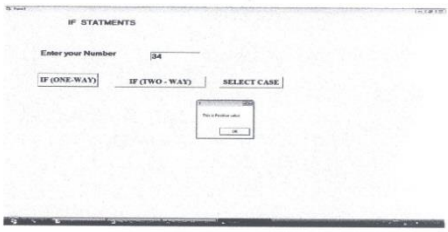
if (Two-way) Button

```
Private Sub Command2_Click()
        Dim A As Integer
        A = Val(Text1.Text)
        If (A > 0) Then
          MsgBox " This is Positive value"

        Else

          MsgBox " This is Negative value"

        End If

End Sub
```

Select Case Button

```
Private Sub Command3_Click()
        Dim ST As Integer
        ST = Val(Text1.Text)
        Select Case (ST)
          Case 10
            MsgBox " Entered value is 10"
          Case 20
            MsgBox " Entered value is 20"
          Case 30
            MsgBox " Entered value is 30"
        End Select

End Sub
```

Output:



11-2 السلاسل الأبجدية في C++ Strings In C++

11-2-1 تعريف السلاسل الرمزية في C++

تمثّل السلسلة الرمزية في لغة C++ بمصفوفة رموز تنتهي بالرمز الصفري ("\0")، ويتم الوصول إليها بواسطة مؤشر يشير إلى أوّل موقع في المصفوفة أي أول رمز في السلسلة.

يتم تعريف السلاسل الرمزية كما يلي :

```
1- char    Array_name [ ] = "String";
2- char   *Pointer_name = "String";
```

الصيغة 1 تؤدي إلى تخزين السلسلة الرمزية String في المصفوفة Array_name، لاحظ أن المصفوفة من النوع char وأنه لم يتم تحديد حجمها لأنه يعتمد على عدد الرموز في السلسلة.

مثلا :

```
char  name [ ] =" Mohammed";
```

هذا التعريف يعمل على خلق مصفوفة name من تسعة عناصر، وإسناد القيمة الابتدائية " Mohammed" لها حيث يخزن كل رمز في موقع كما يلي:

0	1	2	3	4	5	6	7	8
M	o	h	a	m	m	e	d	\0

يمكن كتابة الجملة السابقة على النحو التالي:

```
char name [ ] = {'m', '0', 'h', 'e', 'm', 'm', 'e', 'd', '\0'};
```

يجب أن تكون المصفوفة ذات حجم كافٍ بحيث يتم تخزين جميع الرموز ومن ضمنها الرمز الصفري الذي يدل على نهاية السلسلة في الذاكرة، عادة ما تقوم جملة التعريف السابقة بتحديد حجم المصفوفة بشكل أتوماتيكي اعتماداً على عدد الرموز المعطاة في جملة التعريف.

الصيغة 2 تقوم بالتأشير على السلسة "String" المكتوبة في مكان ما
باستخدام المؤشر Pointer_name، مثلا :

```
*name = "Mohammed";
```

الآن أصبح name عبارة عن مؤشر يشير على الرمز 'M' وطبعا يلي هذا الرمز الرموز ثم الرمز '\0'.

11-2-2 قراءة السلاسل الرمزية

يمكن قراءة السلسلة الرمزية المعرّفة كمصفوفة باستخدام أداة الإدخال cin كما

```
cin  >>Array_name ;
cin .getline (Array_name ,String_length ,stop_character) ;
                    where Array_name is a String array
```

على سبيل المثال : لإعطاء سلسلة رمزية للمصفوفة word [20] نكتب:

```
word;
```

حيث تخزن السلسلة المدخلة في المصفوفة word، تقوم جملة cin بقراءة المدخلة حتى الوصول إلى فراغ أو سطر جديد أو حرف نهاية الملف، لاحظ أنه يجب يكون حجم السلسة أطول من 19حرف (حتى يترك موضعاً للحرف الصفري).

يتوفر أيضا في لغة C++ الدالة cin.getline والتي تقرأ سطر كامل وهذه الدالة ثلاثة معاملات هي: مصفوفة الرموز التي ترغب في تخزين السطر فيها name وأكبر طول للسلسلة المراد إدخالها String_length ويجب أن لا يزيد عن حجم والمعامل الثالث هو الرمز الذي يحدد نهاية السطر مثلا:

```
r sentence [80];
getline (sentence, 80, \n');
```

يتم قراءة سطر مدخل بواسطة لوحة المفاتيح وتخزينه في المصفوفة السا
عملية التخزين بواسطة الدالة cin.getline() عندما يقوم الجهاز بقراءة ال
عندما يصادف رمز نهاية الملف او عندما يتم تجاوز عددالرموز المدخلة والتي
المعامل الثاني-1 (أي79) لأن الموقع الأخير مخصَّصاً للعدد الصفري.

الصيغة 1 تعرف المتغير var_name من نوع string أي أنه يستقبل سلسلة رمزية، الصيغة2 و 4 تعرّف متغير رمزي var_name من نوع String وتعطيه قيمة ابتدائية -val ue أي أن value عبارة عن سلسلة رمزية، الصيغة 3 تعرف المتغير var_name وتخزن فيه الرمز character عدد من المرات يساوي number.

الأمثلة التالية توضح جمل التعريف السابقة

```
string text ("Hello"); //create string
```

تقوم بإنشاء سلسلة رموز وإعطاءها قيمة إبتدائية "Hello " .

```
string text (8,'M')  // string of 8 'M'  characters
```

بموجب هذه العملية يتم إنشاء متغير ويتم إعطاءه قيمة إبتدائية 8 أحرف ' M ' أي أن text ="MMMMMMMM"

```
String text ="Hello" ;
```

وهي نفس نتيجة الجملة string text ("Hello");

إن إشارة (=) هنا ليست إسناد أو مساواة وإنما هي استدعاء ضمني لدالة بناء السلسلة string.

إن سلسلة string لا توفر أي عملية تحويل من نوع int أو char إلى string لذلك فإن التصريحات التالية تؤدي إلى حدوث خطأ.

```
string err1 = 'c';
string err2 = ('u');
string err3 = 22 ;
string err4 = (15);
```

خلافاً لما هو موجودة في السلاسل char المتوفرة في لغة C++ فليس هناك أية ضرورة لوضع الحرف الصفري '\0' في نهاية سلاسل string، يمكن الوصول إلى طول السلسلة الأبجدية هنا بواسطة الدالة length، كما يمكن استخدام [ ]مع string للوصول

لقراءة السلسلة الرمزية المعرّفة كنوع string يمكن استخدام جملة cin حي
عملية القراءة بظهور الفراغ

```
:l;
S1;
```

ملاحظة: في البرامج التي تستخدم فيها النوعstring ضع الملفات الرأسية بدو
<iostream> #includ و<string>#includ لوجودnamspace.

كما أنه يمكن استخدام الدالة getline لقراءة السلاسل الرمزية من النو
وتنتهي عملية القراءة بظهور علامة سطر جديد .'\n'

```
2;
(cin, S2);
```

11-2-5 العمليات على السلاسل الرمزية من نوع string

إسناد قيم لسلاسل string ولصقها

لقد عرفنا كيف يمكن الإعلان عن النوع string بالطرق السابقة وإعطاؤه قيم
يمكن أيضا إعطاء قيمة إلى string بتخصيص قيمة string آخر له كما يلي:

```
1 ="Moh";
2;
;
```

هنا يتم نسخ قيمة S1 في S2.

يمكن أيضا تخصيص قيمة string إلى آخر باستخدام عملية assign كما يلي:

```
string_varname. assign (value)
string_varname. assign (string_object, start_char,number)
```

Where value is a String variable, constant

GREAT SOCIALIST PEOPLE'S LIBYAN ARAB JAMAHIRIYA
UNIVERSITY OF SEBHA

DEPARTMENT OF COMPUTER SCIENCE
B.Sc. - FINAL EXAMINATION - JAN 2010

COURSE : VISUAL BASIC PROGRAMMING --- COURSE CODE:

Time: 2Hrs. **Max. Marks : 40**

ANSWER ANY **FOUR** QUESTIONS:

1. A) **Define Program, Hardware and Software with Examples.** (6)
   B) **Write a VB program for to manipulate Student Mark list.** (4)

2. A) **Solve the following notations:** (5)
   If x = 10, y = 5
   i) x=x +5 * (y+3.2) div 4
   ii) x = y * (x+y) / 2 + 10
   B) **Define Two-Way IF with Example.** (5)

3. A) **Write a VB program for to find Sum of $1^3 + 2^3 + 3^3 + \ldots + n^3$.** (5)
   B) **Define Do-While Loop with Example.** (5)

4. A) **Write a VB program for to ADD 2 matrices.** (6)
   B) **Write a VB program for to find Biggest of given n numbers.** (4)

5. A) **Define Function and Procedure with Examples.** (5)
   B) **Write a VB program for to ADD, SUBTRACT of two numbers Using Function.** (5)

Practical class for Data Structure using C language (CS-503)

Introduction to C language:
C is a poewerful, flexible language that has gained wide acceptance in recent year.
C was originally developed by **Dennis.M.Rithie** in the early 70s at AT & T.Bell labs. It was an outgrowth of several earlier languages like ALGOL-60,CPL,BCPL(basic combined programming language)&B.C was not very popular and was mostly confined to Bell labs until 1978.there is no single compiler for C.(no standard).hence ANSI(American national standard institute)established a committee in 1983 to create a standard for C language.

C is a **structured language** where the program is compartmentalized; a given program is divided into a number of modules, each of which would be used for a specific task. These individuals' modules are called **function.**

C as a middle level language, it combines the elements of a high language such as easy debugging, compactness etc, with the functionalism of the assembly language. Because of this special feature of the language, it is called as a **middle level language**.

Application of C:
The capability of C language to work at machine level makes it well suited for system programming. Used for (operating system, compiler, interpreter, assembler, editor, spread sheet, cad and animation etc).

Advantages:

- It makes the language simple, order and can be learned within a short time.
- Compiler for C is compact and can be easily ported on small machine including PCs.
- It is middle level language, hence suitable for developing application software as well as a system software.
- It has the ability to deal efficient with bits, bytes, word, address etc.

Structure of C program:

```
Main () ----This is the main function and compiler starts execution from here.
{
      ..............;
      ..............; These are the instructions. (Statement).
      ..............;
} ------------This is the end of the program.
```

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B.Sc. - FINAL EXAMINATION - JAN 2010

COURSE : VISUAL BASIC PROGRAMMING --- COURSE CODE: CS

Time: 2Hrs. **Max. Marks : 40**

ANSWER ANY **FOUR** QUESTIONS:

1. A) **Define Program, Hardware and Software with Examples.** (6)

   B) **Write a VB program for to manipulate Student Mark list.** (4)

2. A) **Solve the following notations:** (5)

   If x = 10, y = 5

   i) **x=x +5 * (y+3.2) div 4**

   ii) **x = y * (x+y) / 2 + 10**

   B) **Define Two-Way IF with Example.** (5)

3. A) **Write a VB program for to find Sum of $1^3 + 2^3 + 3^3 + \ldots + n^3$.** (5)

   B) **Define Do-While Loop with Example.** (5)

4. A) **Write a VB program for to ADD 2 matrices.** (6)

   B) **Write a VB program for to find Biggest of given n numbers.** (4)

5. A) **Define Function and Procedure with Examples.** (5)

   B) **Write a VB program for to ADD, SUBTRACT of two numbers Using Function.** (5)

2010-01-20
الزمن: 2:30

امتحان النهائي في مادة لغة التجميع ( )

ملاحظة: يجب إجابة السؤال الأول في ورقة الأسئلة، مع تسليم جميع الأسئلة مع ورقة الإجابة.

س 1 أكمل الفراغات الآتية:

أولاً مسجلات المعالج 8086

يسمى بالمسجل العداد، و يحتوي على عدد (رقم) يتحكم في عدد مرات تكرار حلقة أو عملية إزاحة (shift) للخانات نحو اليسار أو اليمين، كما يمكن استخدامه في العمليات الحسابية.	
تستعليم من خلال هذا المسجل ومسجل مؤشر التعليمة (IP instruction pointer) الوصول إلى عنوان أية تعليمة مخزنة في مقطع التعليمات، والواجب إحضارها (fetching) أولاً ثم تنفيذها.	
يملك هذا المسجل طولاً قدره 16 ثنائية ويحتوي على قيمة إزاحة كلمة في ذاكرة المكدس.	
طوله 2 بايت، وهو المسجل الوحيد من بين مسجلات العامة الغرض منه يستخدم كدليل (index) بغية تعزيز وتوسيع العنونة.	
يعتبر هذا المسجل احد أهم مسجلات المعالج (8086) ويستخدم في معظم وظائف الحاسوب، كم يستخدم أيضا في عملية الإدخال وعملية الضرب والقسمة.	

ثانياً مسجل العلامات أو الرايات

توضع هذه الراية بالقيمة 1 فتشير إلى حالة السماح بحدوث طلب مقاطعة خارجية.	
تشير هذه الخانة إلى وجود حالة فيض (overflow) في ناتج إحدى العمليات الحسابية.	
توضع هذه الراية بالقيمة 0 إذا كان ناتج العملية الحسابية أو عملية المقارنة غير صفري، وبالقيمة 1 عندما يكون الناتج صفرياً.	
تحدد هذه الراية اتجاهاً يسارياً أو يمينياً لعمليات نقل أو مقارنة السلاسل. (string) (معطيات من النوع المحرف character).	

رابعاً تعليمات المعالج:

هما أمران يستخدمان لنقل البيانات من والى الذاكرة وهذه الذاكرة تسمى بالمكدس.	
تعتبر هذه التعليمة احد التعليمات المنطقية وتستخدم لاختبار ثنائية من ثنائيات البايت.	
احد تعليمات التحكم في سير البرنامج وتستخدم لفحص محتوى علم الصفر.	
تستخدم هذه التعليمة لنقل التنفيذ إلى أي مكان في البرنامج بشكل قسري دون اختبار أي شرط أي أنها تعليمة غير شرطية.	
هذه التعليمة تستخدم لصنع حلقة تكرارية ويحتمه توقفه عندما تصبح قيمة المسجل CX مساوياً للصفر.	

س2 أ ما هو المكدس؟ما هي وظائفه؟ ثم وضح بالرسم الشكل العام له؟

س2 ب- اكتب برنامجا يقوم بتخزين حروف الكلمة FINAL في المكدس ؟ ثم وضح بالرسم موقع هذه الكلمة في المكدس ومكان المسجلات SP و SS؟

ملاحظة: افترض إن المكدس فارغ لا يحتوي على بيانات .

س3 أ تكلم عن مسجل العلامات(الرايات) مع الرسم؟

س3 ب- ما هو محتوى الرايات بعد تنفيذ عملية الجمع:

```
  01010101
  01010101
```

ثم أجد محتويات العلامات الآتية: ?=PF ?=AF ?=SF ?=ZF

س4 أ- ما هو محتوى المسجلات بعد تنفيذ البرنامج الآتي:

```
XOR  AL, AL
   MOV  CX, 9
   MOV DI,15
START:
   DEC   DI
   DEC   DI
   INC   AL
   CMP   AL, 5
   JZ    FINISH
   LOOP  START
FINISH:
   MOV AH,0
MOV AH,4CH
INT 21H
```

AL, AH, DI, CX, ZF

تصميم قاعدة البيانات

Database design

-1تحديد كائنات قاعدة البيانات) Identity الجداول, جدول الزبائن, جدول الطلبيات, الخ(
-2تحديد الحقول في كل كائن) الواصفات attribute مثل عنوان الكتاب اسمه مؤلفه, عدد الصفحات, سنة الاصدار, واصفات في جدول الاستعارة, اسم المستعير, مدة الاعارة, تاريخ الاستعارة, الكتاب الذي تم استعارته, عنوان المستعير ,
-3ربط الكائنات) الجداول) معا بشكل جيد, ايجاد علاقات بين الكائنات
الجدول دائما لكائن واحد فقط, الصف ضمن الكائن تحتوي على معلومات و بيانات كاملة لعنصر الكائن, و كل عمود يحتوي على معلومة جزئية لاحد عناصر الكائن.

)هذا هو فن تصميم قواعد البيانات(

فعند البدء بتصميم قواعد البيانات, يجب استخدام طريقة ممنهجة يعتمد على التخطيط, و احد الادوات المستخدمة للتخطيط لقواعد البيانات هي دورة حياة النظام

-1بدء المشروع (و هو كتابة مقترح proposal يشرح بشكل ملخص ما هي فكرة و طبيعة المشروع الذي سيتم انجازه - قرابة نصف صفحة يحتوي) حتى لا يتم ايقاف المشروع لاحقا, من البداية إما ان يتم القرار بالاستمرار به او لا

feasibility study -2لتحديد و دراسة تكلفة و فوائد النظام الذي سيتم انشائه, فيتم النزول الى السوق لتحديد ادوات النظام و تكاليفه و الفوائد التي سيتم انجازها, و بالنهاية يتم مقارنة التكلفة بالفوائد التي سيتم الحصول عليها, فإما ان تكون التكلفة كثيرة جدا مقارنة مع الفوائد, او مفيد جدا, يتم تقديم هذه الدراسة الى المدير.

system analysis -3تحليل النظام, يجب معرفة و بدقة كيف يعمل النظام الحالي, فكيف تحدث الخطوة الاولى, و الثانية, و هل سيكون قادر على تلبية متطلباتك ! سيكون افضل! فإطلاع واضح تماما و مكتوب لكيفية عمل النظام, فماذا سيعمل و يفعل النظام؟ فكلما كان التحليل جيد فتكون النتائج جيدة! (محلل النظم قد يكون اهم من المبرمج, ميزات المحلل ان راتبه افضل و مركزه افضل في الشركة(

-طريقة تحليل النظام البنوية و هي للانظمة المعقدة و الكبيرة

, system design -4بعد تحليل النظام, يجب عمل دراسة تصميمية و البدء بتصميم النظام, في مرحلة تصميم النظام يتم معرفة اي داة تصميم لقواعد البيانات من خلال MYsql او oracle او , access فيتم هنا تحديد ما هي الهارد وير و السوفوير التي ستلزم لانشاء النظام ,

-5اختبار النظام و تجريبيةsystem testing
اختبار النظام كل جزء بجزئة و النظام ككل

-6تطبيق النظام system implementation
تطبيق النظام ,و طرق تطبيق النظام ثلاث تطبيق مباشر و ذلك بحذف النظام القديم و اعتماد الجديد مباشر, و الطريق الثانية تطبيق النظام بالتوازي و هي تشغيل النظام الجديد مع القديم بنفس الوقت, و الطريقة الثالثة

-7عملية الصيانة

بعد انشاء النظام, دائما النظام يكون بحاجة الى مشغل او مسؤول لصيانة النظام.

تعريف الحاسوب(Computer Definition)

• أن كلمة كمبيوتر Computer مشتق من الفعل Compute بمعني يحسب, ويعرف الحاسوب بأنه آلة حاسبة الكترونية ذات سرعة عالية و دقة متناهية يمكنها معالجة البيانات Data Processing وتخزينهاStoring و استرجاعهاRetrieval وفقا لمجموعة من التعليمات و الأوامر للوصول للنتائج المطلوبة.

• الحاسوب هو من الآلات الالكترونية Electronic devices تقوم بمجموعة مترابطة و متتالية من العمليات على مجموعة من البيانات الداخلة Input Data تتناولها بالمعالجة وفقا لمجموعة من التعليمات Instructions والأوامر الصادرة إليه, المنسقة تنسيقا منطقيا حسب خطة موضوعة Algorithm مسبقا لحل مسألة معينة معرفة بغرض الحصول عل على نتائج ومعلومات تفيد في تحقيق أغراض معينة, وتسمى التعليمات والأوامر بالجمل Statements, و مجموعة الجمل هذه تسمى برنامجاً Program والشخص الذي يصمم البرنامج يسمي مبرمج Programmer.
{كتاب: مقدمة في علم الحاسبات الالكترونية والبرمجة بلغة بيسك (د.محمد الفيومي) }

• هو مجموعة من الأجهزة الالكترونية تسمي المعدات Hardware يتم التحكم في أدائها بواسطة مجموعة من البرمجيات Software.

2-1 خصائص الحاسوب:

1. سرعة إنجاز العمليات.
2. سرعة دخول البيانات و استرجاع المعلومات .
3. القدرة على تخزين المعلومات .
4. دقة النتائج و التي تتوقف أيضا على دقة المعلومات المدخلة للحاسوب .
5. تقليص دور العنصر البشري خاصة في المصانع التي تعمل آليا .
6. سرعة إجراء العمليات الحسابية و المنطقية المتشابكة .
7. إمكانية عمل الحاسوب و بشكل متواصل دون تعب .
8. تعدد البرمجيات و البرامج الجاهزة والتي تسهل استخدام الحاسوب دون الحاجة إلى دراسة علم الحاسوب و هندسة الحاسوب .
9. إمكانية اتخاذ القرارات وذلك بالبحث عن كافة الحلول لمسألة معينة و أن يقدم أفضلها وفقا للشروط الموضوعة والمتطلبات الخاصة بالمسألة المطروحة .
10. قابلية الربط و الاتصال من خلال شبكات الحاسوب حيث يمكن ربط أكثر من جهاز مع إمكانية التحاور ونقل البيانات والمعلومات فيما بينها .

3-1 تصنيف الحاسبات الالكترونية:

تصنف الحاسبات الالكترونية حسب :
1. من حيث قدرتها على التخزين و كفاءتها في إنجاز المهام: وذلك عن طريق زيادة حجم الذاكرة التي تؤدي إلى زيادة سرعة وكفاءة الحاسوب في إنجاز العمل.
_الحاسوب الضخم (Super Computer) : يعتبر الحاسوب الضخم أو العملاق من أكثر الحواسيب قوة و تستخدم الحواسيب العملاقة في المسائل التي تحتاج إلى عمليات حسابية معقدة جداً و تستعمل هذه الحواسيب في الجامعات, المؤسسات الحكومية و إدارة الأعمال الضخمة .

_الحاسوب الكبير(MainFrame) :يستطيع الحاسوب الكبير دعم ومساندة المئات أو الآلاف من المستخدمين بحيث يعالج الكثير من عمليات الإدخال و الإخراج و التخزين من المستخدمين لمعالجة البيانات, و يستخدم

الحاسوب الكبير في الشركات الضخمة و المنظمات الكبيرة التي تضم الكثير من المستخدمين الذين يحتاجون إلى المشاركة في البيانات و البرامج .

_ الحاسوب الصغير (Microcomputer) : من الشائع عن الكمبيوتر الصغير أنه الحاسوب الشخصي Personal Computer والذي يطلق عليه "PC", و تندرج في إطار الحاسوب الشخصي الحواسيب المحمول Notebook computers ((laptop بحيث يستطيع المستخدمين حمله بكل سهولة و الإستفاده منه مثل PC.

2.من حيث طريقة العمل :
_ الحاسبات الرقمية (Digital Computers):هي أجهزة الكترونية تقوم بمعالجة البيانات المتقطعة و إجراء الحسابات باستعمال الأعداد ممثلة بصورة مباشرة بشكل رقمي وبسرعة فائقة, حيث يتم تمثيل قيم المتغيرات و الكميات بواسطة الأعداد (بالنظام الثنائي غالباً).وهذا النوع الأكثر شيوعاً و الأكثر دقة ويمكن برمجته واستخدامه في كافة المجالات .
_الحاسبات التناظرية (Analogue Computers):هي أجهزة الكترونية تعمل على أساس الموجات, ويختص بقياس التدفق المستمر للبيانات التي يمكن التعبير عنها في صورة كميات مادية مثل الضغط الجوي و درجة الحرارة و الجهد الكهربائي ويستخدم هذا النوع في المجالات العلمية و الهندسية ويعطي نتائج تقريبية .
_الحاسبات المهجنة (Hybrid Computers):وهي حواسب تجمع بين خواص النوعين السابقين (الرقمي و التناظري) وتستخدم في المجالات العلمية , حيث أن الحاجة إلى معالجة بيانات من النوعين ضروري . ومن مميزات هذا النوع طريقة المعالجة الرقمية ,و القدرة على تخزين البيانات , و الدقة المتناهية, و توليد الاقترانات الرياضية .
ومن مساوئ هذا النوع التكلفة العالية ,و الأخطاء الممكن حدوثها, و البرمجة المتداخلة .

3. من حيث طبيعة أغراض الاستعمال :
_ حاسبات الأغراض العامة (General Purpose Computers):يصمم هذا النوع من الحاسبات لأغراض متعددة, مثل تنظيم أجور و رواتب العمال و الموظفين, وتنظيم عمليات الخزن في المصانع و المؤسسات و تحليل المبيعات ,حيث تمتلك المرونة الكافية لتأمين الكفاءة في المجالات التجارية و العلمية والطبية والهندسية .
_ حاسبات خاصة الاستعمال (Special Purpose Computers): يصمم من أجل أداء وظيفة محددة, مثل أجهزة الإنذار المبكر و أجهزة الحاسوب المستخدمة في العمليات الصناعية وعادة ما تكون الحاسبات من النوع الحاسوب الصغير أو الحاسوب المتوسط .

4-1 تطور الحاسوب:

ارتكزت عملية تطوير الحواسيب على العناصر الأساسية التالية :
1. زيادة سرعة الحاسوب . 2.التقليل من حجم الحاسوب. 3.التقليل من تكلفة الحاسوب.
4. زيادة دقة النتائج . 5. زيادة القدرة التخزينية 6. تسهيل عملية الاستخدام والتشغيل.

1. الجيل الأول (First Generation):
_ بدأت حواسيب هذا الجيل في الظهور من الأربعينيات إلى منتصف الخمسينيات من القرن العشرين.
_الاعتماد على تكنولوجيا الصمامات المفرغة Vacuum tubes في بناء الدوائر المنطقية و دوائر الكترونية شبيهة بتلك المستخدمة في أجهزة الراديو في ذلك الوقت .
_استخدمت خطوط التأخير الزئبقية في بناء الذاكرة ,وفي نهاية هذا الجيل تم استخدام الحلقات المغناطيسية في بناء ذاكرة هذا الجيل .
_البطء النسبي , وسرعة المتدنية نظراً لتدني سرعة الصمامات .
_كان حجم جهاز الكمبيوتر كبيراً , بالإضافة إلى حاجة الجهاز إلى أجهزة التبريد نظراً لارتفاع درجة حرارة الصمامات .
_سعة الذاكرة متواضعة للغاية بالنسبة لحجم الأجهزة و بالنسبة للأجيال اللاحقة .
_ الاعتماد على لغة الآلة Machine Language في برمجتها , مما أدى إلى صعوبة التعامل مع الحاسوب و تشغيله.
_استخدمت البطاقات الورقية المثقبة لتخزين البيانات والتي طورت فيما بعد إلى الأشرطة المغناطيسية و الطبول المغناطيسية drums .
_كان أول حاسبات هذا الجيل هو الحاسب المسمى ENIAC تبعه EDVAC ثم EDSAC و أخيراً الحاسب

المسمى UNIVAC.

2. الجيل الثاني (Generation Second):
_بدأت حواسيب هذا الجيل في الظهور من منتصف الخمسينيات إلى بداية الستينيات من القرن العشرين.
_ الاعتماد على تكنولوجيا الترانزستور Transistor و دوائره التي تتميز بصغر الحجم و كفاءة التشغيل مما أدى إلى تصغير حجم الحاسب بدرجة ملحوظة و زيادة سرعة الحاسوب نظراً لما يمتاز به الترانزستور عن الصمام .
_ استخدام الحلقات المغناطيسية في تركيب الذاكرة وقد ظهرت الأقراص المغناطيسية الصلبة Hard disk حيث استخدمت لتخزين البيانات من أجل الرجوع إليها لاحقاً .
_استحداث لغات برمجة جديدة ذات المستوى العالي(مثل لغة فورتران) التي يمكن باستخدامها تسهيل التعامل البشري مع الحاسب وبرمجته.

3. الجيل الثالث (Generation Third):
_ بدأت حواسيب هذا الجيل في الظهور من فترة الستينيات من القرن العشرين .
_ الاعتماد على تكنولوجيا الدوائر المتكاملة صغيرة المجال Small Scale Integrated و تبعتها الدوائر المتكاملة المتوسطة Medium Scale Integrated مما أدى إلى تصغير الحجم بدرجة كبيرة مع زيادة هائلة في سعة الذاكرة و دقة الأداء .
_زيادة سرعة الأداء عن الأجيال السابقة بشكل كبير .
_ بدأ ظهور الحاسبات الصغيرةMinicomputer, بالإضافة إلى تعدد المعالجات Multiprocessors.
_ تطورت برامج نظم التشغيلOperating System مما أدى إلى زيادة فاعلية وكفاءة الأداء ومن أمثلتها نظام البرمجة التعددية Multiprogramming .
_ ظهور لغات برمجة راقية جديدة مثل لغة Basic و Pascal .
_ظهرت وحدات إدخال و إخراج جديدة مثل أجهزة القراءة الضوئية والشاشات الملونة .

4. الجيل الرابع (Generation Fourth):
_ بدأت حواسيب هذا الجيل في الظهور من فترة السبعينيات و الثمانينيات من القرن العشرين .
_ استخدمت أشباه الموصلات في تطوير الدوائر المتكاملة الكبيرة Large Scale Integrated حيث استخدمت في تصنيع دوائر الحاسوب وذاكرته , وتطورت الدوائر المتكاملة الكبيرة إلى الدوائر المتكاملة الكبيرة جداً Very Large Scale Integrated و التي سميت بالمعالجات الميكروية (الدقيقة) microprocessors.
_ ازدادت سرعة أداء حاسبات هذا الجيل عن الأجيال السابقة .
_ بدأ ظهور الحاسبات المصغرة الشخصية و المنزليةMicrocomputer, Personal and Home Computers .
_ تم تطوير برامج و نظم التشغيل و انتشرت أنظمة التشغيل اللحظية Real time systems.
_ ظهور الأقراص المغناطيسية المرنة

على العنوان الفيزيائي المطلوب :

الحل :- CS=24CC , IP=C0

1- 24CC
× 10
24CC0

2- 24CC0
+ C0
24D80

FA=24D80

a

السؤال الرابع :-

ب 4 انواع توجيهات البيانات وفيما تستخدم :-

1) توجيه DB :- ويستخدم لحجز قيمة لمتغير بحجم واحد بايت

2) توجيه DW :- ويستخدم لحجز قيمة لمتغير بحجم 2 بايت

3) توجيه DD :- يستخدم لحجز قيمة لمتغير بحجم 4 بايت

4) توجيه DQ :- يستخدم ,, ,, ,, 8 بايت

5) توجيه DT :- يستخدم ,, ,, ,, 10 بايت

6

السؤال الخامس

ج 5 اكتب برنامج

```
.Model small
.$code
start:
  Call Input-cH Proce near
  Mov cx, 5
Print:
  Call output-cH proc
  loop print
MoAH, 4ch
Int 21 H
End star
```

```
Input-cH proce
  Mov ah, 01H
  Int 21H
  Ret
Input-cH proce/ EndP

Output-cH proce
  CMP AL,"≠"
  JZ  finish
  Mov AH, 02H
  Mov dL, AL
  Int 21H
  Ret
  Output-cH proce
Finish: EndP
```

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السؤال السادس :-

```
.Model small
.Data
x DB 41H
y DB 61H
.Code
sTart:
      Mov AX,@Data
      Mov DS, Ax
```

```
Mov AL, X
Mov BL, Y
Mov X, BL
Mov y, AL
Mov AH, 4CH
INT 21H
```

اجابة السؤال السادس البرنامج الاول على اليمين.

ج - يقوم هذا البرنامج بعملية التبديل بين قيم المتغيرات X, y باستخدام المسجلات AL, BL

- قيم المسجلات بعد التنفيذ :-

X = 61 AL = 41

y = 41 BL = 61

في هذا البرنامج لا يتم طباعة اي مخرج على الشاشة.

ج البرنامج الثاني :- الذي على اليسار.

يعمل هذا البرنامج او يقوم بعملية الضرب لمسجلين ووضع ناتج العملية في المسجل (AX) ثم يقوم بوضع القيمة الخاصة في عملية الطباعة داخل المسجلات الخاصة بعملية طباعة محرف على الشاشة

١٥

- قيم المسجلات بعد التنفيذ :-

AL = 21H , BL = 02

AH = 02 DL = 21H

- هذا البرنامج يقوم بطباعة قيمة على الشاشة وهي القيمة الموجودة داخل المسجل DL وهو طباعة المحرف او القيمة التي تقابل رمز الاسكي كود الموجود في (DL)

3 > 0 p=3 x=2 y=3 n=3-1=2

2 > 0 p=5 x=3 y=5 n=2-1=1

1 > 0 p=8 x=5 y Out p=0, 1, 1, 2, 3, 5, 8

③ main()
{
Char* st1 = "Mohamed";
Char* st2 = "Ahmed";
Char* st3 = "strcat(st2, st1);" "Ahmed" "Mohamed"
Cout << strlen(st3); strcln(st3) = 13
Cout << strdct(st1, st3); "Mo" "Mohamed Ahmed"
→ "Mohamed Ahmed Mohamed"

Cout << strlen(st3) = 13
Cout << strcat(st2, st3) = "Mohamed Ahmed Mohamed"
strcln = 21

⑪ write program for to factorial value using Recursive Function

```
#include <iostream.h>
long factorial (long a)
{
IF(a > 1)
return (a * factorial(a-1));
 else
 return(1);
}
main()
{
```

Appendix 17

Chemistry Class Observation Reflection

Name of the teacher: CHL1 **Nationality**: Libyan **Discipline**: CH				
Topic: Redox Reaction **Number of the students**: 12 **Observer**: Abuklaish, A.				
Date: 09.11.09 **Time**: 12:00 **Length**: about 1hour				
How often does English language use in…?	**frequently**	sometimes	rarely	never
CS / ZY / BT / CH / PH / Math classroom.				
How often do Arabic language use in…?	**frequently**	sometimes	rarely	never
CS / ZY / BT / CH / PH / Math classroom.				
Students encounter problem of dealing with scientific English terms.	frequently	sometimes	**rarely**	never
Teacher translates English words into Arabic	frequently	**sometimes**	rarely	never
What kind of language do they use?	Writing chemical equations symbols			

The Observer Reflection

The session started with a link to the previous and reviewing what they had learned. Then, he continued explaining and discussing the same subject which lasted about an hour. Within this time of observation, no single English sentence or phrase has been heard in this class neither from the CHL1 nor the students. For example, if we take and translate the first sentence at the Field-notes, it will appear like this: "…everyone knows that the oxidising agent Fe3+ with reducing agent Cu below it in the order…". You can see that the whole sentence is in Arabic and the only thing is pronounced in English is Fe + and Cu. Even the number "three" is pronounced as "*thalatha*". However, it was observed that most of the chemical equations symbols were written and pronounced in English, e.g. Fe2 (SO4)3, but the numbers are pronounced in Arabic because English and Arabic numbers are the same. In contrast, it was also noticed that all elements are written in Arabic with slightly difference in pronunciation, e.g. "oxygen" means "الاوكسجين *oxseegain*", but some has equivalent in Arabic, e.g. " حديد *hadead*" means iron or "كبريتات *kapretat*" means sulphate and الايون الكترون *iyoun alctroun* means electron-ion. In addition, some chemical nouns and verbs are also pronounced like English, e.g. " يؤكسد *yoksid*" means oxidise or "الاكسدة *axidha*" means oxidisation.

Interestingly, none of the students was observed asking for meaning of any of these chemical equations symbols. It sounds that they have no problem in dealing with them. Most of them were interacting with the lecturer freely and confidently, but all appeared to understand what was going on as they were following the lecture and sharing discussion with each other. In addition, the whole session was totally delivered in Arabic and the lecturer was not observed translating or explaining any of these English terminologies into Arabic.

As a researcher, I have come across number of conversation and points which were really hard for me to understand and follow; especially when some points were not completed or written on board. Thus, they seemed to be recognised and understood by all students as I have seen them doing well. This situation also encountered to me with different degrees in the computer science classes I observed.

Chemistry = (CH), ***Italic words*** = Arabic pronunciations of chemical elements and terms

Appendix 18

Chemistry Class Observation Field-notes

Field-notes

Discipline: Chemistry (CH)
Subject: Redox Reaction
Time: 12:00
Date: 09/11/2009

Lecturer: CHL1
No of Students: 17
Place: CH Lab
Lenght: 55 min

00:00 (xxx) الكل يعرف ان عامل مؤكسد Fe^{3+} مع عامل مختزل Cu تحته في الترتيب، وبالتالي يصير تفاعل بين المحلول والإناء، لذلك لا يصلح تخزين كبريتات الحديديك في إناء مصنوع من النحاس لانه بيصير بينهما تفاعل، أكسدة واختزال بشكل تلقائي (xxx) [xxx]
حيث ان Fe^{3+} كعامل أكسدة اقوى من Cu^{2+} وبالتالي يؤكسد Cu من صفر الى موجب وفقاً لهذه المعادلة [xxx]

$3Cu + Fe_2(SO_4)_3 \rightarrow 3CuCO_4 + 2Fe$ (xxx)

$3Cu + 2Fe^{3+} \rightarrow 3Cu^{2+} + 2Fe$ [xxx] (xxx)

$S_2O_3 - \ldots - I_2 \rightarrow \ldots ?$

11:00 (xxx) ومعروف ان الاكسدة هي فقدان الكترونات والاختزال هو استقبال الكترونات، فعملية الاختزال هي التفاعل العكسي لعملية الاكسدة (xxx) هذا يوضح عملية اكسدة لايون او ذرة او جزء

$\underbrace{Fe^{3+} + e^-}_{+3-1=+2} \xrightarrow{\text{اختزال}} \underbrace{Fe^{2+}}_{+2}$ [xxx] (xxx)

(xxx) [xxx]

$\underbrace{Zn^{2+} + 2e^-}_{+2-2=0} \xrightarrow{\text{اختزال}} \underbrace{Zn}_{0}$

14:00 (xxx) ويمكن التمييز بين تفاعلات الاكسدة والاختزال وذكرها من خلال تغير عدد الاكسدة للعنصر (xxx) المتفاعل منه في المواد الناتجة، واضح (xxx) وتكون على النحو التالي

-1-

$3Ag + (aq) + Al(s) \rightarrow 3Ag(s) + Al3 + (aq)$

ذرة Ag استقبلت الكترون واحد ولذلك حدث لها اختزال

(xxx)، ذرة Al فقدت 3 الكترونات وحدث لها اكسدة (xxx)

[xxx]

فتفاعلات الاكسدة والاختزال تنقسم على اساس العامل المؤكسد

(xxx) [xxx]

– تفاعلات (xxx) البوتاسيوم، تفاعلات بيلوجات البوتاسيوم

(xxx) كبريتات (xxx) تفاعلات الاكسدة والاختزال الخاصة

(xxx)

نأخذ مثال (xxx؟)

19:00 ١. وضح اي التفاعلات التالية تفاعل اكسدة واختزال

1) $NaCl \rightarrow Na^{+} + Cl$

2) $Fe_3O_4 + H_2 \rightarrow 3FeO + H_2O$

3) $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$ [xxx]

(xxx) الحل

اولاً نكتب اعداد الاكسدة لكل عنصر

① $NaCl \rightarrow Na^{+} + Cl^{-}$

اذاً $\overset{+1}{Na}\overset{-1}{Cl} \rightarrow \overset{+1}{Na} + \overset{-1}{Cl}$ [xxx]

(xxx) هذا يعني ان عدد الاكسدة لم يتغير ونفهم ان

التفاعل السابق ليس تفاعل اكسدة واختزال (xxx)

24:00 ② $Fe_3O_4 + H_2 \rightarrow 3FeO + H_2O$

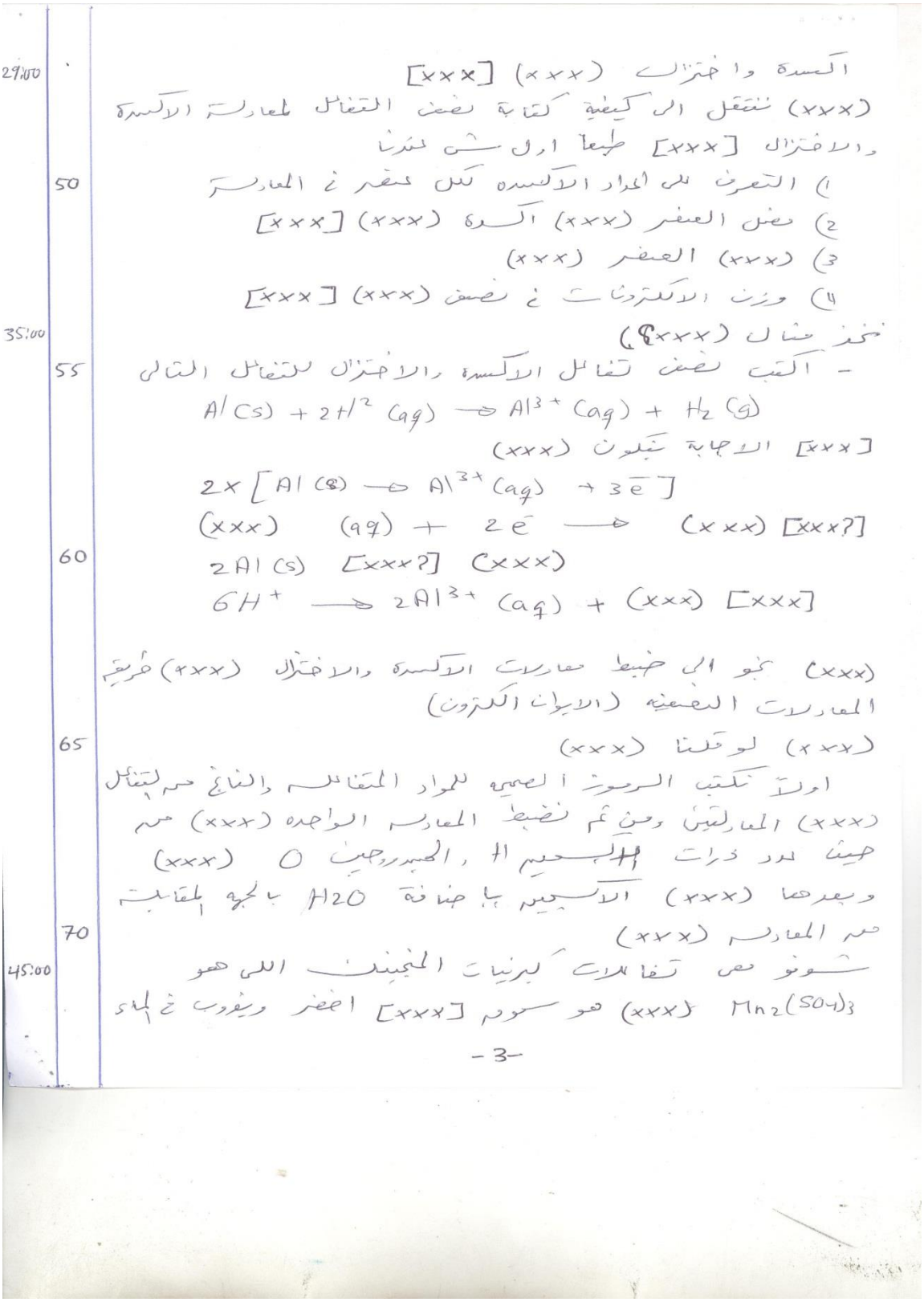
طبعاً (xxx)

$\overset{+8}{Fe_3}\overset{4(-2)}{O_4} + \overset{0}{H_2} \rightarrow \overset{3(+2)}{3Fe}\overset{3(-2)}{O} + \overset{2(+1)}{H_2}O^{-2}$

Fe_3^{+8} (xxx) $\rightarrow Fe^{+6}O^{-6} + H_2^{+2}O^{-2}$ [xxx]

بما ان حدث تغير في اعداد عناصر الاكسدة (xxx) يعني ان التفاعل

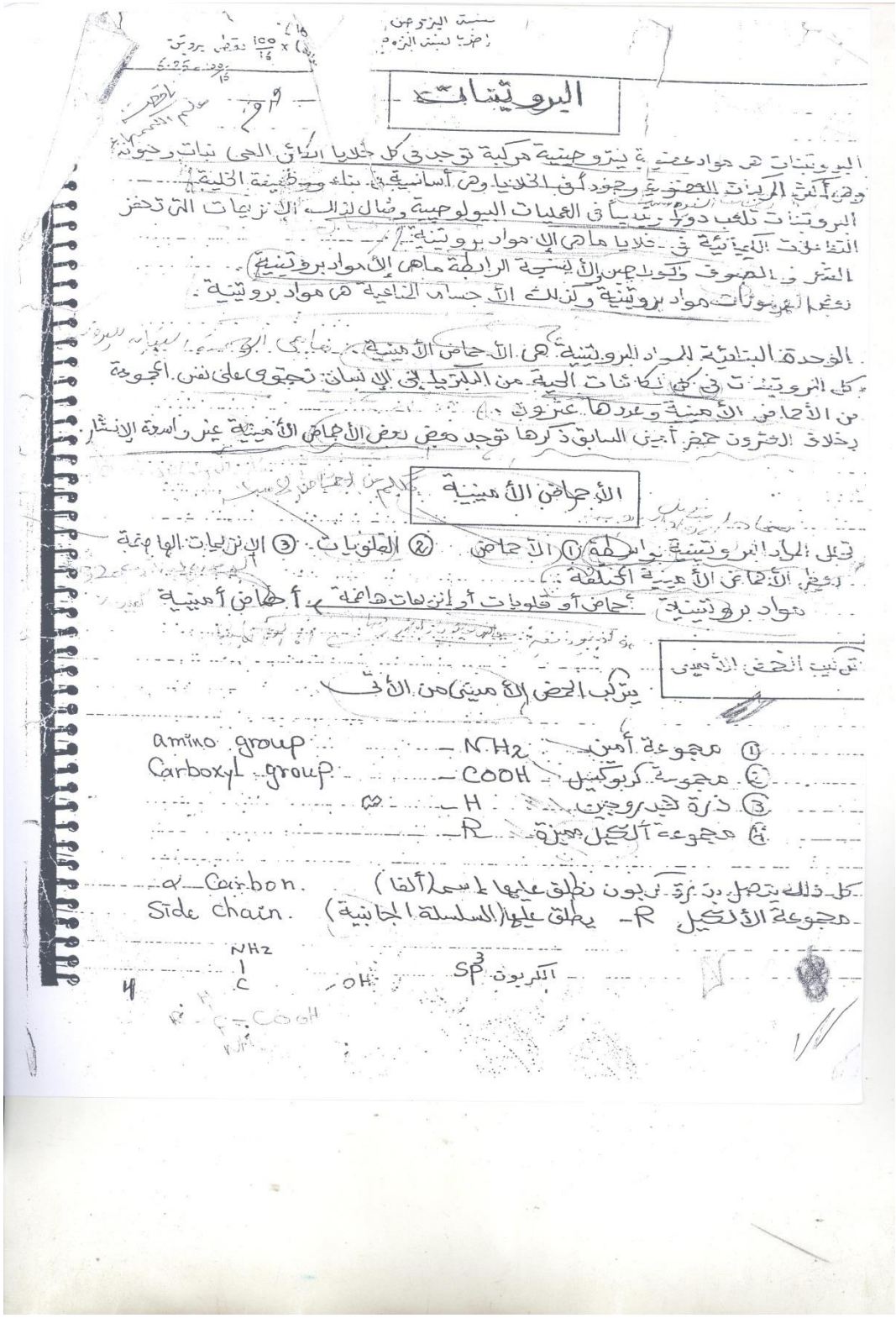
-2-



(xxx) continuation of lecturer's explanations and discussions of the session in Arabic, [xxx] students' voice of participation in Arabic,

Appendix 19

Samples of chemistry classes teaching materials



(1) الأحماض الأمينية المتعادلة

وهي الأحماض الأمينية المحتوية على مجموعة أمين واحدة وكربوكسيل واحدة وتنقسم إلى الأقسام التالية:

(A) أحماض أمينية ألفاتية بها مجموعة أمين ومجموعة كربوكسيل واحدة

(1) الجليسين — الأكيلس

$CH_2(NH_2)-COOH$

ألفا أمينو حمض الأسيتيك

α-amino acetic acid

(2) ألانين

$CH_3-CH(NH_2)-COOH$

ألفا أمينو حمض البروبيونيك

α amino propionic acid

(3) فالين

$(CH_3)_2CH-CH(NH_2)-COOH$

ألفا أمينو حمض أيزو فاليريك

α amino iso-valeric acid

essential

(4) ليوسين

$(CH_3)_2CH-CH_2-CH(NH_2)-COOH$

ألفا أمينو حمض أيزو كابرويك

essential

(5) أيزوليوسين

$CH_3CH_2CH(CH_3)CH(NH_2)COOH$

ألفا أمينو بيتا ميثيل حمض فاليرك

α amino B methyl propionic acid

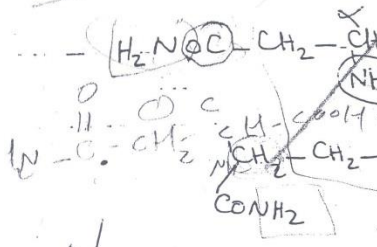
(B) أحماض أمينية هيدروكسيلية

(1) سرين

$CH_2(OH)-CH(NH_2)-COOH$

بيتا هيدروكسي ألفا أمينو حمض بروبيونيك

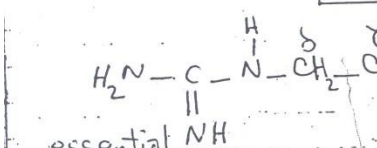
هذان الحمضان يوجدان أيضاً في البروتين في شكل الأميد



أسبرجين

جلوتامين

أحماض أمينية قاعدية

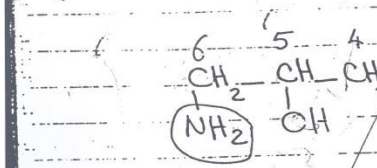


(1) أرجينين *

دلتا جوانيدين ألفا أمينو حمض فاليريك

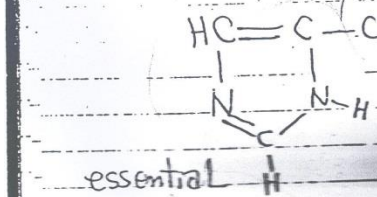
(2) ليسين

6,2 ثنائي أمينو حمض كابرويك



(3) هيدروكسي ليسين

5 هيدروكسي 6,2 ثنائي أمينو حمض كبرويك

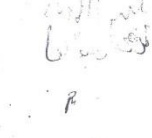
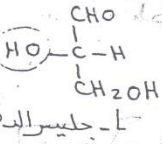
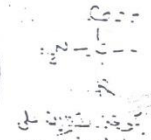
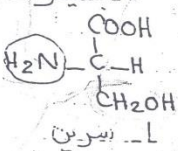


(4) هيستدين *

α, amino acid

وحدة البنية للأحماض الأمينية

في الأحماض الأمينية ألفا تكون مجموعتي الأمين والكربوكسيل مرتبطتين بنفس ذرة الكربون.
الأحماض الأمينية ألفا ترمز أيضا بالرمز (L) الذي يدل على أن التوجه الفراغي للمتبادلات حول ذرة الكربون الرباعية في الحمض الأميني وهي الذرة ألفا المتصلة بمجموعة الأمين تتماثل مع التوجه الفراغي للمتبادلات حول ذرة الكربون الرباعية في (L) جليسر الدهيد

	مرآة	
		
L- جليسر الدهيد		D- جليسر الدهيد
		
L- سرين		D- سرين

كيف يمكن تصنيف الأحماض الأمينية

الأحماض الأمينية تقسم تبعاً لعدد مجموعات الأمين و الكربوكسيل إلى ثلاث مجموعات

① أحماض أمينية متعادلة
هي أحماض أمينية تحتوي على مجموعة كربوكسيل واحدة ومجموعة أمين واحدة.

② أحماض أمينية حمضية
هي أحماض أمينية تحتوي على مجموعتي كربوكسيل ومجموعة أمين واحدة.

③ أحماض أمينية قاعدية
هي أحماض أمينية تحتوي على مجموعة كربوكسيل ومجموعتي أمين.

وكل من هذه المجموعات تقسم تبعاً لتركيب مجموعة الألكيل (R) من حيث كونها أليفاتية أي أروماتية أو غير متجانسة الحلقة.

CH 401

المحاضرة " 3 " 8-1 ، 50

كروماتوجرافيا الطبقة الرقيقة TLC
Thin Layer Chromatography

تعتبر طريقة الكروماتوجرافي ذو الطبقة الرقيقة من أشهر الطرق الكيماوية التحليلية المتبعة الآن ولعلها تأتي من الانتشار وكثرة الاستعمال طريقة الكروماتوجرافي الغازي Gas Chromatography (GC) حتى انها تستخدم كوسيلة تأكيدية للـ GC .

أساسيات الطريقة :

تعتمد هذه الطريقة على تطبيق مخلوط مكونات العينة مجال الفصل والتقدير على طبقة رقيقة من المادة الممتصة الموجودة على لوح زجاجي او طبقة من الالومينا حيث يتم الفصل او التطوير داخل حوض الفصل والذي يحتوي على المذيب المناسب ~~لاجراء الفصل~~ والذي يمثل الطور المتحرك . وبحركة المذيب خلال اللوحة فانه يحمل معه مكونات المخلوط حيث يتم الفصل على مسافات متباينة من نقطة بداية سريان المذيب (خط البداية) وحتى نقطة نهاية المذيب (خط النهاية) كما سبق في كروماتوجرافي الورق . وبذلك ينتج عن ذلك عدة بقع يمكن معرفتها عن طريق حساب قيم معدل السريان (Rf) ومقارنتها بقيم معدلات السريان لمركبات قياسية على درجة عالية من النقاوة تم فصلها تحت نفس الظروف .

* وتمتاز طرق التفريد اللوني الرقيق T.L.C بالاتي :

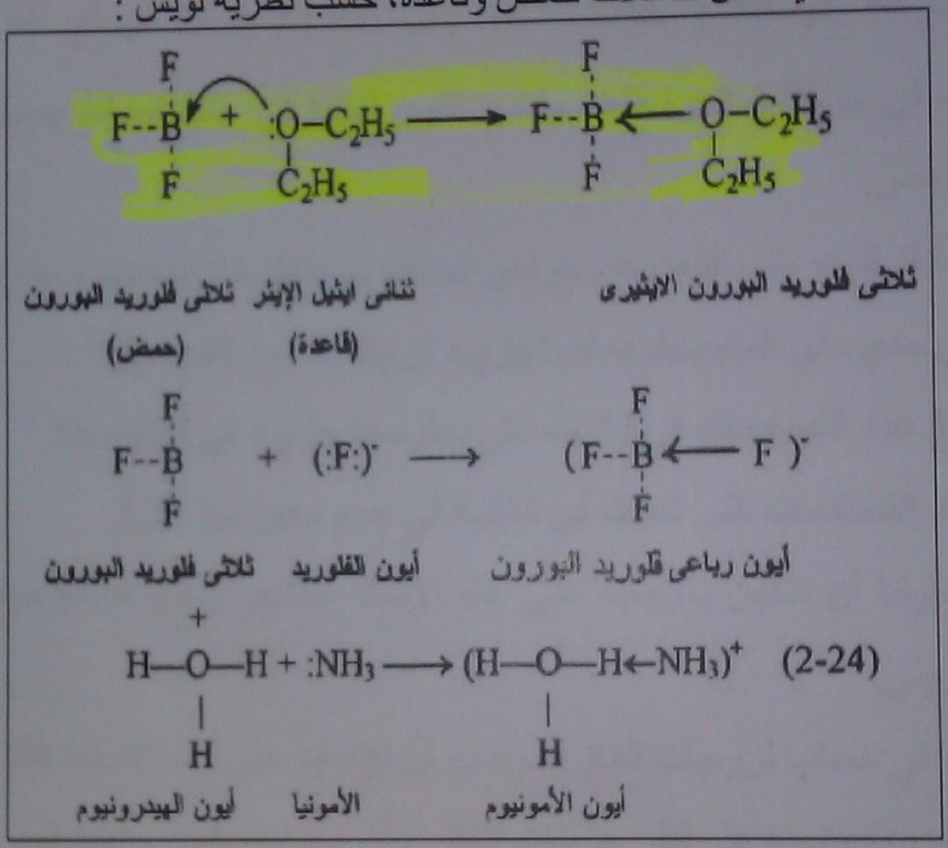
1- امكانية فصل كمية أكبر من المكونات (المتبقيات) غير كروماتوجرافيا الورق .
2- امكانية التحكم في درجة الحرارة
3- يمكن ازالة او كشط Abrassive الطبقة المحتوية على البقعة .
4- يجب ان تذاب العينة في مذيب على الاقل بنسبة 1% قبل عملية التنقيط .
5- يجب ان يكون حجم البقعة (عند التنقيط) 1-10 مايكروليتر (صغيراً) لان زيادة تركيز البقعة او زيادة حجمها يؤدي لنقص حساسية الفصل .
6- صغر حجم حوض التفريد اللوني الرقيق يؤدي الى درجة عالية من التشبع بأبخرة النظام المتحرك فلا يحدث اختلاف في معدل السريان .

أ

أحماض وقواعد لويس

بصفة عامة، فإن جميع قواعد (لويس) يوجد بينها خاصية رئيسية مشتركة، وهي امتلاكها لزوج أو أكثر من الإلكترونات الحرة (غير المرتبطة)، وأن أحماض (لويس) بينها خاصية مشتركة وهي أنها جميعها لديها مداد جزيئي يستطيع أن يكتسب زوج من الإلكترونات .

والتفاعلات التالية تمثل تفاعلات حمض وقاعدة، حسب نظرية لويس :



(2-24)

شمولية نظرية لويس

استخدم لويس مفهوماً أعم بالنسبة للحمض، حيث اعتبره المادة التي لها القدرة على استقبال الإلكترونات من القاعدة لتكوين الرابطة التناسقية.

ويلاحظ أن لويس استخدم زوج الإلكترونات بدلاً من استخدام البروتون لتكوين الرابطة التساهمية (التي تعرف في هذه الحالة بالرابطة التناسقية).

النظائر Isotopes

تختلف العناصر فيما بينها في العدد الذري (عدد البروتونات) إلا أن هنالك عناصر تتشابه في العدد الذري وتختلف فيما بينها في العدد الكتلي وتعرف هذه العناصر بالنظائر.

وتعني كلمة نظير (المكان نفسه) أي أن لها نفس المكان في الجدول الدوري ، إذ أنها لا تختلف فيما بينها في العدد الذري.

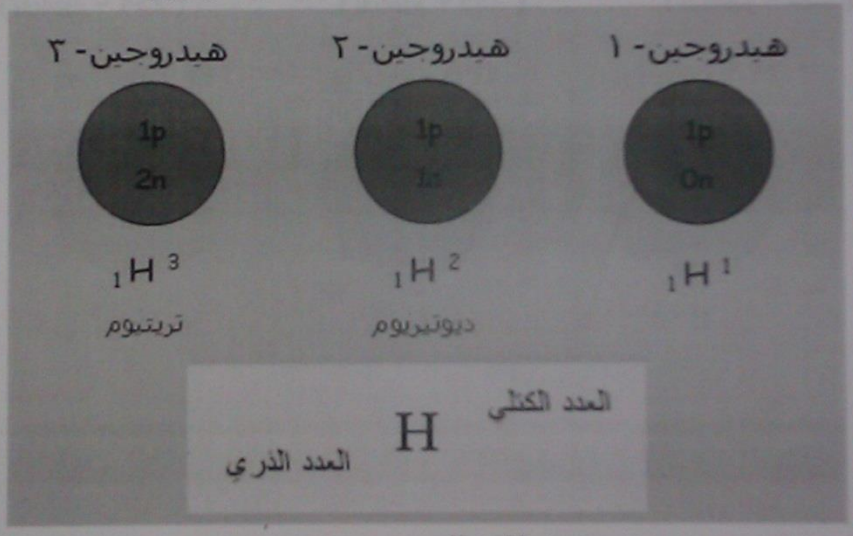
وعادةً ما يتم التعبيرعن النظائر بدلالة كتلها الذرية ، لأن أعدادها الذرية ثابتة .

مثال 1 :

للهيدروجين (العدد الذري للهيدروجين = 1) ثلاثة نظائر مشهورة ، تشترك جميعها في احتوائها على نفس العدد من البروتونات (العدد الذري) . وتختلف فيما بينها في عدد النيوترونات (العدد الكتلي) .

يسمى كل نظير نسبة إلى عدده الكتلي :

- يسمى النظير الأول للهيدروجين (هيدروجين - 1) .
- يسمى النظير الثاني للهيدروجين (هيدروجين - 2) أو الديوتيريوم .
- يسمى النظير الثالث للهيدروجين (هيدروجين - 3) أو التريتيوم .



نظائر الهيدروجين

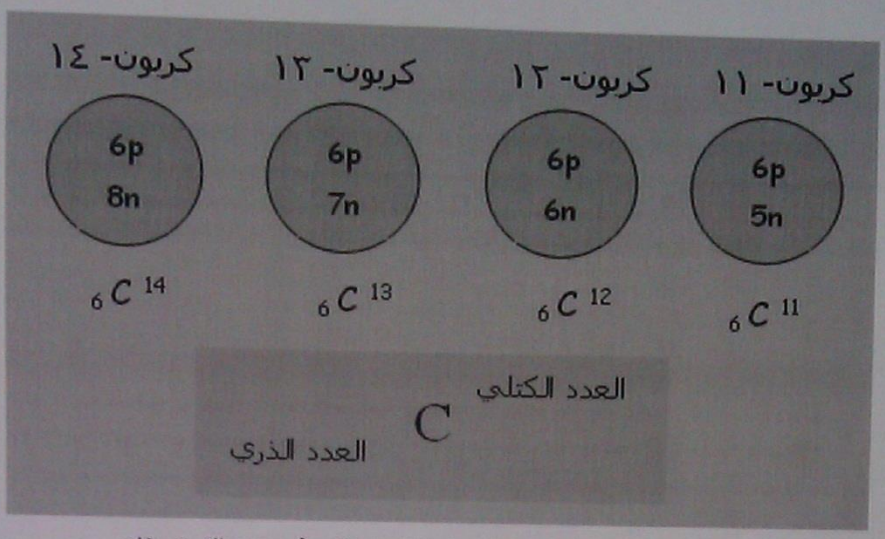
لاحظ أن جميع نظائر الهيدروجين تتشابه في عدد البروتونات وتختلف في عدد النيوترونات.

مثال 2 :

للكربون (العدد الذري للكربون = 6) أربعة نظائر معروفة تعرف بالأسماء :

. (كربون – 11) . (كربون – 12) . (كربون – 13) . (كربون – 14) .

ويشكل النظير (كربون – 12) 99% من نسبة الكربون الموجود في الطبيعة .



لاحظ أن جميع نظائر الكربون تتشابه في عدد البروتونات وتختلف في عدد النيوترونات

مثال 3 :

لليورانيوم (العدد الذري لليورانيوم = 92) عدد من النظائر أشهرها :

. (يورانيوم – 234) . . (يورانيوم – 235) . . (يورانيوم – 238) .

ويشكل النظير (يورانيوم – 238) حوالي 99.3% من نسبة اليورانيوم الموجودة في الطبيعة ، بينما يشكل النظيران

(يورانيوم – 235) و (يورانيوم – 234) 0.7% من النسبة المتبقية تقريباً

الخصائص الكيميائية والفيزيائية للنظائر

تتشابه نظائر العنصر الواحد فيما بينها في السلوك الكيميائي ، أي أنها تتفاعل مع غيرها بنفس الطريقة والآلية والسرعة ، ويعود ذلك لتشابهها في العدد الذري والذي يمثل عدد الإلكترونات كما هو يمثل عدد البروتونات ، وأنت تعلم أن التفاعل الكيميائي تشارك فيه الإلكترونات وليس للنواة علاقة به .

الفصل الثاني: الذرات والجزيئات والأيونات Atoms, Molecules and Ions

حاول المفكرون منذ العصور القديمة أن يتعرفوا على طبيعة المادة، ونتيجة لتضافر جهودهم عبر السنين تكونت نظرتنا الحالية عن التركيب الذري التي تبلورت في أوائل القرن التاسع عشر الميلادي بنظرية دالتون الذرية. ونحن نعلم الآن أن جميع أشكال المادة تتكون من ذرات وجزيئات وأيونات. وأن كل ما يخص علم الكيمياء يهتم بطريقة ما بما يخص هذه الأصناف الثلاث.

2. 1 النظرية الذرية The Atomic Theory

منذ القرن الخامس قبل الميلاد اقترح الفيلسوف الاغريقي ديمقراطس فكرة الذرة بمعنى أن جميع المواد تتكون من أجزاء أو جسيمات متناهية في الصغر غير قابلة للانقسام undividable أطلق عليها atomos التي تعني حرفيا باللغة اليونانية الشيء غير القابل للانقسام. ولكن فكرة الذرات رفضت من قبل عدد من الفلاسفة الاغريق خاصة أرسطو وافلاطون. ولكن العلم الحديث قدم العديد من الدلائل التجريبية التي دعمت فكرة وجود الذرة والتي نتج عنها تدريجيا التعاريف الحديثة للعناصر والمركبات.

وقد قدم العالم الانجليزي جون دالتون في العام 1808 م تعريفا تفصيليا للوحدات الأساسية لبناء المادة التي نعرفها باسم الذرات atoms وقد كان هذا ايذانا ببدء العصر الحديث لعلم الكيمياء.

ويمكن تلخيص الفروض الأساسية التي قامت عليها نظرية دالتون الذرية في النقاط التالية:-

1- تتكون العناصر من جسيمات متناهية الصغر تسمى ذرات.
2- تتشابه ذرات العنصر الواحد من ناحية الحجم والكتلة والخواص الكيميائية وتختلف ذرات أي عنصر عن ذرات عنصر آخر.
3- تتكون المركبات من اتحاد ذرات أكثر من عنصر ولأي مركب فإن نسبة عدد ذرات العناصر المكونه له تكون أما عدد صحيح أو كسر بسيط.
4- يحدث التفاعل الكيميائي بأحد الطرق الآتية : فصل الذرات المكونة للمركب عن بعضها أو عن طريق اتحاد ذرات جديدة أو اعادة ترتيب الذرات المكونة للمركب، وفي كل الأحوال لا ينتج عن التفاعل تخليق ذرات جديدة ولافناء لذرات موجودة. يوضح الشكل 2 . 1 رسم تخطيطي للفرضيات الثلاث الأخيرة.

يوضح الفرض الثاني أن ذرات العنصر الواحد تختلف عن ذرات جميع العناصر الأخرى ومع هذا فإن دالتون لم يعط أي محاولة لوصف تركيب وتكوين الذرات فالواضح أنه لم يكن يمتلك أدنى فكرة عن هذين الأمرين. ولكنه كان مدركاً أن الخواص المختلفة التي تظهرها العناصر كالأكسجين والهيدروجين يمكن تفسيرها بناءا على الاختلاف في تركيب كل من ذرة الاكسجين والهيدروجين ومن الفرض الثالث نجد أن تكون مركب معين يستلزم ليس فقط ذرات من نوع محدد ولكن أن تكون كذلك بأعداد محددة.

ومن الفرض الثالث نجد أنه لتكوين مركب ما فإننا نحتاج إلى ذرات من العنصر المناسب وكذلك عدد محدد من الذرات هذه الفكرة هي امتداد للقانون الذي اقترحه الكيميائي الفرنسي جوزف بروست في العام 1799 م والمعروف باسم قانون النسب الثابتة الذي ينص على

"أن العينات المختلفة من مركب ما تحتوي دائما على نفس العناصر بنفس نسب الكتلة "

فإذا حللنا عينات مختلفة من مركب ثاني أكسيد الكربون فإننا سنجد أنها تحتوي في كل عينة على نفس نسب الكتلة المختلفة لعنصري الكربون والأكسجين. وعلى هذا الأساس نجد من المنطقي أنه لو كانت نسبة الكتلة للعناصر المختلفة المكونة للمركب نسبة ثابتة فإن نسب ذرات هذه العناصر يجب أن تكون أيضا ثابتة.

كذلك فإن الفرض الثالث من نظرية دالتون يعمل على تدعيم قانون النسب المتضاعفة الذي ينص على:

"أنه حين يتحد عنصرين ليكونا أكثر من مركب فإن كتل أحد العنصرين تتحد مع كتلة ثابتة للعنصر الآخر بنسب من أعداد صحيحة صغيرة"

وبذلك نجد أن نظرية دالتون تقدم تفسيراً بسيطاً لقانون النسب المتضاعفة حيث أن المركبات المختلفة التي تتكون من نفس العناصر ولكنها تختلف في عدد الذرات المتحدة مع بعضها فمثلا يكون الكربون مع الأكسجين مركبين ثابتين هما أول أكسيد الكربون وثاني أكسيد الكربون. وقد أوضحت التقنيات الحديثة أن ذرة واحدة من الكربون سوف تتحد مع ذرة واحدة من الأكسجين ليتكون أول أكسيد الكربون. بينما يتكون ثاني أكسيد الكربون من اتحاد ذرة واحدة من الكربون مع ذرتين من الأكسجين. بمعنى أن نسبة الكربون إلى الأكسجين في أول أكسيد الكربون مقابل نفس النسبة في مركب ثاني أكسيد الكربون هي 1 : 2 وهذا ما يتوافق مع قانون النسب المتضاعفة.

كذلك يمكن اعتبار الفرض الرابع لدالتون أنه إعادة صياغة لقانون حفظ الكتلة الذي ينص على أن المادة لاتفنى ولاتستحدث. لأن المادة أصلها ذرات والذرات لاتتغير في التفاعل الكيميائي وبذلك فإن الكتلة لن تتغير أيضاً.

2 . 2 التركيب الذري The Structure of the Atom

نستطيع أن نعرف الذرات على ضوء نظرية دالتون الذرية بأنها الوحدات الأساسية للعناصر التي تستطيع أن تدخل في اتحاد كيميائي. وقد تصور دالتون الذرات بأنها متناهية في الصغر إلى جانب كونها غير قابلة للانقسام. ولكن عدد من الدراسات التي بدأت منذ العام 1850 م حتى القرن العشرين الميلادي أوضحت بما لا يدع مجالا للشك أن للذرة تركيب داخلي بمعنى أنها تتكون من جسيمات أصغر منها تسمى الجسيمات تحت الذرية. ومن هذه الدراسات تم اكتشاف الإلكترونات والبروتونات والنيوترونات.

الإلكترون The Electron

ساد بين العلماء في تسعينيات القرن التاسع عشر رغبة كبيرة في دراسة الاشعاعات أي عمليات انبعاث الطاقة عبر الفضاء على هيئة موجات مما ساعد في فهم التركيب الذري بصورة كبيرة. ومن أهم الدراسات التي ساهمت في هذا المجال كانت الدراسات التي أجريت على أنابيب أشعة المهبط cathode rays tube (وهي الانابيب الضوئية التي منها لاحقا تم اختراع اجهزة التلفاز).

تتكون أنابيب أشعة المهبط من أنبوبة مغلقة ومفرغة من الهواء مصنوعة من زجاج سميك، وتحتوي داخلها على صفيحتين من أحد الفلزات بحيث توصل هاتين الصفيحتين بمصدر عالي الجهد وبذلك تصبح أحد الصفيحتين مشحونة بشحنة سالبة وتعمل كقطب سالب أو كاثود بينما تصبح الصفيحة الثانية مشحونة بشحنة موجبة أي تصبح قطب موجب أو أنود. والشكل 2 . 3 يوضح رسم تخطيطي لهذا النوع من الأجهزة. وعند تشغيل مصدر الجهد العالي يصدر المهبط أشعة غير مرئية هي أشعة المهبط وتتسارع ناحية المصعد لتعبر الفتحة الموجودة في منتصفه وتستمر في طريقها حتى تصل إلى نهاية الأنبوبة التي تحتوي على سطح مطلي بمادة معينة وحين تصطدم أشعة المهبط بها فإنها تصدر تألقا ضوئياً قوياً.

وفي تجارب أخرى تمت إضافة قطبين كهربيين وقطبين مغناطيسيين خارجيين لمعرفة تأثير كل من المجال الكهربي والمغناطيسي كلا على حده على أشعة المهبط (الكاثود). فوجد أنه عند التأثير على أشعة المهبط بمجال مغناطيسي وحده تنحرف الأشعة لتصطدم بالشاشة عند النقطة A كما بالشكل 2 . 3 أي أن الأشعة تنحرف ناحية القطب الجنوبي للمغناطيس. وعندما يتم التأثير على الأشعة بالمجال الكهربي وحده فإن أشعة المهبط تنحرف لتصطدم بالشاشة عند النقطة C الشكل 2 . 3 أي أنها تنحرف ناحية القطب الموجب. وعندما لايتم التأثير عليها بأي مجال خارجي فإنها تعود لتسير بخط مستقيم وتصطدم بالشاشة عند النقطة B . وعلى ضوء النظرية الكهرومغناطيسية يمكننا تفسير الملاحظات السابقة على أساس أن الأشعة الصادرة من المهبط تحمل شحنة سالبة لذلك فقد انجذبت للقطب الموجب من المجال الكهربي الخارجي. وأنها تظهر أيضا خواصا مغناطيسية حين يؤثر عليها مجال مغناطيسي. كل هذه المشاهدات تدل على أنها تحمل شحنة سالبة وهذه هي الجسيمات التي نعرفها حاليا باسم الإلكترونات. يوضح الشكل 2 . 4 تأثير قضيب من المغناطيس على أشعة الكاثود.

وقد قام الفيزيائي البريطاني J. J. Thomsom بدراسة أشعة المهبط على ضوء النظرية الكهرومغناطيسية وذلك ليستطيع أن يحدد قيمة نسبة شحنة الإلكترون إلى كتلته وقد وجد أنها تساوي القيمة

$$e/m = -1.76 \times 10^{8}\ \text{C/g}$$

حيث C هي الكولوم أي وحدة الشحنة الكهربية. g الكتلة بوحدة الجرام. وعليه وبعد سلسلة من التجارب التي أجريت ما بين الأعوام 1908 حتى 1917 م نجح العالم مليكان Millikan في قياس قيمة شحنة الإلكترون بدقة عالية حيث أثبت أن الشحنة على جميع الإلكترونات متكافئة تماما وقد تضمنت تجربة مليكان اختبار حركة قطيرة زيت حين تقوم بحمل شحنات ساكنة من أيونات موجودة في الهواء المحيط بها في وعاء التجربة حيث قام بتعليق القطيرة المشحونة في الهواء بتطبيق مجال كهربي ومن ثم تتبع حركتها من خلال ميكروسكوب كما في الشكل 2 . 5 . ومن معرفته بقوانين الكهرباء الساكنة وجد مليكان أن شحنة الإلكترون لها القيمة

$$e = -1.6 \times 10^{-19}\ \text{C}$$

ومن هذه القيمة وقيمة e/m التي أوجدها طومسون أمكن حساب قيمة كتلة الإلكترون (انظري الحسابات في الكتاب) وهي قيمة متناهية في الصغر.

النشاط الإشعاعي Radioactivity

في العام 1895 م لاحظ العالم الفيزيائي الألماني ويليام رونتجن أن خروج أشعة المهبط واصطدامها بالزجاج والصفائح الفلزية قد سبب خروج أشعة غريبة. وقد كان وجه الغرابة في هذه الأشعة عالية الطاقة أنها كانت ذات قدرة عالية على النفاذ حتى أنها أثرت في الألواح الفوتوغرافية الموجودة داخل أغلفتها. هذه الأشعة لم تتأثر بفعل المجالين الكهربي والمغناطيس الخارجيين كما في أشعة المهبط مما دل على أنها إشعاعات كهرومغناطيسية وليست جسيمات مشحونة. وقد أطلق رونتجن عليها اسم اشعة x أي المجهولة أو الغريبة إذ أن طبيعتها لم تكن معروفة.

بعد ذلك قام العالم الفرنسي انطون بيكريل بدراسة خواص التألق الفلوريسيني للمواد ومن خلال دراسته هذه وبمحض الصدفة وجد أن تعريض الألواح الفوتوغرافية المغلفة بأغلفة سميكة إلى مركبات اليورانيوم أدى إلى فساد هذه الألواح

Appendix 20

Samples of physics classes teaching materials

الانكسار

4

الهدف من التجربة:-

تعيين معامل الانكسار لمادة منشور.

الأدوات المستخدمة:

منشور– مقياس الطيف– لمبة صوديوم

النظرية:

المنشور : هو عبارة عن جسم مصمت أو أجوف مصنوع من مادة شفافة كالزجاج.ذي ثلاثة أوجه كل منها على هيئة مستطيل وله قاعدتان كل منها على هيئة على شكل مثلث ، وعند استخدامه يوضع على أحدى قاعدتيه المثلثين .

و هو عبارة عن سطحان يميل أحدهما على الاخر بزاوية معينة ولتكن A بحيث لايلاشي الانحراف الذي يسببه السطح الأول بالسطح الثاني بالسطح الثاني يسبب زيادة الانحراف .

يعرف معامل الانكسار: أي وسط ضوئي بأنه النسبة بين سرعة الضوء في الفراغ وسرعة الضوء في ذلك الوسط.

يختلف معامل انكسار أي وسط باختلاف موجة الضوء أي انه للوسط الواحد معاملات انكسار مختلفة باختلاف الألوان.

نفترض أن PQRS أشعة تعاني انحرافاً عندما تمر خلال منشور زاوية انكساره A .(كما في الشكل)

وعليه فإن الانحراف الزاوي يساوى <LQR+ <LRQ

وعليه فإن

$$D=(i-r)+(i'-r') \longrightarrow (1)$$

$$D=(i+i')-(r+r') \rightarrow (2)$$

∵ AQNR رباعي الإضلاع فإن <MNQ= <A

<M NQ =<NQR+QRN $=(r+r')$

$$A=(r+r') \rightarrow (2)$$

نفرض أن $i=i'$ ، $r=r'$

من المعادلة (1) يمكن كتابتها على النحو التالى

$$D=2i-2r$$

ومن المعادلة (2)

$$A=2r$$

بالتعويض من قيمة $A=2r$ في المعادلة (3)

$$D=2i-A$$

$$\therefore i=\frac{A+D}{2}$$

$$r=\frac{A}{2}$$

ومن خلال قانون سنل فإن معامل الانكسار

$$n=\frac{\sin i}{\sin r}$$

1

$$n = \frac{\sin(\frac{A+D}{2})}{\sin(\frac{A}{2})}$$

خطوات العمل:-

أولاً : تعيين زاوية راس المنشور

1- ضع المقياس أمام المصدر الضوئي.

2- انظر خلال العدسة حتى تحصل على إضاءة متجانسة وهذا يحدث عندما يكون محور المجمع ومركز المصدر على استقامة واحدة.

3- عين زاوية رأس المنشور باستقبال راس المنشور الفتحة الضيقة بحيث نحصل على صوره واضحة للفتحة الضيقة بالانعكاس على احد وجهي المنشور.

4- خذ القراءة لتكن(a_1,b_1).

5- تكرر الخطوتين 3-4 على الوجه الأخر وخذ القراءة على نفس التدريج(a_2,b_2).

المشاهدات والنتائج:-

T_1		T_2		$2A = \frac{[(a_1 - a_2) + (b_1 - b_2)]}{2}$	
a_1	b_2	a_2	b_2	a_1-a_2	b_1-b_2

ثانياً: نعين زاوية النهاية الصغرى للانحراف:

1-نضع المنشور بحيث تسقط الاشعه على احد أوجهه ثم نحرك التلسكوب في تلك الجهة حتى نحصل على ثلاث خطوط ملونه.

2- نحرك التلسكوب والقاعدة تباعا بصوره بطيئة حتى نحصل على النقطه التي تتحرك فيها الأشعة الملونة ثم ترتد او تختفي.

3- عند هذه النقطة نسجل (a_1,b_1).

4- بدون تحريك المنشور نحرك للجهة اليمنى كلا من القاعدة والتلسكوب لتسقط الأشعة على الوجه الأخر للمنشور.

5- نكرر الخطوات السابقة ونسجل (a_1,b_2).

6- نطبق العلاقات الرياضية المستخدمة.

المشاهدات والنتائج:-

T_1		T_2		$2D = \frac{[(a_1 - a_2) + (b_1 - b_2)]}{2}$	
a_1	b_1	a_2	b_2	a_1-a_2	b_1-b_2

نعوض في العلاقة لإيجاد معامل الانكسار

$$n = \frac{\sin\left(\frac{A+D}{2}\right)}{\sin\frac{A}{2}}$$ القانون المستخدم

ملاحظة :- بمعلومية إن معامل الانكسار $n=1.5$ للزجاج نوجد الخطأ المئوي في القراءة والخطأ المطلق.

جدول الرموز ووحدات القياس:

الرمز	المعنى الفيزيائي	وحدة القياس
$(a_1,b_1)T_1$	موضع التلسكوب من الجهة اليسري	بالدرجات
$(a_1,b_2)T_2$	موضع التلسكوب من الجهة اليمني	بالدرجات
n	معامل انكسار المنشور	.....
A	زاوية راس المنشور	بالدرجات
D	زاوية النهاية الصغرى للمنشور	بالدرجات

تجربة رقم 2

تعيين الطول الموجي لضوء الصوديوم باستخدام محزوز الحيود

الاحهزة المستخدمة :-

مقياس الطيف- محزوزالحيود- لمبة صوديوم .

النظرية:- عندما يسقط ضوء أحادي اللون طول موجته λعمودي علي محزوز الحيود المسافة بين فتحاته d
فإن مواضع الزاوية للنهايات العظمي الرئيسية تحدد بالعلاقة :-

$$D\sin\Theta=n\Theta$$

Nالرتبة الطول الموجي
وتظهر النهايات العظمي الرئيسية المركزية (صورة واضحة للمصدر الضوئي مناظرة للزاوية n=0 0
تخرج اشعة متوازية من المجمع لتسقط علي محزوز الحيود الذي يوضع علي نضد دائري حيث يدور حول محور تلسكوب في بدايته عدسة وفي نهايته العينية في المستوي البؤري للعدسة السابقة.

خطوات العمل :-

1- نضبط عرض فتحة الشق لاقل مايمكن .
2- نضع محزوز الحيود وننظر خلال التلسكوب حتي نحصل علي الخط الرئيسي بحيث يكون واضح قدر الامكان ويقع عند تقاطع السلكين .
3- يدار التلسكوب للجهة اليسري فنحصل علي الخطين(T_2 T_1) ونسجل لهما علي الترتيب.
4- يدار التلسكوب الي الجهة اليمني فنحصل(T_1T_2) علي الخطيين ونسجل لهما علي الترتيب.

$$\lambda=d\sin\Theta/n$$

النتائج :-

1) للحصول علي n_1 ومنها λ_1 :-

الجهة اليسري T_1		الجهة اليمني T_2		$2\Theta=a_1-a_2+b_1-b_2/2$	
A_1	B_1	A_2	B_2	A_1-a_2	B_1-b_2

$2\,\Theta_1 = (a_1-a_2)+(b_1-b_2)/2$

$\Theta_1 = 2\,\Theta_1/2$

$\lambda_1 = 1m/(2*N)\sin\Theta$

للحصول علي n_2 ومنها علي Θ_2 :-

الجهة اليسري T_1		الجهة اليمني T_2		$2\Theta=a_1-a_2+b_1-b_2/2$	
A_1	B_1	A_2	B_2	A_1-a_2	B_1-b_2

$2\,\Theta = (a_1-a_2)+(b_1-b_2)/2$

$\Theta_2 = 2\,\Theta_2/2$

$\lambda_2 = 1m/(2xN)\sin\Theta_2$

$$\lambda = \lambda_1 + \lambda$$

$$1m = 10^{10}A$$

الخطا المطلق=(القيمة الحقيقة ـالقيمة العملية الظاهرة) /القيمة الحقيقة

الخطا المنوي =الخطا المطلق x‰

الذرات والجزيئات
Atoms and Molecules

حاول المفكرون منذ العصور القديمة أن يتعرفوا على طبيعة المادة، ونتيجة لتضافر جهودهم عبر السنين تكونت نظرتنا الحالية عن التركيب الذري التي تبلورت في أوائل القرن التاسع عشر الميلادي بنظرية دالتون الذرية. ونحن نعلم الآن أن جميع أشكال المادة تتكون من ذرات وجزيئات وأيونات. وأن كل ما يخص علم الكيمياء يهتم بطريقة ما بما يخص هذه الأصناف الثلاث.

2. 1 النظرية الذرية The Atomic Theory

منذ القرن الخامس قبل الميلاد اقترح الفيلسوف الاغريقي ديمقراطس فكرة الذرة بمعنى أن جميع المواد تتكون من أجزاء أو جسيمات متناهية في الصغر غير قابلة للانقسام undividable أطلق عليها atomos غير التي تعني حرفيا باللغة اليونانية الشيء القابل للانقسام. ولكن فكرة الذرات رفضت من قبل عدد من الفلاسفة الاغريق خاصة أرسطو وافلاطون.

ولكن العلم الحديث قدم العديد من الدلائل التجريبية التي دعمت فكرة وجود الذرة والتي نتج عنها تدريجيا التعاريف الحديثة للعناصر والمركبات.

وقد قدم العالم الانجليزي جون دالتون في العام 1808 م تعريفا تفصيليا للوحدات الأساسية لبناء المادة التي نعرفها باسم الذرات atoms. وقد كان هذا ايذانا ببدء العصر الحديث لعلم الكيمياء.

ويمكن تلخيص الفروض الأساسية التي قامت عليها نظرية دالتون الذرية في النقاط التالية:-

1- تتكون العناصر من جسيمات متناهية الصغر تسمى ذرات.
2- تتشابه ذرات العنصر الواحد من ناحية الحجم والكتلة والخواص الكيميائية وتختلف ذرات أي عنصر عن ذرات عنصر آخر.
3- تتكون المركبات من اتحاد ذرات أكثر من عنصر ولأي مركب فإن نسبة عدد ذرات العناصر المكونه له تكون أما عدد صحيح أو كسر بسيط.
4- يحدث التفاعل الكيميائي بأحد الطرق الآتية : فصل الذرات المكونة للمركب عن بعضها أو عن طريق اتحاد ذرات جديدة أو اعادة ترتيب الذرات المكونة للمركب، وفي كل الأحوال لا ينتج عن التفاعل تخليق ذرات جديدة ولافناء لذرات موجودة.
يوضح الشكل 2 . 1 رسم تخطيطي للفرضيات الثلاث الأخيرة.

يوضح الفرض الثاني أن ذرات العنصر الواحد تختلف عن ذرات جميع العناصر الأخرى ومع هذا فإن دالتون لم يعط أي محاولة لوصف تركيب وتكوين الذرات فالواضح أنه لم يكن يمتلك أدنى فكرة عن هذين الأمرين. ولكنه كان مدركاً أن الخواص المختلفة التي تظهرها العناصر كالأكسجين والهيدروجين يمكن تفسيرها بناءا على الاختلاف في تركيب كل من ذرة الاكسجين والهيدروجين ومن الفرض الثالث نجد أن تكون مركب معين يستلزم ليس فقط ذرات من نوع محدد ولكن أن تكون كذلك بأعداد محددة.

ومن الفرض الثالث نجد أنه لتكوين مركب ما فإننا نحتاج إلى ذرات من العنصر المناسب وكذلك عدد محدد من الذرات هذه الفكرة هي امتداد للقانون الذي اقترحه الكيميائي الفرنسي جوزف بروست في العام 1799 م والمعروف باسم قانون النسب الثابتة الذي ينص على

"أن العينات المختلفة من مركب ما تحتوي دائما على نفس العناصر بنفس نسب الكتلة "

فإذا حللنا عينات مختلفة من مركب ثاني أكسيد الكربون فإننا سنجد أنها تحتوي في كل عينة على نفس نسب الكتلة المختلفة لعنصري الكربون والأكسجين. وعلى هذا الأساس نجد من المنطقي أنه لو كانت نسبة الكتلة للعناصر المختلفة المكونة للمركب نسبة ثابتة فإن نسب ذرات هذه العناصر يجب أن تكون أيضا ثابتة.

كذلك فإن الفرض الثالث من نظرية دالتون يعمل على تدعيم قانون النسب المتضاعفة الذي ينص على:

الحث الكهرومغناطيسى

* مقدمة:

* استطاع أورستد اكتشاف أن: التيار الكهربي يولد مجالا مغناطيسيا

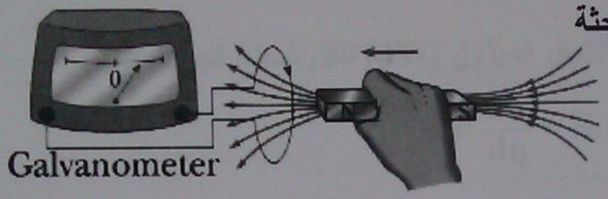
- حاول فاراداى إثبات عكس ما قاله اورستد وحقق ذلك فعلا عام 1831 ونجح في : "توليد تيار كهربي من مجال مغناطيسي"وسميت هذه الظاهرة:(**الحث الكهرومغناطيسى)**

ويسمى التيار الناتج : تيار كهربي حثي (I) والقوة الدافعة الكهربية حثية (ε)

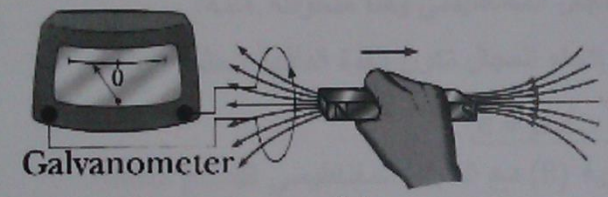
** تعريف الظاهرة :

" إذا قطع سلك فيضا مغناطيسيا يتولد في السلك قوة دافعة كهربية مستحثة وكذلك تيار مستحث"

* هذا يعنى أن: [شرط تولد قوة دافعة مستحثة هو قطع خطوط الفيض المغناطيسي]



(a)



(b)

* الاستنتاج:

* حركة مؤشر الجلفانومتر تعنى تولد قوة دافعة مستحثة وتيار مستحث

- اتجاه حركة مؤشر الجلفانومتر تعتمد على اتجاه حركة المغناطيس

* الحقيقة هي :

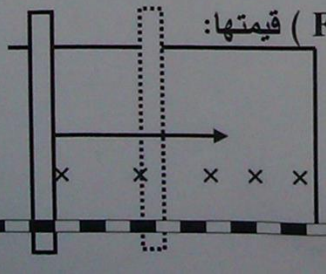
أنه عند قطع خطوط الفيض المغناطيسي بواسطة موصل (سلك أو ملف) يحدث إثارة للإلكترونات الحرة في الموصل فتتحرك هذه الإلكترونات في اتجاه ما في الموصل فتسبب فرق في الجهد بين طرفيه وبالتالي تولد تيار مستحث.

- يضيف هذا الاكتشاف نوعا جديدا ومهما لانتاج الطاقة الكهربية وهو تحول الطاقة الميكانيكية الى طاقة كهربية .

* حركة موصل في مجال مغناطيسي:

من المعروف سابقا انه عند وضع سلك مستقيم طوله (ℓ) يمر به تيار كهربي (I) في مجال مغناطيسي عمودي حثه (B) فانه يتولد قوة مغناطيسية تحركه (F) قيمتها:

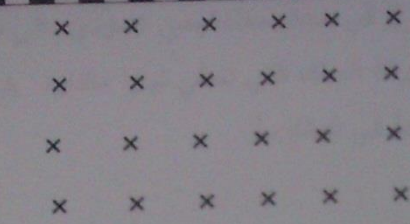
$$F = I.\ell.B$$



اما الآن نعكس التجربة:

بتحريك سلك مستقيم طوله (ℓ) عمودي على مجال

مغناطيسي حثه (B) وليكن تحرك مسافة (dx)



في زمن (dt) فإنه يتولد في السلك قوة دافعة حثية (ε) وكذلك تيار حثي (I)

* نلاحظ ان الشغل النبذول لتحريك السلك هو:

$$dW = F.dx$$

ومعلوم ان: $dx = v \cdot dt$ & $F = I.\ell.B$ بالتعويض في الشغل نجد ان:

$$dW = F.v.dt = I.\ell.B.v.dt$$

وحيث ان الشحنة التأثيرية التي تولدت خلال زمن (dt) هي: $dq = I.dt$

فيكون المعادلة هي: $dW = B.\ell.v.dq$

ومن المعروف ان القوة الدافعة الكهربية هي الشغل المبذول (dW) لنقل شحنة كهربية (dq) :

$$\varepsilon = \frac{dw}{dq} = B.\ell.v$$

حيث ان (v) هي سرعة حركة السلك في المجال المغناطيسي وهنا ملحوظة هامة:

1. اذا كان اتجاه حركة السلك عمودية على اتجاه المجال تكون القوة الدافعة الحثية هي:

$$\varepsilon = B.\ell.v$$

2. عندما يكون اتجاه حركة السلك يميل بزاوية (θ) مع المجال المغناطيسي فتصبح العلاقة:

$$\varepsilon = B.\ell.v.\sin\theta$$

ولايجاد شدة التيار الكهربي المستحث نستخدم العلاقة:..... $I = \frac{\varepsilon}{R} = \frac{B.\ell.v}{R}$

والقدرة الكهربية المستنفذة تكون:..... $P = \varepsilon.I$

• قاعدة فلمنج لليد اليمنى :

هي قاعدة لمعرفة اتجاه التيار الحثى المتولد في سلك مستقيم يتحرك عمودي على مجال المغناطيسي وهي تنص على أنه:

[عند تعامد أصابع اليد اليمنى الثلاثة الإبهام والسبابة والوسطى فإذا كان الإبهام يشير لاتجاه الحركة والسبابة لاتجاه المجال المغناطيسي فيكون الوسطى يشير إلى اتجاه التيار الحثى الناتج.]

** مثال:

تتحرك سلك طوله 1.2 m على موصل به مقاومة 6 Ω في مجال مغناطيسي عمودي على سطح الموصل حثه المغناطيسي $2.5\ Wb/m^2$ احسب سرعة حركة السلك التي تعطي تيارا مقداره 0.3 A ثم احسب القوة الدافعة الكهربية الحثية وكذلك القدرة الضائعة في المقاومة.

** الحـــل:

$\ell = 1.2\ m\ ,\quad R = 6\ \Omega\ ,\quad B = 2.5\ Wb/m^2\ ,\quad I = 0.3\ A\ ,\quad \varepsilon = ??\ ,\quad P = ??$

$$\varepsilon = B.\ell.v = I.R$$

$$\therefore v = \frac{I.R}{B.\ell} = \frac{0.3\times 6}{2.5\times 1.2} = 0.6\ m/s$$

$$\varepsilon = 2.5 \times 1.2 \times 0.6 = 1.8\ V$$

$$P = \varepsilon .I = 1.8\times 0.3 = 0.54\ W$$

* تجربة فاراداى لتوليد قوة دافعة مستحثة في ملف:

1. وصل فاراداى طرفي ملف حلزوني بجلفانومتر حساس مؤشره في المنتصف
2. عند إدخال مغناطيس فى الملف لاحظ انحراف مؤشر الجلفانومتر (لحظيا) في اتجاه ما.
3. وعند لحظة إخراج المغناطيس من الملف ينحرف مؤشر الجلفانومتر في اتجاه مضاد.
4. وعند توقف المغناطيس عن الحركة يعود المؤشر للصفر ويتوقف التيار.

قانون فاراداى:

القوة الدافعة المستحثة في ملف تتناسب طرديا مع معدل التغير في الفيض المغناطيسي

السؤال الآن: ما هي العوامل المؤثرة في القوة الدافعة الكهربية المستحثة ؟؟

الإجابة : 1- معدل التغير الزمني لقطع خطوط الفيض المغناطيسي :أي أن: $\left(\varepsilon \propto \frac{d\varphi}{dt}\right)$

2- عدد لفات الملف: .... $(\varepsilon \propto N)$

فتكون الصورة النهائية لقانون فاراداى هي: ⇐ $\boxed{\varepsilon = -N\frac{d\varphi}{dt}}$

وعندما تكون مقاومة الملف هي (R) فتكون شدة التيار الحثي هي: $\boxed{I = \frac{\varepsilon}{R} = -\frac{N}{R}\frac{d\varphi}{dt}}$

* يبقى سؤال : ما سبب وجود الإشارة السالبة في قانون فاراداى ؟؟؟؟

ج : الإشارة السالبة تدل على أن:

" اتجاه القوة الدافعة الحثية (اوالتيار المستحث) بحيث يعطي فيضا مغناطيسيا يعاكس أو يضاد دائما مقدار التغير في الفيض المغناطيسي المسبب له " وتسمى هذه (قاعدة لنز)

** تفسير قاعدة لنز :

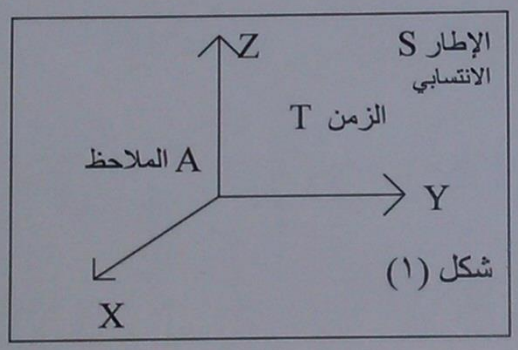
(1)

الإطار الانتسابي: Reference frame

تتألف الظواهر الطبيعية من أحداث Events تقع عند مكان معين وزمن معين ، ولكي نقيس تلك الأحداث ، و نصوغ القوانين التي تحكمها يلزمنا ساعة مضبوطة لمعرفة زمن وقوعها وهندسة فضاء تمكننا من تحديد أماكنها والمسافات بينها .

تتعين خواص الفضاء الثلاثي الذي تقع فيه الأحداث في الطبيعة الكلاسيكية بهندسةاقليدس حيث تتحدد النقطة الهندسية بتقاطع ثلاث مستويات يمكن اختيارها للسهولة متعامدة. كل مستويين يتقاطعان في خط مستقيم. وفى النموذج الرياضي تمثل الحادثة بنقطة هندسية يتحدد موضعها بقياس أبعادها (احداثياتها Coordinates) عن ثلاث مستويات تسمى المستويات الأساسية ،كما يطلق على خطوط تقاطع هذه المستويات المحاور الأساسية وتقاس الأطوال أو المسافاتبين الأحداث بالنسبة لمجموعة المحاور الأساسية تبعا لقواعد الهندسة الاقليدية .

تعرف مجموعة المحاور الأساسية بالإضافة إلى ساعة قياس الزمن بالإطار الانتسابي ويرمز له بالرمز S ، حيث تكون الإحداثيات المكانية هي (X,Y,Z) والزمن هو T كما يطلق اسم الملاحظ أو المراقب Observer على من يقوم بالملاحظة والقياس في هذا الإطار الانتسابي ، ويرمز بالرمز A شكل (١)



شكل (١)

كم عدد الإطارات الانتسابية ؟

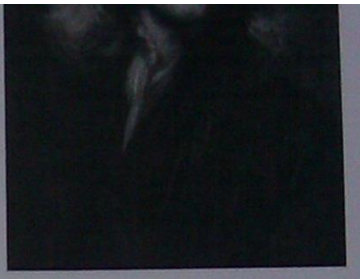
يوجد عدد لا نهائي من الإطارات الانتسابية التي تصلح لقياس الظواهر الطبيعية -

كيف يختارها المراقب ؟

وعادة يختار المراقب الإطار الانتسابي الذي يتفق مع حالته الميكانيكية فإذا كان المراقب ساكنا فانه يختار إطارا ساكنا ، وإذا كان متحركا فانه يختار إطارا متحركا معه بنفس حالته الديناميكية (أي يكون ساكنا بالنسبة له)

وسنرمز لهذه الإطارات المتحركة بالرموز S' و S'' و------ حيث تكون الإحداثيات المكانية هي (X' , Y' , Z') و (X'' , Y'' , Z'') و----- والأزمنة المناظرة هي T' و T'' و---------- وهكذا .

قوانين نيوتن للحركة



الإطار المطلق: Absolute Frame

فرض نيوتن وجود إطار انتسابي مفضل عن غيره ، ويمكن قياس جميع الظواهر من سكون أو حركة بالنسبة إليه ، فالأطوال والأبعاد يمكن قياسها ، والأزمنة التي تقع عندها الأحداث يمكن تعيينها ، أينما كان الجسم ومتى وقع الحادث . هذا الإطار أطلق عليه الإطار المطلق Absolute Frame

وقد صاغ نيوتن قوانينه الثلاث المعروفة بالنسبة إلى الإطار المطلق ، فإذا رمزنا لهذا الإطار بالرمز S ، فان قواني
ن نيوتن تأخذ الصور الآتية :

القانون الأول:

إذا انعدمت القوة $\vec{F}$ المؤثرة على جسيم ما ، فانه يتحرك بسرعة منتظمة $\vec{v}_o$

في خط مستقيم ، أي انه إذا كانت $\vec{F} = 0$ ، فان :

$$\vec{v} = \frac{d\vec{r}}{dt} = \vec{v}_o \qquad (1-1)$$

حيث $\vec{r}$ متجه الموضع للجسيم و t الزمن مقاسان بالنسبة للإطار المطلق كذلك

بتكامل الطرفين بالنسبة إلى t

$$\int \frac{d\vec{r}}{dt}\, dt = \int \vec{v}_o\, dt$$

$$r = v_o t + \text{constant}$$ ثابت

يمكن تعيينه كآلاتي : عندما $t = 0$ فان : $r = r_o$

وبالتعويض :

$$\text{constant} = r_o$$

الزمن المطلق: Absolute Time

من قانون نيوتن الأول نجد انه إذا تلاشت القوة المؤثرة على جسيم ما ، فان مسار الجسيم مقاسا بالنسبة للإطار S يكون خطا مستقيما . إذا اعتبرنا إطارا انتسابيا آخر S' يتحرك بسرعة منتظمة في خط مستقيم بالنسبة للإطار S ، فإننا نجد أن الجسيم يتحرك بالنسبة إلى S' بسرعة منتظمة $\vec{v}'$ تعطى بالصورة :

$$\vec{v}' = \vec{v} - \vec{V} \qquad (١-٥)$$

حيث $\vec{v}$ سرعة الجسيم بالنسبة إلى S . إذا كان r' هو متجه الموضع للجسيم بالنسبة إلى S' فان:

$$\frac{\vec{dr}'}{dt'} = \vec{v} - \vec{V} \qquad (١-٦)$$

حيث t' الزمن مقاسا بالنسبة إلى S' ،و وبالتعويض عن

$$\vec{v} = \vec{v}_o .$$

من قانون نيوتن الأول في المعادلة السابقة فان:

$$\frac{\vec{dr}'}{dt'} = \vec{v}_o - \vec{V} \qquad (١-٧)$$

بإجراء التكامل بالنسبة إلى t' ، نجد أن :

$$\int \frac{\vec{dr}'}{dt'} dt' = \int \vec{v}_o \, dt' - \int \vec{V} \, dt'$$

نظرية الكم والإشعاع الكهرومغناطيسي:

٧-١ ما هي الموجة؟ وضحي المقصود بالمصطلحات التالية:
الطول الموجي wavelength, التردد frequency, سعة الموجة amplitude
٧-٢ ما هي وحدات كل من الطول الموجي والتردد للموجات الكهرومغناطيسية؟ ما هي سرعة الضوء بالمتر/ ثانية؟
٧-٣ عددي أنواع الإشعاع الكهرومغناطيسي مبتدئة بالإشعاع ذو الطول الموجي الأطول ومنتهية بالإشعاع الأقصر في الطول الموجي؟
٧-٤ أعطي قيم أعلى وأقل طول موجي للمنطقة المرئية في الطيف الكهرومغناطيسي؟
٧-٥ باختصار وضحي نظرية الكم لبلانك؟ وما هو الكم quantum؟ ماهي وحدة ثابت بلانك h ؟

التأثير الكهروضوئي:

٧-١٣ وضحي بالمقصود بالتأثير الكهروضوئي؟
٧-١٤ ما هو الفوتون photon ؟ ما الدور الذي لعبه تفسير اينشتين للتأثير الكهروضوئي في تطوير مفهوم الطبيعة الموجية للإشعاع الكهرومغناطيسي؟

نظرية بور لطيف ذرة الهيدروجين:

٧-٢١ ما هو طيف الانبعاث؟ كيف يختلف الطيف الخطي عن الطيف المستمر؟
٧-٢٢ ما هو مستوى الطاقة؟ وضحي الفرق بين المستوى الأرضي ومستوى الإثارة؟
٧-٢٣ باختصار وضحي نظرية بور لطيف ذرة الهيدروجين وكيف تفسر ظهور طيف الانبعاث؟ كيف اختلفت نظرية بور عن مفهوم الفيزياء التقليدية؟
٧-٢٤ وضحي المقصود بالإشارة السالبة في المعادلة (٥.٧) ص٢٧٥

الطبيعة المزدوجة للموجة:

٧-٣٥ وضحي المقصود بالعبارة " المواد والأشعة لها طبيعة مزدوجة "
٧-٣٦ كيف عللت فرضية دي بروجلي حقيقة أن طاقة الإلكترون في ذرة الهيدروجين مكماة؟
٧-٣٧ لماذا تعد معادلة (٨.٧) معبرة فقط في حالة الجسيمات الصغيرة مثل الإلكترونات والذرات وليس المواد العينية؟
٧-٣٨ هل تمتلك كرة البيسبول الطائرة خواصاً موجية؟ وإذا كان الجواب نعم فلماذا لا نستطيع تقدير خواصها الموجية؟

ميكانيكا الكم:

٧-٤٣ ما هي عيوب نظرية بور؟
٧-٤٤ ما هو مبدأ عدم التأكد لهايسنبيرج Heisenberg؟ وما هي معادلة شرودنجر Schrödinger ؟
٧-٤٥ ما المعنى الفيزيائي للدالة الموجية ψ؟
٧-٤٦ كيف استخدم مفهوم كثافة الإلكترون في وصف مكان الإلكترون في المعالجة بميكانيكا الكم؟
٧-٤٧ ما هو الفلك الذري؟ كيف يختلف الفلك الذري عن المدار؟

الأفلاك الذرية:

٧-٤٨ صفي شكل الأفلاك d, p, s وما هي قيم أعداد الكم m_ℓ, ℓ, n لهذه الأفلاك؟
٧-٤٩ عددي أفلاك الهيدروجين مرتبة وفقا لزيادة الطاقة؟
٧-٥٠ وضحي خواص فلك s, فلك p, فلك d, وأي من الأفلاك التالية غير موجود
$4g, 3f, 3d, 3p, 2d, 2s, 1p$

Tables

Table 6.7: Sample of Observation framework used for analysis of data analysis (Nunan 1991)

Class Activities	***Comments***
Activity type (What is the activity type, e.g., lecture, discussion?)	Activities included lecture, problem-solving tasks, Q&A, and discussion.
Content (What is the focus of the class?)	• Specialized knowledge of terms used in the business world was needed to participate. Topics included: inflation, the definition of money, liquidity, interest, financial crises, reserve ratio, the Federal Reserve, federal charters, fiscal vs. monetary policy, loss and gain, bonds, and discount rates in reserve ratio. • A wide range of lexico-grammatical resources was needed. Pragmatic acts included: questioning, answering, explaining, hypothesizing, exemplifying, clarifying, and arguing. Also, a specialized knowledge of the topic was needed to apply new concepts. • Students need to engage in problem-solving as a means of acquiring, elaborating, personalizing, and generalizing
Student modality (What is the nature of student participation? Are students involved in listening, speaking, reading, writing, or combinations of these?)	• The professor set up a problem and proceeded to ask students questions. • About 80% of questions initiated by the lecture • Students answer questions raised in the text. • Listening to lecturer and taking notes were the most activity applied.
Use of target language To what extent is the target language used?	
Discourse initiation Do learners have opportunities to initiate discourse?	

Table 6.11: Ellis and Johnson's framework

1. Genre: Type of text being analysed, e.g. report, letter, memo, etc. Who are the target audience? e.g. bosses, colleagues, etc.		
2. Organisation: How is the text organised? What is the layout and how many paragraphs/sections? Is there an introduction/conclusion? Is there list of points of cohesive paragraph?		
3. Sentence structure: are sentences complete or in note form? Are they correctly punctuated? Are they linked with cohesive devices? Are sentences simple/complex? Are there relative or clauses?		
4 .1. Function	**4.2. structure**	**4.3. Lexis**
What function are being exposed? e.g. condition, intention, description, request, order.	What are the most frequent grammatical structures? e.g. active/passive, verb forms , complex noun phrases, prepositional phrases, verb tenses.	What type of vocabulary is used? e.g. technical vocabulary, semi-technical. Which lexical items occur most frequently?

Figure 6.3: Breen and Candlin's model for the analysis and evaluation of teaching materials.

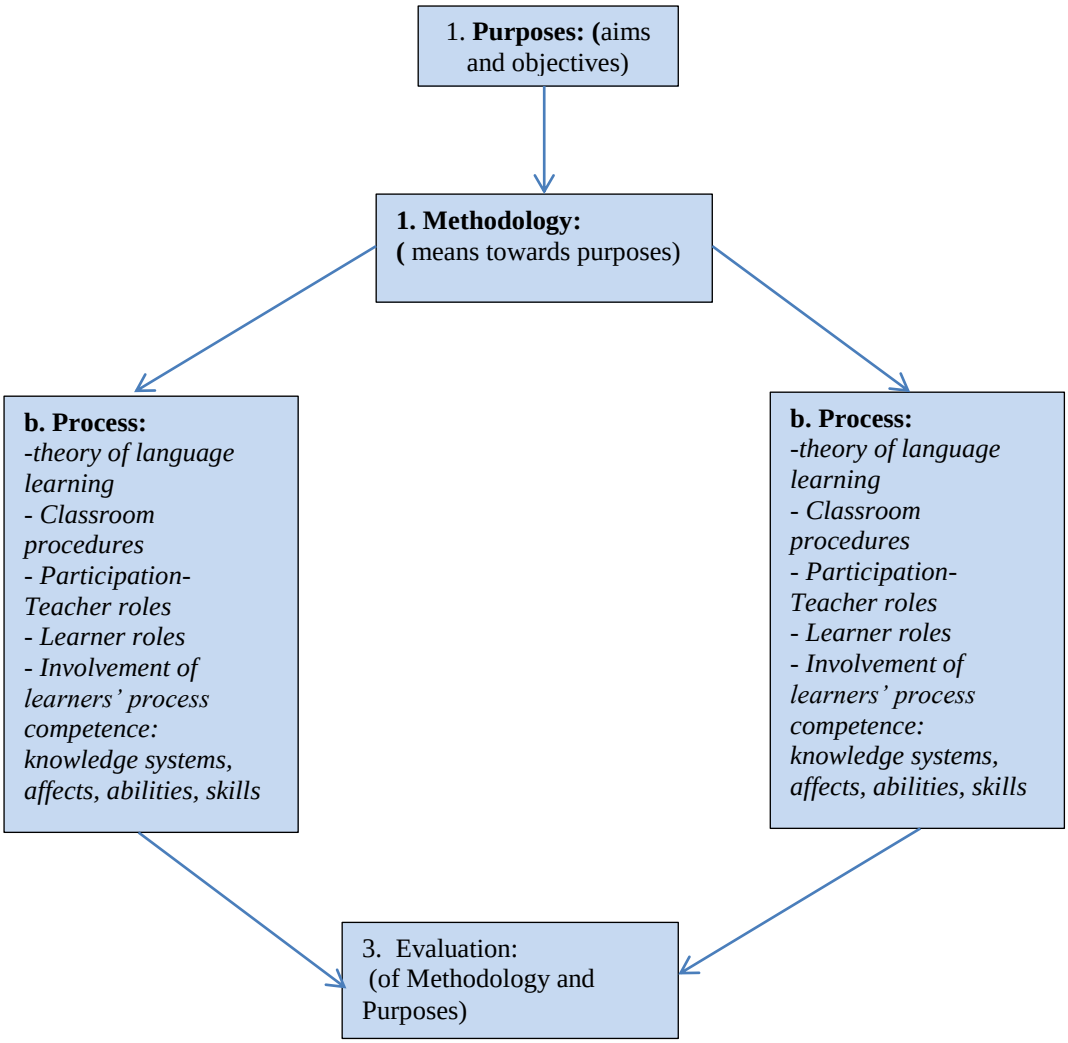


Figure 6.4: The English Class seat arrangement