UNIVERSITY OF SOUTHAMPTON

THE IMPLEMENTATION OF A NEW SECONDARY PHYSICS CURRICULUM IN TURKEY

AN EXPLORATION OF TEACHING ACTIVITIES

BY

ALI RIZA AKDENIZ

(BSc(Ed)., MEd)

This Thesis was Submitted for Examination for the

Degree of Doctor of Philosophy

FACULTY OF EDUCATIONAL STUDIES

November, 1993

TABLES OF CONTENTS

LIST OF CONTENTS

CHAPTER 3 CURRICULUM CHANGE

CHAPTER 4 METHODOLOGY

CHAPTER 5 DEVELOPMENT OF DATA COLLECTION INSTRUMENTS

CHAPTER 6 MAIN STUDY DESIGN

CHAPTER. 7 DATA ANALYSIS

LIST OF TABLES

LIST OF APPENDICES

ACKNOWLEDGEMENTS

I would like to express my sincere gratitude to my Supervisor Prof. Peter J. Kelly for his encouragement, helpful comments, unsparing support and advice at each stage of this study. I also wish to extend my thanks to Dr. Terry Martin for his supervision at the beginning of my work.

My special thanks to Prof. Helen Simons, Head of School of Education, Dr. Robin Usher, Dr. Rose Mitchell, Mr. Alan Pritchard, Head of Science Division, Mrs. Mary Ratcliffe, for their comments and professional advice.

I am grateful to the Turkish Government the Administration of Karadeniz Technical University and the Fatih Faculty of Education for sponsoring this study. I am indebted to the Turkish Ministry of Education, Black-Sea Educational Authorities, teachers and students for contributing to the outcomes of this study.

I must also thank Mrs. Marigold Smart and Mr. Philip Myles from the Language Centre for their assistance in refining the language of my study.

Special thanks also go to my colleagues Dr. Salih Cepni, Dr. Alipasa Ayas, Mr. Ali Al Musawi, Mr Ahmet Gucel and Ms. Maria Elisa Silveira for their comments on the instruments used in the study and their moral support.

Finally, I owe very special thanks to my parents, my grandfather, I. Hakki, grandmother Hatice, my father Ali, my mother Emine, My sisters Fatma, Ayse and Havva, my brother Bulent. My deep gratitude goes to my wife, Umran and my beloved daughter, Neslihan without whose love and patience this work would not have been completed.

UNIVERSITY OF SOUTHAMPTON

ABSTRACT

FACULTY OF EDUCATIONAL STUDIES

Doctor of Philosophy

THE IMPLEMENTATION OF A NEW SECONDARY PHYSICS CURRICULUM IN TURKEY AN EXPLORATION OF TEACHING ACTIVITIES

BY ALI RIZA AKDENIZ

One of the aims of the Turkish Ministry of Education is to improve the implementation of the Physics curriculum in secondary schools.

This study attempts to compare the objectives of the Ministry of Education concerning the implementation of the physics curriculum and the activities actually used in the schools of the Black-Sea Region of Turkey. It is hoped that this study will contribute towards developing improved methods in the curriculum change process.

A literature review on the theoretical aspects of curriculum change and curriculum implementation studies in other countries was undertaken. This provided the information for the development of this study.

The researcher employed a case study research methodology using both teachers' and students' questionnaires, class observation of four teachers and interviews with them. Fifty physics teachers from the region mentioned above completed the questionnaires. Four physics teachers from one province of the same region were observed and interviewed. Questionnaires were applied to students in the classes that had been observed.

The researcher adapted and piloted the research instruments. The teachers' questionnaires included 27 items related to biographical information, curriculum awareness, teaching preparation and opinions on teaching objectives. A semi-structured observation schedule was developed and used to record the types of classroom activities used and the amount of time the teacher devoted to them. Interviews focused on the reasons for choosing teaching activities. Students' questionnaires were used for the purpose of analysing the teaching activities from their point of view.

Responses to the teachers' questionnaires indicated that there is a gap between the objectives of the Ministry of Education and the actual implementation of the physics curriculum. It was found from the teachers' questionnaires and interviews that activities unique to individual teachers were being used in the classrooms. It was also found that teachers spent about 80 percent of their time on teacher-dominated activities. Student responses revealed that some of the activities suggested by the Ministry of Education did not suit their educational and cultural backgrounds.It was also found that teaching activities were affected by the demands of the Ministry, the University Entrance Examination and conditions in the classrooms.

Following the conclusions drawn from the study, recommendations are made for improving the implementation process and teaching-learning activities and suggestions are given for future implementation studies.

CHAPTER 1

ORIENTATION AND OVERVIEW

1.0 Introduction

Every country in order to improve its living standards in line with other countries, aims to benefit from the most advanced innovations. One of the most important ways to carry out this aim is to give its people a better school education. This requires us to define the essential business of schools in a sufficiently detailed way.

In order to define the essential business of schools in a society, one of the main requirements is to decide the contents and objectives of new curricula which should reflect the realities of the context. Having completed this process, a second and most important issue is suddenly raised, which is how the intended curricula could be put into practice in schools. Then, the issue of the effectiveness of the dissemination as well as the implementation process become a crucially important area to be investigated.

Curriculum implementation studies, traditionally, used to investigate only the students' achievements (Fullan & Pomfret, 1977). Later, this trend shifted to defining the factors which affect the implementation process of a curriculum (Fullan, 1992) rather than the outcomes. Nowadays curriculum implementation studies are particularly concerned with exploring teachers' beliefs and perceptions about the factors which influence their classroom practice.

Investigation of curriculum implementation mostly involves a case study research methodology and has recently focused on common practices which teachers share or reflect in their classroom.

Based on both theoretical and empirical curriculum change studies, this study investigates how teachers implement the new physics curriculum in secondary schools in Turkey. It focuses mainly on teaching activities. The main consideration is to explore teachers' points of views concerning the key factors which affect their manner of classroom practice.

The need for this study is the subject of the next section. Additionally, the research questions, a summary of the main issues in the dissemination and implementation process and a view of the research methodology and main study processes are also given in the following sections of this chapter.

1.1 Need for The Study

Teachers' beliefs and interpretation of curriculum objectives are two of the main factors which influence teachers' methods of teaching in classroom practice. Because of their importance, these two factors have already taken educational researchers' attention in implementation studies (Crocker, 1983). Apart from these two factors, external factors, such as curriculum materials, the dissemination process, class conditions and the expectation of families and students, should be considered in in-depth studies, particularly where the educational system is centralized (as in Turkey) (Tobin & Gallagher, 1987; Fullan, 1992).

The need for this study can be summarised as follows. There are many problems related to the new physics curriculum, such as the low achievement of students in physics (OSYM., 1990). Additionally, in Turkey there have been recent changes in the curriculum implementation for secondary schools. The findings of this study should help to determine the need for changes in the curriculum innovation process and will suggest some remedial attempts to improve the dissemination process which can be seen as effective factors for the implementation process. The other specific reason to conduct this investigation is that the implementation process of the new physics curriculum has not yet been studied at classroom level. Chapter 2 gives more information about the Turkish context and the need for this study.

The following section deals with the research questions and the study purposes.

1.2 Questions to be Studied

1.2.1 Purpose of the Study

The purpose of this study is to investigate the factors which affect the implementation process of the new physics curriculum in the schools of the Black-Sea Region of Turkey.

1.2.2 Questions

i- How do physics teachers perceive and interpret the objectives of the new curriculum?

ii- To what extent are the intended objectives implemented?

iii- What are the main activities which physics teachers employ in implementing the new physics curriculum?

iv- What are the main external factors which influence the implementation of the new physics curriculum?

v- What are teachers' perceptions about remedial changes for effective implementation of the new physics curriculum?

1.3 A View of some Issues in Studying Curriculum Dissemination and Implementation Processes

Chapter 3 briefly reviews literature related to the curriculum change process. Section 1 of this chapter presents the theoretical side while section 2 focuses on the practical aspects of curriculum change processes. In summary, the following issues relating to theoretical aspects of the curriculum change are presented: (a) some of the models which are used for the curriculum innovation processes; (b) the experience of some curriculum development agencies in the United Kingdom and Turkey. In section 1, components and recommendations for a successful dissemination process are also discussed in relation to the curriculum implementation process.

Section 2 of Chapter 3 presents some empirical studies relating to this investigation. In reviewing empirical studies, one of the aims is to define the methods employed in this study. Two main issues, one of which is a shortcoming in the dissemination process and the other influence of context realities on the implementation process, are also discussed in more detail in this section.

1.4 A View of the Research Methodology

Chapter 4 presents methodological issues and particularly the case study research methodology which is employed in this study. It describes recent approaches applied to implementation studies. This chapter also presents reasons for the approach employed in this study.

Description and definition of case study as given by Stake (1985), Merriam (1988) and Yin (1989) are presented as well. Each method used in this study is explained in detail.

Chapter 5 presents the development process of the research instruments. The presentation process goes from the pilot to the final form of the instruments and their employment in the main study process. Items on the instruments and their relevance to the research questions are also discussed.

1.5. A View of the Main Research Process

Chapter 6 presents in detail the steps followed in the main study. This chapter also includes the sample of the study as well. The following paragraphs briefly describe the main research samples and the purpose of the instruments used in this process.

-Fifty physics teachers filled in a questionnaire in the secondary schools of the Black-Sea Region of Turkey. The purpose of this was to explore the teachers' perspective as regards the dissemination and implementation process of the new physics curriculum.

-Four physics teachers were observed for a period of eight to ten weeks. The purpose of the observations was to give an account of the types and the quality of activities the teachers employed in their classrooms.

-The four observed teachers were also interviewed. The purpose of these interviews was to explore the rationale behind their teaching methods.

-Informal interviews were carried out with the physics teachers at the visited schools and the Local Educational Authorities, and with inspectors and policy makers from the National Ministry of Education (the implementation unit and the curriculum development unit). The purpose of these was twofold; (a) to get a global picture of curriculum innovations, and (b) to investigate problems encountered in the implementation process as viewed by an informally interviewed sample.

-Students in the observed classrooms also filled in the questionnaire for the purpose of exploring their attitudes and perspectives towards teaching-learning activities.

The above mentioned processes are given in Table 1 below with period of time and related research questions.

Table 1

Main Study Design

Subjects	Instruments	Research Questions (p.4) i	ii	iii	iv	v	Duration Periods
Fifty Physics Teachers	Teachers' Questionnaires	+	+	*	*	*	6(Weeks)
Four Physics Teachers	Observation Schedule	+	*	+			10
Four Physics Teachers	Formal Interviews	+	*		+	+	1
Other Related Bodies	Informal Interviews				*	*	2
Observed Class Students	Students' Questionnaires	*		+			1

+: Directly related

*: Indirectly related

1.6 A View of Research Findings: Analysis and Conclusion

Chapter 7 presents the analysis of the research findings in three sections. Section 1 deals with the findings of teachers surveyed. Section 2 presents the findings of observations and interviews. Section 3 gives the findings of the students' questionnaires. Section 7.4 presents the summary of the results which emerged from the three sections mentioned above.

Chapter 8 discusses the findings of the study. In this process, it presents the conclusions reached and recommendations and suggestions for future research. It also gives the researcher's reflections about the study for other interested researchers.

CHAPTER 2

TURKEY, ITS EDUCATIONAL SYSTEM AND SECONDARY PHYSICS CURRICULUM

2.0 Introduction

This chapter starts with a presentation of some general background information about Turkey and goes on to discuss its Education System, its organisation and structure. The main focus is on secondary education as well as its curriculum processes. Specifically, the physics curriculum implementation process is explored, this being the main focus of this study. It is expected that furthermore this chapter will clarify why such a study is needed.

2.1 Background of the Country

The Republic of Turkey straddles two continents, Asia and Europe, with 97 percent of its land in Asia. The European territory of 1,400 sq. km has borders with Greece and Bulgaria, and is separated from Anatolia in Asia by the Bosphorus strait. Anatolia stretches some 2,000 km east and is 960 km from north to south. It borders with Russia, Iran, Iraq and Syria. Turkey has a total area of 780, 576 sq. km.

The population is 60 million, with an annual growth rate of 2.4 per cent. 99 percent are Muslims, with religious and ethnic minorities such as Jews and Christians. Turkish belongs to the Ural-Altaic language group and is the official language of the nation. Written in Latin Script, it has been used in schools since 1926.

Turkey has been a democratic and secular state since the proclamation of the Turkish Republic in 1923, following the decline of the Ottoman Empire. The Republic pursued a policy of opening to the west from the twenties onwards and the radical social and political reforms of the founders of modern Turkey have determined the nature of the country today. The government and administration of the country are centralized. The country is divided into 73 provinces which are themselves subdivided into administrative districts. The governors of the provinces are appointed by the central government and the regional departments correspond to the ministries in the capital Ankara. The mayors of the municipalities are elected.

The urban population was 52.5 percent in 1985. The country's economy has an agricultural structure. According to the last available statistics (1985) 59.1 percent of the workforce belonged to the agricultural sector while 12.7 percent were employed in industry and 28.2 percent in the service sector. It is expected that this picture will gradually change in favour of the industrial and service sector in the coming years.

Turkey is a half-industrialized, developing country according to World Bank sources (OECD, 1989). In the 1980's the country set itself the goal of becoming fully industrialized, with high economic growth and full integration into the European Community by the year 2000. To achieve this aim, successive Turkish governments have given great emphasis to improving educational standards with a view to economic alignment to western standards and to furthering the nation's development (OECD, 1989).

2.2 Turkish Educational System

2.2.1 Organisation

In Turkey, there is a centralised state administrative system. There is a hierarchical structure from the central government to the provinces, divided on the basis of geographical considerations, economic conditions and public service requirements; there are lower level administrative districts within the provinces.

The Ministry of National Education is responsible for the performance, supervision and control of all the educational services of the State which include both formal and non-formal education. Essentially formal education comprises basic (pre, primary and middle school), secondary and higher education.

Educational administration is centralised under the control of the Ministry of Education. The Ministry is responsible for drawing up curricula, coordinating the work of official, private and voluntary organisations, designing and building schools, developing educational materials, etc.

A simplified version of the central organisation of the Ministry of Education is given in Figure 1 (see appendix 1). There are two advisory bodies in the central system. One of them, the National Convention of Education, is convened once a year by the Minister of Education and makes suggestions on almost all matters relating to education. The convention is a legal entity.

The second advisory body is the Board of Education. It is a permanent organisation. The members of the Board are appointed by the Minister. Among the functions of the Board are the design of curricula, examinations, and the approval of textbooks.

The policy for higher education, on the other hand, is the responsibility of the Higher Education Council.

The Board of Ministerial Inspectors inspects secondary schools directly and supervises provincial inspectors of elementary schools. The inspection and supervision of the elementary schools are undertaken by provincial inspectors of elementary education.

Educational affairs in the provinces and districts are organised by the Directors of National Education, who are appointed by the Minister. Provincial departments of education are relatively powerless in determining educational policies, but they take care of the other issues of the provinces, mostly administrative matters.

The Turkish Educational System was centralised by the "Law of Unification of Instruction" in 1924. This Law put all educational institutions including the religious schools under the control of the National Ministry of Education. However, the minority groups, the Jews and the Christians, are exempt from this. They have their own schools and curricula.

The general objectives of the Turkish national educational system are:

"a) to raise each member of the Turkish nation to be a citizen devoted to the reforms of the founder of Turkey and Turkish nationalism;

b) to bring up all Turkish citizens as constructive, innovative, and productive individuals;

c) to prepare all Turkish citizens for life through developing their interests, talents, and abilities so that they may acquire the necessary knowledge, skills, attitudes, habits of cooperation, and professional expertise to find happiness and contribute to the community" (quoted from Oney, B. 1985, p.5311).

2.2.2 Structure

Formal Turkish education today consists of three main components, namely Basic, Secondary and Higher education.

Basic education: The first level of basic education involves pre-schools, which accept children between the ages of three and six. Pre-school education provided by the government is not very common. Many of the pre-schools are privately owned and operated. The curricula of these schools have to be approved by the National Ministry of Education. Most pre-schools are in the big provinces and industrialized areas, where women participate in the workplace.

The second level of basic education involves primary schools. **Primary education**, which is compulsory, lasts five years. It is co-educational and free of charge in the case of state schools. Primary education accepts students at the age of six. The main aim of primary education is to prepare children for the third level of Basic education, middle schools. However, according to statistics (Turkish Review, 1989), 51 percent of children do not continue their education beyond the elementary schools.

The third level of basic education is middle schools. **Middle schools:** these schools cover three years which are free of charge in state schools. The general objectives of the middle schools are to develop students' general culture, to make them aware of problems affecting individuals and society and prepare them for secondary education. Since the concern of this study is the physics curriculum in secondary schools, the following sections deal with these schools in more detail.

2.3 Secondary Education

According to the National Education Act No 1789, of the National Education, secondary education follows basic education and covers general, religious, vocational and technical lycees (MEB (NATIONAL MINISTRY OF EDUCATION) 1986). While technical and religious lycees offer a four year programme, general, vocational lycees offer a three year programme.

The growth of the lycees involved dramatic changes. When the Republic was proclaimed in 1923, there were 1,241 students and 23 lycees. By 1935 the number of lycees had increased to only 38 with 13,622 students. In 1950, the number of lycees rose from 59 to 159. According to the latest statistics available, for the academic year 1987-1988, these numbers have increased as shown in the following Table (quoted from Turkish Review, 1989, p.242):

Table 2

Development of Public and Private General Lycees

(1923-1988)

Schools, students and Teachers.

Years	Schools	Students	Teachers
1923-24	23	1.241	517
1932-33	58	16.140	637
1960-61	194	75.632	4.219
1970-71	518	244.569	11.219
1980-81	1.167	534.605	41.334
1987-88	1.451*	697.227	54.512

* 1,451 Lycees, including 10 Night Lycees, 38 Anatolia Lycees, 28 Teacher Training Lycees, 121 Private Lycees.

"It is a common objective of the lycee programmes to offer students an education at secondary school level, to develop their general culture, to make them aware of problems affecting the individual and society and to try to find solutions to them, and to contribute to the economic, social and cultural development of the country " (MEB, 1985, p.26). In addition, the general lycees prepare students for entry into higher education, while technical and vocational lycees prepare students both for a professional qualification and also for entry into higher education.

This study is concerned with the physics curriculum implementation in general lycess. Therefore, the following section deals with these lycees.

2.3.1 General lycees

General lycees are the core of secondary education in Turkey as they teach the majority of young people who continue education after basic education. These schools are for three years.

After graduating from secondary schools, particularly general lycees, students have to pass two nation-wide examinations to be students at any university. These examinations are the OSS (Student Selection Examination) and the OYS (Student Allocation Examination). These examinations mostly influence the secondary school curriculum implementation in the class. Since only 25 percent of the candidates are accepted after these exams there has been heavy competition among lycee graduates. Therefore, teachers aim to teach lessons in such a way that their students can solve as many problems as possible in these examinations, rather than necessarily to understand the topics in a meaningful manner.

Related to these issues, Nasuhoglu (1984) supported the above argument by stating that the majority of science (physics, chemistry and biology) teachers in state schools teach science lessons in accordance with the questions asked in the university examinations in order to satisfy the students' expectations. This is because the majority of students want to solve the problems asked in these exams in a practical way. In fact, this is not the Ministry of Education expectation of how they want the teachers to apply the curriculum in their classes. The Ministry of Education wants teachers to teach the topic in a meaningful way, and to apply active learning which involves students' engaged activities. In other words, the requirement of the Ministry of Education is that teachers use "the inquiry teaching methods" (M.E.B., 1987). In fact, common knowledge suggests that teachers do not involve students in participated inquiry activities at the required level. Thus, one of the aims of this study is to explore this issue to see to what extent these kind of activities are applied and applicable in the class context.

The level of educational performance in general lycees is criticised by parents and the public (OECD, 1989). One of the indications that this criticism is justified is that the majority of lycee graduates take private university entrance courses. The following reasons may be put forward: high student-teacher ratios, crowded classrooms, frequently cancelled classroom hours, (OECD, 1989) and the inadequacy of a number of teachers, and other factors which arise from the dissemination process of the curriculum such as the inadequate functioning of the in-service programme and meetings with other physics teachers (see p.23). Issues relating to the curriculum innovation process are presented in the following section in detail.

2.4 Secondary School Curriculum

2.4.1 Development Process

Traditionally, the process of programme development was as follows. The Board of Education determined the general aims and content of the courses. When their proposals were approved by the Minister of Education, they were produced in the form of a curriculum guide. Then students textbooks were written conforming to this guide. After 1960 this trend started to change. Firstly, adaption of foreign curricula (the Physical Science Study Committee and Chemical Study) were implemented. Secondly, the committee based curriculum developed. These trends are reviewed in section 2.5. Since this study considers the physics curriculum, emphasis is given to this programme.

Recently, teachers in the Turkish Education System, have curriculum guidelines and textbooks prepared by a curriculum committee and approved by the Minister. Teachers have also yearly and daily plans prepared by themselves and approved by their principals. Items on the daily and yearly plans are given in section 2.4.3 of this chapter. The following section deals with the second stage of curriculum innovation processes in the Turkish Educational System.

2.4.2 Dissemination Process

The 'Journal of Official Communication', the in-service Programme and Local and School Subject-Colleagues' Meetings are the important elements of the curriculum dissemination process in Turkey, the following sections deal with each of them in turn.

2.4.2.1 'Journal of Official Communication' and its Function in the Dissemination Process

The Journal of Official Communication was first published on 9 January 1939 and has been published since then (MEB,1939) on Mondays of each week. This journal includes all the issues which the Ministry of Education wants to communicate to related bodies. These related bodies are teachers and principals in the schools and Local Educational Authorities in Provinces and Sub-Provinces. As far as teachers are concerned, when the journal reaches the schools, teachers have to read it and sign that they have read and understood it. Then they have the responsibility of implementing its recommendations and comments.

However, when the researcher visited schools, he noticed that most of the teachers signed it without reading and understanding. Some of the school principals even realize this fact and draw attention to these issues in their meetings with teachers. Therefore it is worth looking at this process in depth to find out the possible ways of improving the process of making teachers aware of the related issues, in other words making the dissemination process more effective.

The 'Journal of Official Communication' is the only official periodical, but there are some additional periodicals such as the 'National Education' journal, newspapers and magazines which contain related issues on curriculum innovation from time to time. Television and Radio are also used to inform teachers and the public about aspects of innovation. Some of the courses of the Turkish Open University are related to teacher education and include radio and television programmes. The purpose of these courses is to disseminate ideas about innovation to the teachers. These programmes are designed to help teachers who have not graduated from the faculties of teacher education, to develop their professional skills as well as subject knowledge which may not be up-to-date. With these courses, the Ministry of Education also aims at making most teachers Faculty Graduates.

2.4.2.2 In-Service Training and its Functions in the Dissemination Process

In-Service Training (INSET) is regarded by the Ministry of Education as a top priority. The INSET programme is financed and planned centrally by the Ministry of Education. However, the local organisation is undertaken by the educational authorities in each province. The Ministry of Education determines priorities each year and plans the year's programme. The in-service planners in the Ministry of Education can take ideas from several sources:

* National, provincial inspectors;
* Directorates within the Ministry of Education
* Provincial directors
* School principals
* Faculties of education

In order to provide a centre of excellence for INSET, the Ministry of Education has intended to set up a National Institute since 1987. However this is not yet established, but it is hoped that it will undertake, as one of its functions, to monitor examples of educational innovations and good teaching practice and ensure that they are widely known.

A report prepared by OECD (1989) noted that whenever a major curriculum change occurs or a new teaching method or type of equipment is introduced, appropriate courses are organised. It is claimed that in the dissemination processes, INSET is theoretically well organised throughout the country. The OECD report also indicated that "the unknown factor is that of the impact of INSET on school performance and classroom practice" (OECD, 1989, p.47).

As indicated above the effect of INSET on classroom practice is unknown as far as the dissemination of new curriculum is concerned. However, there is evidence that the function of INSET, which is theoretically well defined does not work as expected. One of the indications of this is that, as mentioned above, the Ministry has intended to establish a national institute since 1987 to undertake INSET functions.

2.4.2.3 Local and School Subject-Colleagues' Meetings

Local Educational Authorities of Provinces and Sub-Provinces also contribute to the dissemination process through their subject-colleagues' meetings. Issues concerning the experience of previous years of implementation process are considered by the senior subject teachers of the secondary schools. The chairman of this meeting is one of the vice-directors of the Local Educational Authority. He/she does not necessarily have a qualification in the relevant subject. The chairman only runs these meeting; he/she cannot make suggestions to the teachers concerning the subject matter. This is one of the weaknesses of these meetings. Nevertheless, teachers in the same province or sub-province can share their ideas and help each other through these meetings.

At the school level, subject teachers meet twice a year to discuss the implementation process. A more experienced subject teacher is chairman of these meetings. Theoretically, they examine the curriculum objectives and discuss how they can adopt them in their situation. By these meetings also, innovation disseminates to the appropriate teachers. In these meetings and in others with the provincial authorities, teachers discuss plans which are prepared by them for the implementation stage.

2.4.3 Implementation Process

Before classroom implementation, teachers prepare daily and yearly plans. Teachers are made aware of the process of preparing these plans. The 'Journal of Official Communication', INSET, and local and school subject-colleagues' meetings are the main sources of information.

A yearly plan includes the following items:

1- Time.

2- Topics

3- Objectives

4- Teaching/Learning Strategies.

5- Materials (Teaching-aids)

6- Experiments, Observations, Field trips

7- Cooperation with other colleagues

8- Homework

9- Examinations.

A daily plan includes the following contents.

Part I. LESSON

1- The Name of the Lesson.

2- Class

3- The Name of the Unit.

4- Topic

5- Time.

Part II. TOPIC

1- Objectives

2- The subheading of the topic

3- Teaching/learning Strategies

4- Materials (Teaching-aids)

5- Experiments, Observation, Field trips

Part III. EVALUATION

Part IV. COMMENTS ON THE IMPLEMENTATION OF THE LESSON

2.5 Physics Curriculum

2.5.1 Before the Modern Curricula

Traditionally, the process of programme development was as follows. The Board of Education determined the general aims and content of the courses. When this document was approved by the Ministry of Education it was produced in the form of a curriculum guide. Student textbooks were then written conforming to this guide.

The above process was followed for the development of the science programme until 1960. Common experience showed that during this time the content of the programme was out-of-date, the strategies were ineffective, the equipment and materials were not adequate to conduct experiments. Research was not undertaken to determine the effectiveness of this programme (Turgut, 1990).

2.5.2 Adaptation and Implementation of Modern Foreign Science Curricula in some Secondary Schools (Physics, Chemistry, Biology)

In the early 1960s, in parallel to curriculum change around the world in science education, some innovative attempts were made to improve science education in Turkey. Innovation related to the organisation of in-service training for teachers and the production of curriculum materials for schools. These attempts were enhanced by the establishment of the science lycee in Ankara. The aim of establishing this lycee was to use it as a pilot centre for adapting foreign programmes. A Commission was established in 1967 for the purpose of translating, adapting, and implementing in-service courses and evaluating these programmes. The members of this Commission were selected from the staff of the science departments in the universities of Ankara. During the first stage, the Physical Science Study Committee (PSSC) and Chemical Study (CHEM Study) from the United States were translated and pre-piloted in the science lycee. The Commission decided to disseminate this project to the nine general lycees for the purpose of large scale piloting. During this large pilot study, formative evaluations, including teachers' and inspectors' reports, discussions between evaluators and teachers, as well as measurement of student achievements, were carried out for the purpose of determining the future direction of the projects. As a result of the pilot study, the projects were reorganised and implemented in about 200 lycees in Turkey (Turgut and Pekgoz 1976). This wider implementation revealed that many problems still existed. Moreover, an extended revision of all aspects of the curricula was recommended. Hence, the Council of Education suggested to the Ministry of Education that they disseminate these projects to other lycees taking into account the above recommendations (MEB, 1983).

However, this suggestion was not taken up by the Ministry of Education. It decided to abandon the foreign-based curricula and develop new ones. Some of the reasons given for abandoning these projects were as follows: (a) The philosophy of these projects was not applicable to the Turkish classroom situation. For example the main philosophy of these projects was implemented on an 'inquiry-based' approach in the teaching-learning process. However, the physical condition of the Turkish classroom was not adequate for that purpose, (b) Most of the teachers were not made aware of the implementation of the projects. As a result of this, not more than 200 lycees were able to implement these projects.

Another argument for the Ministry of Education abandoning these projects was that the country of origin was not implementing them any more either. A further reason was that these projects were not suitable for the country because of the National University Entrance Examination. Since these projects could not be applied in most of the lycees, it created a dichotomy which was undesirable from the perspective of the National University Entrance Examination, in which all students take the same papers. Therefore, the Ministry decided to abandon the projects and implement one programme throughout the country (Interview: Curriculum Development Unit in the Ministry of Education, 18 April, 1992).

In terms of pre-service training regarding these projects, parallel innovations were not undertaken at the outset in the pre-service curricula. Although in later stages some attempts were made to integrate the innovations into the pre-service programme, it was not possible because of the wide-spread anarchy in the country during the period 1976-1980 (Turgut, 1990). Turkey experienced political crises during that period. Many of those involved were students taking opposing stances. It was a period of internal chaos, in which many people were killed, including university students. This process affected the school programmes in such a way that some courses were cancelled and sometimes students could not attend their classes for fear of being targeted. Occasionally in the classes there was police supervision to handle the conflicts between student factions.

2.5.3 The New Physics Programme

After the abolition of the implementation of the PSSC curriculum, a commission was established in the National Ministry of Education to develop new curricula in physics, as well as for other science subjects. The members of this commission, in contrast to the previous one, were selected from the school teachers and inspectors from the National Ministry of Education besides university lecturers from the related subjects.

The development commission of the new physics programme developed the programme in a short time, but the dissemination process of the programme was problematical at the outset. They developed the curriculum guide but the student textbook was not ready. Without any in-service programme, the teachers had to implement new content which they had not learned. However, in two years the Ministry of Education had developed the textbooks and made them available to teachers and students. Even after this process most of the teachers still faced many topics with which they were not familiar.

As far as the implementation level is concerned, it is worthy of investigation. The objectives of the new physics programme are similar to foreign-based ones, but may not match the context of the classroom, nor students' and parents' expectations. Specifically, suggested teaching activities are required from the teacher to apply 'inquiry methods' (MEB, 1987). It is dubious as to whether teachers can be expected to use these activities in the Turkish context. Some researchers who have studied the Turkish Education system have indicated that the conditions and structure of the Turkish context do not allow teachers to use the idealised 'inquiry teaching' method (Aydin, 1989; OECD, 1989 and Ayas, Cepni & Akdeniz, 1993). Therefore, a need is felt to explore and suggest activities which are applicable.(The study done by the researcher and his colleagues is attached to appendix 2).

CHAPTER 3

CURRICULUM CHANGE

3.0 Introduction

This chapter looks at the curriculum change process from two perspectives, namely: theoretical and practical. Section 1, Theoretical Aspects of Curriculum Change, starts by introducing models for curriculum change. It continues with a number of the British and Turkish experiences of curriculum innovation. Section 2 deals with the practical aspects of curriculum change. It mainly focuses on the relationships between the developmental and the diffusion process of curriculum change. This section concludes with a presentation of reviewed implementation studies.

This chapter aims to establish a basis for studying implementation in general. Specifically, it is expected that this will help to define the theoretical and methodological basis of this study as well.

3.1 Theoretical Aspects of Curriculum Change

Curriculum innovations do not take place frequently in most countries. They occur when the countries realise that their curricula are not up-to-date, and thus they change their curricula either by developing a new one or integrating the innovations into the existing curriculum.

In the history of curriculum development, the first and best-known systematic model was suggested by Tyler in 1949. His model is based on a set of objectives which are used in the curriculum development process (Stufflebeam and Shinkfield, 1985). Since then, many curriculum models have been developed using Tyler's rationale. While the later models of curriculum development have their origin in Tyler's model, it seems that they are more sophisticated as argued by Kelly, V. (1989). The latest models are mainly related to the curriculum change process (MacDonald and Walker, 1976). Because of its leading role as a curriculum development model, Tyler's model will be discussed briefly and then curriculum change models will be reviewed.

Tyler's (1949) model has been widely used by many curriculum developers. It consists of four main components, namely: objectives, content or subject matter, methods or procedures, and evaluation. He argued that there were four questions which led him to acknowledge the above linear components of his curriculum development model. These four questions are:

1- What educational purposes should the schools seek to attain?

2- What educational experiences can be provided that are likely to attain these purposes?

3- How can these educational experiences be effectively organized?

4- How can we determine whether these purposes are being attained?

As can be seen above, Tyler's model requires the curriculum developers to follow the linear systematic approach. This model is criticised because it does not allow the curriculum developer to interrelate the four components indicated above (Kelly, V., 1989). Kelly, V. (1989) also argues that Tyler's model is too simple to provide appropriate curriculum innovations.

Kelly, V. (1989) points out that a more suitable model would allow curriculum developers to interrelate each component to the rest of the components. However, there are no curriculum researchers who argue that Tyler's model is completely useless in the above respect since the questions Tyler's model uses define the major components of the process.

Defining the objectives of a curriculum programme and then developing the rest of the components on the basis of these prescribed objectives raises some problems. Kelly, V. (1989) argues that a model which attempts to regulate objectives in a scientific way turns education into an industrial process of mass-production. He further argues that to adopt this kind of model for curriculum development is to assume that it is legitimate to mould human beings, and to modify their behaviour, according to certain clear-cut intentions, without making any allowance for their own individual interest. He further suggests that "any model we adopt for curriculum planning must allow for the personal and professional autonomy of the teacher" (Kelly, V., 1989, p.74).

Stenhouse's (1975) approach to this problem was to deliberately eschew any kind of statement of objectives in the Schools Council Humanities Curriculum Project in the United Kingdom. He put forward a 'process' model of curriculum development, which means the gradual evolving of a curriculum through the implementation process. The adoption of the objective-based model ignores certain aspects which emerge as a result of the implementation process.

The assumption behind the Tyler model is that if a well-designed programme is developed, it will be implemented easily in the classrooms (Fullan & Pomfret, 1977). As reported by Kelly, P.J (1979) this was the assumption of the early Nuffield and Schools Council projects in Britain in the 1960s and early 70s. Later, it was found that there was a disparity between the expectation of the curriculum projects and their influence on the curriculum of schools and teachers' classroom practices. It became inevitable that the curriculum innovation processes should be studied in more detail in order to minimise the disparity and improve current practices. In particular, the dissemination and implementation processes which had been ignored should be investigated.

Since this study is more concerned with the effect of dissemination has on implementation, the following section deals with the dissemination of curriculum in detail.

3.1.1 Curriculum Dissemination

Kelly, P. (1980) argues that curriculum dissemination is a crucial component of the curriculum change process. He advises researchers to look at dissemination in more detail. Moreover, he points to another perspective to be worth investigation in the curriculum change process which he terms 'diffusion'. Thus, he distinguishes between diffusion and dissemination: "...diffusion refers to what actually happens; to the interaction between dissemination and the complex of influences in the social context in which it occurs" (Kelly, P., 1980, p. 68). The dissemination process has four inter-related aspects, namely, translocation, communication, animation and re-education. Translocation means to allocate the necessary materials. Communication refers to the transfer of information about an innovation from one person to another. Animation refers to the need for providing a stimulating environment for change. Re-education implies that considerable understanding and commitment are required in the effective implementation of an innovation (Ruddock & Kelly, 1976, Kelly, P., 1980). Therefore, there is a need to consider these four components of dissemination in order to have effective change. Ruddock and Kelly (1976) studied the dissemination of curriculum development in six countries, namely France, Denmark, Ireland, The Netherlands, the Federal Republic of Germany and England and Wales. They conceptualised the following components and gave useful recommendations regarding dissemination for effective curriculum change:

(1) Targets: dissemination has two main targets, teachers and support agencies. Firstly, teachers are an important element in the curriculum dissemination process because changes depend on their initiatives and adaptation to the intended curriculum. Secondly, to reach these aims, curriculum innovation requires the support of administrators in schools, educational authorities, academics in teacher education colleges, and professionals such as librarians and publishers.

(2) Phases: dissemination seems to have three main phases. The first is concerned with receptivity, which refers to

preparing agencies and persons for change. The second phase is related to adoption. It is essentially concerned with decision-making. The third phase of dissemination is related to the implementation stage.

(3) Modes: written materials and personal contact through meetings, workshops and courses are considered as modes of dissemination.

(4) Other social systems: educational innovations are affected by educational systems but are also influenced by other social structures which can either inhibit or facilitate these innovations.

(5) Control of education system: as far as control is concerned, dissemination can be classified into two categories: 'open' and 'obligatory'. Some of the curriculum development projects of the Netherlands and the Federal Republic of Germany have shown an open approach to dissemination. When curriculum development is centralised and the adaptation of innovation is obligatory (as in France and Denmark) the dissemination process tends to have an obligatory nature.

(6) Maintenance: the maintenance of a long term strategy is seen to have five majors aspects. Firstly, it should allow for social and educational changes over periods of time. If changes coincide with other favourable influences affecting the values, prestige and confidence of people in education, then innovations are likely to succeed. The second important aspect of maintenance is that there should be mechanisms for monitoring and quality control. It should be

possible to know what is happening to the curriculum within the classroom and the effectiveness of the supporting facilities. However, this is not the case for curricula in some countries. Therefore, mechanisms of evaluation research should provide a comprehensive feedback to improve current practices and inform future innovators in these countries. Information derived from such research enables judgments to be made about capacities and degrees of receptivity of individuals and the organization and resources for innovation and dissemination. In this way it is possible to determine the necessary steps towards an effective curriculum change. Thirdly, policies are required in order to stimulate the necessary changes among personnel so that experience can be applied at influential points. Policies are also required to counteract with the inevitable mobility of personnel as they are recruited, change positions or retire. Fourthly, there is a need for some regulations of the pace, magnitude and variety of innovation so that the level of dissemination can be maintained at reasonable proportions. This suggestion requires coordination which may lead to inflexibility and cause rigidity. To avoid this, Ruddock and Kelly (1976) put forward a fifth suggestion which implies that the dissemination strategy should be based on flexible decision making.

(7) Personal interaction: the role of personal interaction in dissemination is seen as an imperative element in educational dissemination. This point will be discussed in

more detail later in the chapter under curriculum dissemination models and curriculum control.

(8) The dissemination cycle: this point is related to the models of dissemination used in many countries. These are reviewed in detail in the following section.

3.1.1.1 Dissemination Models and Curriculum Control

The models of dissemination used in curriculum projects to some extent depend on the control of the curriculum. Control of the curriculum can be categorized using the terms, 'open' and 'obligatory'. If the education system is centralised, then the curriculum usually has an obligatory nature. Usually, in a centralised education system, models adapted for dissemination have a linear nature. This corresponds to models described by Schon (1971) (in MacDonald and Walker, 1976) as 'Centre-Periphery' and by Havelock (1971) (in MacDonald and Walker, 1976) as the 'Research-Development-Diffusion Model'. The essence of the 'Centre-Periphery model' is to control and manage the process of dissemination centrally. In this model, the innovation is planned and prepared in detail prior to its dissemination, and the process of dissemination is one-way, from the centre out to the receiver. The 'Research-Development-Diffusion Model' identifies three groups in the curriculum change process. These are: (1) the researchers who determine the needs of the receivers; (2) the developers who design the types of materials and activities which are based on the research findings; (3) the disseminators who bring the activities and materials to the receivers. In this process, the receivers usually remain passive. There is little difference between the two models as far as the receiver is concerned. The receiver remains passive in both models. Adaptation of these models for dissemination, in particular the 'centre-periphery model' causes some problems in the implementation process. For example, Kelly, P.,(1980) noted that a disparity between expectations of the curriculum development projects and the depth of their influence on the curriculum of schools and the practice of teachers arose from ignorance of effective dissemination methods and adaptations of the 'centre-periphery' model.

If an education system is decentralised it shows an open character. In this type of education system, models of dissemination can be more easily adapted other than the models for the centralised system mentioned above. This does not mean that these models can only be applied in a decentralised education system. In a centralised education system, it is possible to apply these models. Havelock (1971) proposed other models, namely the 'Social Interaction Model' and the 'Problem Solving Model' and Schon (1971) defined the 'Proliferation of Centres Model' and the 'Shifting Centres Model'. These are all described in the next section. There are differences in these models but there are also similarities in that neither are in a linear form.

'Social Interaction Model': In this model the needs of users are defined by the sender. In the later stages, diffusion and communication take place between senders and receivers. In this model, the key idea is the adoption and implementation of the innovation. Success or failure are both dependent on the channels of communication.

'Problem Solving Model': In this model, the receiver mainly initiates the process of change by feeling the need for these changes or by putting forward these changes as concerns. Having defined the change requirements, the receivers are responsible for fulfilling them in two ways, either by their own efforts or by requests for help from the related agency which is responsible for the curriculum change. In the process of exchanges of ideas, the receivers consult the senders. This is described as a client system which acts mainly to help individual receivers.

'Proliferation of Centres Model': In this model, in addition to the primary centre, there are also secondary centres. Secondary centres are local groups supported by the central team through the provision not only of advice or help but also sometimes through training courses. The main focus is on the process of dissemination rather than other aspects of the innovation process.

'Shifting Centres Model': This model provides explanations on how unplanned diffusion occurs rather than just offering a strategy for planned dissemination. There is clearly an established centre which appears, reaches a peak, and disappears to be replaced by new centres within quite a short period of time. There is no stable centrally-established message, because the message shifts and evolves as it produces a family of related messages. This system of movement is distinct from the centre-periphery model.

In summary, models of dissemination and the control of curriculum have been described above. This section has shown that the curriculum implemented is usually either decentralised under the open education system or centralised under the obligatory education system. Models adapted for dissemination usually depend on these systems. The key point in adopting these models should be to disseminate the users' applicable ideas in an efficient way. This requires something more than a linear model to make the sender aware of the desires and conditions of the receivers. Therefore, strategies should be established and adapted to possible models for effective dissemination regardless of control of the education system.

The following section deals with the experience of curriculum change processes in Britain and Turkey. This will help to clarify the issues of curriculum dissemination models and the control of the curriculum mentioned above.

3.1.2 The British Experience with Curriculum Change Process

Different strategies have been used by curriculum agencies in the United Kingdom since 1964. The two agencies which have mainly influenced the development of curriculum change in the United Kingdom are the Schools Council and the National Curriculum.

3.1.2.1 Schools Council

The period of the 1950s and 1960s in the UK witnessed the beginning of a number of attempts to change curricula because it was felt that content and teaching methods were out-of-date. There was strong supporting pressure from the public and demands for significant reform to take place (Kelly, P., 1980). The Schools Council was established in 1964 to 'undertake research and development on the curriculum and to advise the Secretary of State on matters of examination policy' (Lawton, 1980, p.68). The Council was funded mainly by the Local Education Authorities (LEAS) and the Department of Education and Science (DES). Its constitution implicitly endorsed the idea of teacher control of the curriculum. The role of the Council on the one hand was to maintain a balance between curriculum development and public examination. On the other hand, the Schools Council was conceived as a hopeful act of reconciliation between central and local government and teachers (Plaskow, 1985). The work of the Schools Council contributed to opening out discussion, and raising issues in public which had previously been confined to academic circles, since no wider forum existed for engaging a broad and democratic constitution. Plaskow (1985) considers that the Schools Council was the only forum where all educational bodies met, on neutral territory, to discuss matters other than salaries, conditions of service and professional policy, and where the sole concern was with the curriculum and examinations.

However, in 1984, this agency was closed. Plaskow (1985) gives as a reason for its closure that it was an untidy democratic institution. In other words, its policies were heavily bureaucratic. He argues that there was no coherent policy about curriculum. Responses to proposals from external sources were either instant death, or sometimes a long delay until a final decision was reached. In fact, teachers who put forward proposals knew that cases would appear for discussion before six different groups, each of which expressed a view on these proposals and passed them on to the 'Programme Committee', which gave the final verdict.

Beside the reason mentioned above, there was another reason, the decentralisation of the curriculum, which led to the Schools Council being abandoned. The government thought that control of the curriculum in a decentralised system was not easy. It is obvious that the control of the curriculum in centralised education system is much easier.

In addition to the pre-mentioned reasons, Plaskow (1985) reported that there was a continually unresolved issue on the Council's agenda: the role of the examination system and its relation to the curriculum. The Council agreed that examinations exist to serve the curriculum. However, facts in the field contradicted this assumption. The teachers' view suggested that the opposite concept appeared to be true, that the curriculum was serving the examinations system.

The Schools Council initially adopted the centre-periphery model for their projects (Kelly, V.,1989). Five key issues formed the main concerns of the Council. These were:

1- organization in school

2- helping teachers' professional development

3- developing the curriculum for a changing world

4- the needs of individual people

5- improving the examination system (Schools Council, 1980).

In summary, the Council seemed to come under severe criticism because it could not fulfil its duties properly. The government thought that control and quality could be maintained through a more centralised system. Thus, the

Council's support in curriculum innovation was diminished in 1984 to allow for the introduce of a centralised system.

It was found relevant to review the School Council, specifically from the aspect of the dissemination process. On the other hand, it is an example for other countries to establish this kind of council for curriculum innovation process even in a centralised education system. Particularly, the researcher found the Council very useful in the way in which teachers actively involved in the curriculum innovation process. It is obvious that when teachers actively participate in the curriculum development process, the fidelity of curriculum implementation should be higher.

The following section presents the National Curriculum.

3.1.2.2 National Curriculum

The National Curriculum was introduced through the Education Reform Act (ERA) of 1988. The ERA recommended the establishment of the National Curriculum Council and the School Examination and Assessment Council, and gave them the responsibility of determining the objectives and content of the curriculum to be studied in state schools. These schools are compulsory and include students within the 5-16 age range.

In 1989, the Secretary of State, Kenneth Baker, summed up the aims of the National Curriculum at the North of England Conference as:

"1- giving a clear incentive for all schools to catch up with the best and will be challenged to do even better;
2- providing parents with clear and accurate information;
3- ensuring continuity and progression from one year to another, from one school to another;
4- helping teachers concentrate on the task of getting the best possible results from each individual child" (Hull, 1993, p.23).

Fears regarding the prescriptive nature of a National Curriculum were allayed by statements that it was a 'framework' not a 'straight-jacket' and also a 'minimum entitlement'. How the 'Programme of Study' was to be implemented and learned was not specified.

The National Curriculum is a statutory framework which encompasses what is to be taught and what is intended to be learnt by students or more specifically, how student achievements are to be assessed (Hull, 1993). Thus, the curriculum model can be called subject-dominated, with ten subjects plus Religious Education to be fitted in. English, Maths and Science form the "core" curriculum. The seminal HMI document, "Science 5-16: A statement of policy" (DES,1985) the ASE and the Secondary Science Curriculum Review, all played a part in preparing the ground for a core curriculum status for science.

When the government embarked on the National Curriculum, someone had to advise on, and write, the curriculum. For the purpose of the development of the curriculum, the first group, the Task Group on Assessment and Testing (TGAT) was established. This group was chaired by an academic from London University. The TGAT gave guidance to working groups which were set up by the Secretary of State to produce recommendations on what the curriculum should be. University academics and practitioners were represented and HMI and the National Curriculum Council officials also attended the meetings of working groups. They recommended Draft Attainment Targets to the Secretary of State. Later the final form of the Attainment Targets was produced and made available to the teachers to follow.

Subsequently, schools were required to start implementing the National Curriculum, which as far as Science is concerned, started in 1989. A massive in-service training exercise was mounted by the LEA's to prepare teachers to implement the new curriculum. Fortunately, many primary advisory teachers had been given posts, funded by Education Support Grants, and the Secondary Science Curriculum Review had stimulated the appointment of secondary advisory teachers. Advisory teachers were recruited from amongst good classroom practitioners to lead in-service training, to prepare support materials for teachers and coordinators, to work alongside teachers in the classroom and to act as consultants and advisors.

However, it is too early to comment on the impact of the National curriculum on student achievements. Future studies will show the strengths and weaknesses of the curriculum change processes. But, as far as examinations were concerned, the majority of teachers were not willing to accept them. Because of that, the government announced that some changes would be made on this issue.

3.1.3 Comparison of Experience of the Turkish Curriculum Innovation to the British National Curriculum

The Turkish model of curriculum development is a committee-based one. A committee, consisting of teachers from state schools, curriculum developers from the Ministry of Education, academics from universities and psychologists from state schools, was assigned the responsibility of defining the contents of curricula. As a result of the committee's work, textbooks were produced.

There are similarities between the two curricula, British and Turkish. Both are developed by a committee as far as the new programmes are concerned. In terms of the education system Turkey did not experience a decentralised system as Britain did. In this respect, there are differences between the two countries' teachers. Although Britain started to apply a national curriculum, it should be considered that British teachers normally have more autonomy since they have experience with decentralisation.

Provinces and sub-provinces have local education authorities who are responsible for disseminating the developed textbooks. The local education authority and also the 'Journal of Official Communication' inform teachers about the nature of the new curricula. This type of dissemination process is similar to that of the centre-periphery model. It was adopted in the projects of the Schools Council in an early stage, but was not found appropriate to disseminate curriculum in an adequate way.

The centre (the Ministry of Education) initiates all the requirements; teachers are mainly passive and have little influence on the dissemination process. In the process of dissemination, INSET training is mainly provided. In addition, local and school subject-colleagues' meetings are used as a support source for the dissemination process.

With this approach, it is assumed that teachers will be very receptive to the intended curriculum and that they will understand its philosophy. In fact, the British experience showed that the centre-periphery model is not sufficient to disseminate ideas to the users. In the case of the Turkish context, the following issues exists. Firstly, the main problem in this process is that, in many cases, the local centres are not aware of the class realities in the schools. Secondly, INSET, and local and subject-colleagues' meetings do not function as intended for the process of dissemination. They usually give only a very global message to the teachers about the intentions of the curriculum. During these meetings, the objectives of the national curriculum are read by the chairmen of meetings without in-depth discussions about the meaning of each objective and its application in the class context. A majority of teachers believe that these meetings are not helpful since some suggested activities are not applicable but are mainly imaginative rather than realistic for the Turkish Context.

From the above brief account of the curriculum innovation process, it can be concluded that it seems that a discrepancy exists between the intended curriculum and the implemented one. On the one hand, some indications show that the dissemination elements (INSET, local and school subject-colleagues' meetings) do not effectively function to help the teachers in applying the suggested activities. On the other hand, the class context may prevent teachers from applying the suggested activities. Thus, one of the aims of this study is to make an in-depth investigation of the class realities as well as the effects of the dissemination process on implementation.

To conduct this type of implementation study in a centralised education system will also help other countries where similar education systems exist.

3.1.4 Summary of Main Issues Emerging from this Section

The studies reviewed above showed that there are different approaches applied in the curriculum change process. As an example, the first systematic approach to curriculum development, Tyler's model, was described and later some criticisms were mentioned. As an alternative to the linear type of models, Stenhouse's (1975) process model was reviewed. As a result of these reviews, it was argued that whatever curriculum model is adopted, it should give some autonomy to the teachers as well as to the curriculum developer. Moreover, the curriculum developers should explicitly consider the context in which the developed curriculum is intended to work.

Later, the dissemination process of innovation was focused on. A rationale was presented for studying the dissemination and implementation process. The elements in the dissemination process were derived from Ruddock and Kelly's (1976) work. Their definitions of elements and suggestions for effective implementation were found to be constructive. The weaknesses and strengths of curriculum dissemination models were also considered in this process so that curriculum developers could develop their innovation strategies based on this research.

Curriculum change processes in the United Kingdom and Turkey were described. In this review, the Schools Council and the experiences of National Curriculum in the UK were outlined. The Turkish experience of a curriculum innovation process was presented in accordance with the subject of this study.

As a result of these reviews of theoretical curriculum change process, it was revealed that: to adopt a centre-periphery model causes a disparity between curriculum intention and implementation, and a highly centralised education system causes similar problems in curriculum development in the way that the developer cannot consider local schools and particular classes properly. Therefore, it is important to investigate the dissemination process, and in particular to explore the class context in detail so that the necessary changes can be made for optimal improvement.

3.2 Practical Aspects of Curriculum Change

3.2.0 Introduction

This section describes how implementation processes are studied by empirical work. An emphasis on the main factors that affect curriculum implementation in general is discussed. Section One above demonstrated that the problematic issues that teachers encounter in the implementation processes mainly result from both the shortcomings of the dissemination process and the incongruity between intended curriculum and class contexts. In this section, two issues, namely shortcoming in the dissemination process, and the influence of context realities on the implementation process, are examined. Some empirical studies are also reviewed for two purposes: (1) to clarify the main factors which affect the implementation process; (2) to help define the methods employed in this study.

3.2.1 Components and Influential Factors of Curriculum Implementation

Implementation consists of the process by which an idea, a programme or set of activities, and structures are put into practice. These elements are new to those attempting or expected to make changes (Fullan and Stiegelbauer, 1991).

The components of implementation depend on changing practice. Many researchers have indicated that change in practice is multidimensional, which means that there are a number of components of existing practice that are altered as a result of implementing something new. Leithwood (1981) defined some distinct dimensions of curricular implementation in describing changes in global conceptions. These are: objectives, content, instructional material, and teaching strategies.

Although there are many factors which influence curriculum implementation, some of them are common ground in the work of a number of researchers. These factors are divided into three broad categories, namely:

1- Characteristics pertaining to the curriculum change being attempted;

2- Local contextual conditions at the school district and school levels;

3- Local strategies at the school and district levels used to foster implementation (Fullan and Stiegelbauer, 1991).

3.2.2 Empirical Studies Related to the Curriculum Implementation Process

The following review of empirical studies is chosen from a variety of countries. These studies were selected on the basis of relevance to this study. Specifically, these implementation studies were selected in order to help to define the methodology of this study. The important aspect of the reviewed studies is that they were conducted in a number of countries. Other studies have been conducted, but were not considered necessary for the intended purposes of this research.

Lantz and Kass (1987) in Canada investigated the interpretive process of curriculum implementation involving high school chemistry teachers. Three questions mainly dominated their investigation. Firstly, "What is the nature of teachers' functional paradigms as represented by the way they interpret curriculum materials? Secondly, What are some factors which influence teacher interpretation of curriculum materials? Thirdly, What would be some of the characteristics of a model of teacher interpretation of curriculum materials which is based on the data derived from the study?" (p.117-118).

They used both qualitative and quantitative approaches in the data collection process. The samples consisted of three teachers for interviews and observations and sixty-nine chemistry teachers from a sample of fifty selected high schools for questionnaire study, out of 242 high schools in the province of Alberta. Students from observed classrooms filled in the student questionnaire.

The interview questions aimed to explore teachers' thinking about the materials and how they adapted, modified and supplemented specific aspects of the materials during their classroom practice.

Many of the items on the questionnaires derive from the interview and observations with the three chemistry teachers. The teacher questionnaire included ninety items related to classroom practice. The questionnaire was developed to enable the teacher to rate objectives, factors influencing curriculum adaptation, and teaching strategies on a five point-scale ranging from no emphasis to heavy emphasis in relation to their classroom practice.

Student questionnaires investigated students' opinions about the materials.

Lantz and Kass's (1987) findings show that teachers' functional paradigms differ from each other. However, they indicated that many elements are common to a number of teachers. The findings also showed that teachers' functional paradigms are built around a somewhat different drift of beliefs, values, techniques, examples, and routines. In particular, it seems that teachers' values concerning the aims, purposes, and the requirements of effective teaching are closely bound up in their perception of what the authors termed the other three curriculum common-places (subject matter, learners, and milieu).

The teachers' responses to interviews and questionnaires indicated that there were four types of perceptions about the current chemistry curriculum, namely that: officially chemistry is limited to the topic outline in the curriculum guide; taught chemistry includes a more personal set of topics, not necessarily listed in the curriculum guide; major theoretical concepts and principles are associated with emphasis on applied chemistry in the curriculum materials; finally, the perceptions of teachers of high school chemistry also focus on applied chemistry.

The teachers' responses to interviews and questionnaires indicated that there were three types of perceptions about teaching chemistry, namely: pedagogical efficiency values (fast effective means of giving students a clear understanding of chemical concepts and principles); academic rigour (the emphasis on academic rigour seems to be connected with the view that high school chemistry is geared towards academic courses intended for students who are university bound); and finally student motivation (emphasis on laboratory work and the use of entertaining, novel teaching approaches and visual demonstrations).

The teachers' perceptions of students were divided into two categories, focusing on: students' abilities, and interests.

The teachers' perceptions of school setting were divided into three categories. These are: school facilities, local community concerns, and broader social concerns. Regarding local setting, many teachers seemed to focus on school facilities, especially citing lack of equipment and materials or laboratory assistance as the reasons for not engaging students in experimental work. There were some references to the expectation of the community in terms of achievements, leading teachers to select and use materials which would help students do well in examinations.

Lantz and Kass (1987) also indicated that there were three sets of factors which influence teachers' interpretations of curriculum materials namely: elements in the functional paradigm of teachers, teachers' background, and teaching situation. Some of the beliefs and values were identified as part of the functional paradigm of teachers. Furthermore, observation and interview data suggested that specific techniques, use of examples , and routines are also part of the functional paradigm of teachers. However, sets of routines teachers employed varied from one teacher to another.

The most important factors in the process of interpreting curriculum materials in classroom practice were found to be the teachers' background, training in chemistry, and the teaching situation. They concluded that as teachers gain more training and experience, they become more self-sufficient and rely less on officially approved curriculum materials. The context realities seem to be the most influential factor on teachers' interpretation of curriculum materials.

Lantz and Kass (1987) held the view that the term 'teacher's functional paradigm' seemed to be a particularly good way of describing teachers' interpretation of curriculum materials. They believed that the model may be a valuable construct for investigating translation of curriculum materials in other subjects. The model of interrelationships presented in this study may contribute a further understanding of teachers' practical knowledge. In general, it was found that teachers have more common beliefs, values, techniques, examples, and routines than differences.

The authors suggested that curriculum developers and school authorities should regard teachers' functional paradigms as resources to be tapped rather than obstacles to be overcome.

The model used by Lantz and Kass (1987) has some cross-cultural value in investigating the interpretation of curriculum materials in the implementation process in general. As a framework, it could be followed by international researchers. However, the elements within the framework could differ from one context to another. In their study, three chemistry teachers were used to illustrate one specific local context. Although it was found that most elements are context-bound, the researchers tended to generalize their findings.

Another relevant work was conducted by Tobin and Gallagher (1987) in Australia. They studied how the implementation process takes place in a science classroom in general and they studied activity structure and academic work in particular.

They used mainly qualitative techniques including classroom observations and interviews. Their study included teachers and students in the process of data collection. The study sample was 15 science teachers from two co-educational high schools. Each teacher was observed during the teaching learning activities for several lessons in three or four different classes. Data were collected in three stages. At the first stage, nine teachers were observed by trained observers for a period of six weeks. The collected data in this first stage gave the researchers the opportunity to construct hypotheses to be tested at the later stages of the study at different levels of high school. The second stage continued for twelve weeks and consisted of observations of six volunteer teachers from public school. The third stage of the study consisted of formal interviews with teachers and students. All fifteen teachers and eighty-six students were interviewed. The student sample was selected by using a stratified random sampling technique from each science class in the private school.

The findings of the study were presented according to two categories: (a) findings related to activity structure; and (b) findings related to academic work. In terms of activity structure, four types of activities were found, namely whole class interactive, whole class non-interactive, individual and small group work. The findings relating to academic work were examined under six assertions. These assertions mostly focused on the factors that influenced activities and the level of academic work in curriculum implementation. The researchers found that rewards, teacher expectations, external factors, and student characteristics seemed to affect the process of curriculum implementation. The reward structure and teacher expectation were influenced by teachers' beliefs about the nature of the curriculum as well as how students learn, and the extent to which teachers can control the curriculum in their classrooms. It was also found that homework, tests and the examination system were mainly used by teachers to motivate students. A feature of teachers' action was that they sought to complete the curriculum content in the prescribed time at the expense of students' understanding.

Furthermore, Tobin and Gallagher's (1987) findings suggested that external factors had a strong influence on curriculum implementation. These external factors mostly arise from the structure and situation of the education system. This result was confirmed by two different sources of information (interviews about the teachers' perceptions and observations in the classrooms).

Their findings showed that the different teachers observed engaged in similar academic work in teaching science in the same school. However, they also indicated that the findings of their study should not be generalized to other parts of the world, because each country has its own system with its own requirements. They suggested that teachers' beliefs and their pedagogical knowledge basis, as well as subject knowledge, are all important areas in the study of implementation that require the further attention of future researchers.

It should be noted that the findings of the study appear to contain a contradictory element. They found that different teachers engaged in similar types of academic work in the same school. At the same time, teachers believed that uniqueness should be a recommended feature of teaching. However, factors in their study relating to contextual realities rather than the teacher's individuality appear to determine the teachers' actions in the classrooms.

They mainly used a qualitative approach in the process of data gathering. However, this approach could be described as subjective and may not work in cross-cultural curriculum research. In their study, the subject matter which the teachers' sample implemented was broad and thus it was not possible to clarify the effects of individual teachers on the level of academic work and activities applied in the implementation process.

However, the methodological approach as well as the issues investigated in Tobin and Gallagher's (1987) study could to some extent be utilized as far as this thesis is concerned. In particular, activities and academic work in relation to context situation were well defined and investigated in their studies. Therefore, these two issues could be a source for further related investigative studies.

Adamu (1990) studied the Kano State of Nigeria science curriculum innovation process from two perspectives. One was the basis of science school projects as an educational change strategy. The second was the analysis of the implementation of the project with reference to classroom dynamics in the schools. The second perspective of his investigation is more relevant to this thesis. Thus, more emphasis will be given to it.

He used the illuminative research tradition as proposed by Parlett and Hamilton (1975). More details on this illuminative research approach are given in chapter four.

His investigation lasted seven months in Kano State, Nigeria and took place at four secondary schools. He employed a structured observation and interview schedule for teachers and students. School administrators were also interviewed for his investigation.

The purpose of the classroom observations in his study was to provide an opportunity to determine to what extent selected teachers and students implemented the current project in order to attain stated objectives. Classroom activities were identified according to nine categories. The focus was on activities in terms of frequency, the amount of time and the percentage of time. The researcher also took notes in the classroom observation period in order to analyse in detail classroom activities as well as the teaching process in the class context. In addition, he interviewed the teachers observed to further validate his findings by making comparisons with observed activities in the classroom.

The findings from the interviews with teachers showed that there was a lack of correlation between policy, expectations and application in the classroom. He argued that this condition had significant consequences on student achievements. The findings of the study also showed that inadequacy of laboratory materials and equipment was the main factor influencing the teaching styles adopted in the classroom. Overall, the study findings showed that there was a considerable lack of correlation between suggested activities and classroom realities.

His findings were lacking in depth as a result of using Parlet and Hamilton's (1975) illuminative research approach. However, he was also aware of the weaknesses of this approach and indicated that subjectivity was the main concern.

Kimpston (1985) undertook case studies in the USA to assess to what extent the intended activities of a curriculum are implemented and to clarify the relationship between teachers' perceptions of curriculum development and their implementation tasks. The independent variable which the researcher selected was teachers' beliefs regarding (i) perceived importance, (ii) desired participation and (iii) actual involvement in curriculum implementation tasks. The dependent variable was fidelity of implementation. This focused on whether there was a high/low fidelity between the planned curriculum and what teachers actually practised in classrooms.

The study was conducted in a Midwestern suburban school district in the USA. There were 13,623 students and 821 staff in 12 elementary (primary and intermediate), 2 junior and 2 senior high schools in this district. From this district, 53 elementary, 13 junior high and 8 senior high school teachers were selected to be included in the study sample.

Two different types of questionnaires for teachers were employed as well as structured interviews with a small sample of teachers. The aim of the first questionnaire was to test to what extent the objectives of the curricula were implemented. The purpose of the second questionnaire was to assess 28 defined tasks that teachers may potentially employ to implement the curriculum. These 28 items were divided into four categories of curriculum implementation. These are: selection of objectives, development of instructional plans, application of theory to practice, and formalization of evaluation processes. The interviews were conducted with a stratified sample of teachers who also responded to the two questionnaires. The aim of the interviews was to ensure that the formalisation of language in the questionnaire and in the objectives format of the curriculum guide had been understood by the respondents as well as to clarify the perceived constraints of implementation that teachers listed on the questionnaire.

The findings of this study showed that teachers in teaching the lower grades classes (younger students) placed more emphasis on district-specified objectives, while teachers of higher grade levels (older students) placed less emphasis on district-specified objectives.

The findings also showed that if teachers perceived the objectives of the curriculum as important, their 'desired involvement' with the defined tasks in practice increased.

At the primary level, there were significant differences between high and low implementation resulting from teachers' views about the perceived importance of implementation tasks as related to instructional plans and evaluation.

At the intermediate and junior high school level, there were no significant differences between high and low implementation resulting from perceived importance, desired participation and actual involvement in any of the four curriculum implementation task areas.

For teachers at the senior high level, significant differences were found between high and low implementation, but only in the category of perceived importance of evaluation tasks.

Although not statistically significant, the findings gave a good picture of teachers' perception of prespecified curriculum implementation tasks. Teachers across all grade levels consistently rated the importance of tasks more highly than their desire to be involved. Likewise, a desire to be involved was usually more highly related than actual involvement.

The findings show that teachers expressed dissatisfaction with their implementation roles if the discrepancy between desired and actual involvement was significant.

The constraints which influenced teachers' implementation in the classroom were indicated as follows: 'lack of time', 'no established process', and 'not expected of me'.

In general, it was found that the degree of curriculum fidelity as measured in this study was extremely low at all four grade levels. It could be argued that the results of this study suggested that if teachers were considered as a part of the development and decision-making process of implementation of a curriculum, the fidelity of curriculum implementation would be higher. It could also be argued that the investigation of curriculum fidelity measured by teachers' reports on themselves combined with interviews with them was very effective as regards the degree of curriculum implementation.

Kelly and Monger (1973 and 1974) studied the implementation of the Nuffield O-level biology course in England and Wales to assess the use and suitability of course materials (books, visual aids), teaching learning methods and examinations associated with them.

A survey approach mainly dominated their investigation. The sample for this investigation consisted of senior biology teachers working in 204 schools throughout the country (England and Wales). All the schools had a full five years experience with the Nuffield O-level biology course. In addition to the teacher survey, a short questionnaire concerned with interest in and difficulties of the course was answered by 1,700 pupils from 51 visited schools.

The survey questionnaire covered the following issues:

i- the ways teachers use and adopt course materials,

ii- their assessment of the suitability of the content and teaching methods included in the books

iii- the extent to which they considered the materials helped to achieve the objectives of the course

iv- unforseen outcomes of the work

v- suggestions for improvement

The purpose of visiting schools was to discuss issues mentioned in the questionnaire in more detail with teachers and pupils as well as to observe how the course was implemented.

Teachers' comments on the questionnaire, observations, and discussion in the school indicated that, in most cases, they used the students' texts basically as sources of information providing the framework and the content for their overall teaching strategies. They affected the tactics used by teachers to some extent. Teachers appeared much less familiar with the teacher guide and used them less than the student texts.

It was found that asking teachers to arrange curriculum objectives in order of importance was not very valid for teachers since they indicated that the importance of the objectives may depend on teacher experience and student abilities in the classroom. It was observed that teachers rarely seemed to use a guideline for their implementation.

Teachers' assessments of students' achievements apparently did not have a direct correspondence with the actual content of the books and the examinations. This is because results from the content analysis indicated that the objectives of the course were not developed specifically as examination objectives; rather they were intended to serve as guidelines for writing the books and for describing the intentions behind the content and activities of the course.

Although there were no major problems at the visited schools, there seemed to be some minor problems. For example, some experiments were too often unsuccessful; there were concepts which appeared to be too difficult; some objectives were not adequately dealt with. In order to rectify the problems indicated above, the researchers recommended that the content of the course should be revised in accordance with the specific problematic areas pointed out during the investigation.

Other problems concerning the use of course materials arose from infrequent use of the teachers' guide. They suggested that if teacher guides were used, the encountered problems may be reduced. It was concluded that using teacher guides might also help in writing assessment items and providing samples of items that could be used both for course work and examinations. However, teacher guides should be made more explicit as regards content. A need was felt for the objectives and their relation with the content of the course to be more carefully explained.

In general, the investigators found that there were inconsistencies between teachers' understanding of objectives and content, and the actual implementation of the courses in the school. It was also found that similar inconsistencies existed between the objectives and content of both the books and examinations. These inconsistencies mainly derived from the influence of previous experience, lack of facilities, and the background of pupils. They recommended that holding more meetings with teachers could reduce communication problems related to the intention of the course and the perceived importance of the objectives by the teachers. They also argued that the methods they employed may have led to some weaknesses in their investigation, namely an inability to probe deep level realities. However, they suggested that the weaknesses of the methodological perspective could be reduced in future by focusing on in-depth studies of specific aspects of implementation.

It could be argued that Kelly and Monger (1973 and 1974) established a well-defined framework to find weaknesses in implementation processes in newly developed curricula. However, the areas they researched were very large. As a result of this, as they also indicated, they could not come up with very specific remedial recommendations. Their recommendations are valuable but general. It should be noted that some of the their findings and recommendations could have some value from a cross-cultural perspective. For example, using a teacher's guide is one of the most important issues in implementation studies which is not context-bound. Although they mentioned observations and interviews, the process and contents of these methods were not explained in detail.

3.2.3 Critical Summary of the Reviewed Studies

The studies reviewed above suggested that there are strong relationships between components of the implementation and changes in practice. The components of curriculum implementation varied but some of them were more significant in classroom practice. The main components of curriculum implementation were defined as objectives, content and teaching strategies. Later, empirical studies were viewed from two main dimensions. The first mainly dealt with the factors which affect curriculum implementation in relation to classroom practice. The second established a basis for the investigative approach of this study.

Some of the studies reviewed above mainly dealt with curriculum materials, teachers' background, and the teaching situation in relation to classroom practice (Lantz and Kass, 1987; Tobin and Gallagher, 1987; Kelly and Monger, 1973 and 1974). Although the three factors defined above have been seen as effective in classroom practice, the teaching situation was found to be the more influential

(Lantz and Kass, 1987; Tobin and Gallagher, 1987). However, recent attempts in this area focus mainly on activities and academic work in relation to teaching situations (Tobin & Gallagher, 1987; Kimpston, 1985 and Adamu, 1990). Additionally, the main issues of some of the studies were to compare the intended activities with the implemented ones (Kimpston, 1985; Kelly and Monger, 1973 and 1974).

In order to make implementation studies more effective, personal contact was recommended as the most useful strategy in the dissemination process. In fact, Lantz & Kass (1987) and Tobin & Gallagher (1987) confirmed this idea in their implementation studies. The argument supported from the study reviewed above was that when teachers were involved with curriculum development, the fidelity of implementation was found to be very high (Kimpston, 1985).

In terms of methodology, some of the researchers under review mainly employed a qualitative approach which in many cases was supported by a quantitative approach to give an overall description of the cases. In many cases, they defined their studies as case studies (Lantz & Kass, 1987; Tobin & Gallagher, 1987 and Adamu, 1990). Interviews and observations were the main research methods in their methodological approaches. Some of the researchers used interviews after observations for the purpose of confirming the findings from the teachers' perspectives. Following observations, some patterns were further examined by the researchers in their interviews and in order to clarify the reasons behind these patterns (Kelly and Monger, 1973 and 1974; Tobin and Gallagher, 1987). Some of the researchers used interviews before observations and questionnaires for the purpose of piloting their instruments as well as research questions (Kimpston, 1985).

Some researchers used the illuminative research approach in their investigation of implementation studies (Tobin & Gallagher, 1987 and Adamu 1990). The illuminative approach was defined as stage base research (Parlet and Hamilton, 1975).

In order to define the content of the instruments, the majority of the researchers reviewed above mostly used document analysis to determine the differences between the intention of curriculum and its practice in the classroom (Kelly and Monger, 1973 and 1974; Kimpston, 1985 and Adamu, 1990).

Although the nature of the interviews and observations were rarely mentioned in terms of content and process, the researchers explained clearly the items they used on the questionnaires. In fact, it is possible to obtain some ideas on process and content by examining the results of interviews and observations. These ideas could guide researchers in their search for adequate instruments for their own implementation studies.

3.3 Summary

The following points emerged from the above review of curriculum change studies.

- There are different approaches applied in the curriculum change process. However, the 'negotiation model' is perhaps more appropriate to achieve the best possible results.

- In curriculum innovation, the experience of other countries should be taken into consideration in terms of process rather than product.

- The dissemination of a curriculum is a very important stage in the innovation process (Kelly, 1979, 1980; Fullan & Pomfret, 1977, Fullan and Stiegelbauer 1991). The review of the first section showed the main elements in the curriculum change process (Ruddock and Kelly, 1976).

- Successful curriculum implementation requires a knowledge of the class context (Fullan & Stiegelbauer, 1991 and Lantz and Kass, 1987).

- One of the ways to look at the curriculum implementation process is to compare the intended curriculum with the implemented one (Kimpston, 1985; Kelly and Monger, 1973 and 1974 & Lantz and Kass, 1987).

- Case study methodology was employed in most of the reviewed studies using qualitative and quantitative methods (Lantz and Kass, 1987 and Tobin and Gallagher, 1987).

This review leads the researcher to conclude that curriculum implementation is an important stage in the innovation process. More importantly, curriculum implementation studies need to explore the class context in order to design and apply the best possible curriculum accordingly. A case study approach was found appropriate and employed in the majority of the reviewed studies. The next chapter deals with this methodological issue in detail.

CHAPTER 4

METHODOLOGY

4.0 Introduction

This chapter starts by introducing some research methodologies which have been used in curriculum implementation studies. It continues by describing recent approaches in implementation studies. Later, emphasis is given to the case study approach with supporting reasons for the choice of a case study methodology for this investigation. Methods used in case studies are also discussed as applicable to the subject of this thesis.

The themes in research methodologies are discussed from historical perspectives. The issues which have been, and still are, the subjects of investigation in implementation studies are identified. The manner in which these issues are investigated is also examined.

This chapter also gives theoretical information about case study research methodology as well as the research methods used in the empirical studies reviewed in chapter 3.

4.1 Research Methods Used in Curriculum Implementation Studies

When the curricula of the late 1950s and early 1960s were developed, financing agencies and users were interested in obtaining evidence of the success or failure of the new programmes (Lewy, 1977; Skilbeck, 1984). Prior to the 1960s three themes dominated evaluative approaches. These were: the use of expert judgments, measurement, and the testing of objectives using Tyler's approach (Stufflebeam and Shinkfield, 1985). In the process of using expert judgement, traditionally inspectors' or curriculum developers' ideas concerning the success or failure of the new programme were taken into consideration via their reports which mainly reflected their subjective thinking about the situation. Another theme in the evaluation of curriculum innovation was the measurement of students' outcomes. However, this approach could not reveal the problems encountered in the implementation process (Fullan & Pomfret, 1977). The third approach to the evaluation of curriculum innovations was to test the implementation of the intended objectives of the curriculum. This approach mainly comes from Tyler's (1949) linear models of curriculum developments. This approach was found to be insufficient in interrelating the implementation stage with others aspects of the innovation process (Kelly, V., 1989).

Achievement of the objective model as a means of evaluation of curriculum development indicated that:

"the assumption appears to have been that the move from the drawing board to the school or classroom was unproblematic, that the innovation would be implemented or used more or less as planned, and that the actual use would eventually correspond to planned or intended use. The whole area of implementation, what the innovation actually consists of in practice, and why it develops as it does, was viewed as a "black box" where innovations entering one side somehow produce the consequences emanating from the other" (Fullan and Pomfret, 1977, p.337).

In contrast to the objective models, investigating the importance of curriculum process and context later became prominent in curriculum evaluation. The objective-based models have traditionally used psychometric measurement and have mainly been concerned with collecting quantitative data for decision making. However, this trend was criticized by McCormick & James (1983) on the grounds that quantitative data and the manner of its collection could not very often explain the process of implementation.

In order to explain more clearly the process of implementation, qualitative research strategies were put forward as alternatives to the traditional ones. The qualitative approach was mainly based on ethnography. Ethnographical research explores the 'process' involved:- 'to get inside' the world of a programme in which participants describe or explain the effects of the programme from their points of views (Merriam, 1988). For example, Parlett and Hamilton (1975) developed this approach in more detail and proposed a new illuminative research model. They argued that the roles of researchers in the process of using their model should be to adopt a position such as the following:

The stance of the evaluators was to be that of anthropologists, concerned with description and interpretation rather than with measurement and prediction (Merriam, 1988).

The illuminative research model seeks to describe and to interpret rather than to measure and predict the success of the curriculum implementation process. It also takes into account the context in which educational innovations operate. There are three stages in this illuminative approach to the evaluation of the implementation process. In the first stage, a researcher observes the general process and becomes familiar with the context in a fairly open way. The second stage begins with the selection of a number of phenomena and themes associated with the change, which emerge from the perceptions of those involved with the implementation process. The third stage explores general principles underlying the organisation of the change process, by spotting patterns of cause and effect within its operation and placing individual findings within a broader exploratory context (Parlet and Hamilton, 1975).

In fact, the illuminative approach has been used in some important curriculum evaluation studies, such as Success and Failure and Recent Innovations (SAFARI) based at the Centre for Applied Research in Education, University of East Anglia under B.MacDonald and R. Walker, and the Evaluation of the Humanities project in Britain (MacDonald, et al. 1976).

Illuminative evaluation studies have been criticized on the grounds that they lack theoretical bases and thus, the information gathered from such studies can be questioned as to its validity and reliability (Atkin, 1984). Additionally, Atkin (1984) argued that if researchers used only one of the approaches (either qualitative or quantitative), they would not obtain comprehensive results. Also he argued that using only one approach is narrow and in that it requires a higher level of expertise approach. By using both qualitative and quantitative approaches researchers are provided with more alternatives (Adelman et al. 1980; Bell, 1989; Merriam, 1988).

Although there are many factors which influenced the researcher to choose a case study approach for this investigation, the three most important factors were: most of the previous curriculum evaluation studies used case study approaches (Lantz and Kass, 1987; Tobin and Gallagher, 1987) the research questions asked in this study could be best investigated via the case study research approach; lack of access to a control group of schools and time limitations also directed the researcher to choose the case study strategy for this investigation.

The following sections give more detailed information about the nature of case study in relation to methods used for this investigation.

4.2 Theoretical Perspectives about Case Study Approach

Adelmen et al. (1980) described the case study as an umbrella term for a family of research methods having in common the decision to focus on inquiry around an instance. Stake (1980) defined case study as a "bounded system with a conception of unity or totality" (p.4). Yin (1989) also supported Stake's (1980) definition of the case study. Yin (1989) described case study as an examination of specific phenomena such as a programme, an event, an institution or a social group.

This study investigated physics curriculum innovation processes in relation to their classroom implementation. The implementation process of the new physics curriculum in the schools of the Black-Sea Region of Turkey was accepted as a bounded system for this investigation.

Case studies can be categorized into two types. In the first type, the issues are given and a bounded unit is selected in which the issues are studied in that context. In the other type, the bounded system is given and issues are discovered in order to understand the nature of a particular case (Stake, 1976).

This study was conducted in the Black-Sea Region of Turkey. In the defined case, in the schools of the Black Sea Region of Turkey, issues relating to physics implementation were studied. The researcher believes that this type of investigation is mainly consistent with the second type of case study described above by Stake (1976). The issues which influence teachers' ways of teaching are the main concern of this investigation.

Yin (1989) suggested that in the process of data gathering, multiple methods, particularly interviews, observations and document analysis should be employed. In using multiple methods of data gathering, a researcher should have greater opportunity to cross-check data obtained from one method against others. This process in educational research is called 'triangulation'. In this way, the validity and reliability of the findings are significantly increased (Merriam, 1988; Yin, 1989; Simons, 1987). In the case of this study, in order to fulfil the rules of triangulation, multiple methods (interviews, observations, document review, and questionnaires) were used. A cross-check of the data obtained from the multiple methods was undertaken in the process of discussion of the findings.

4.2.1 Document Analysis

Researchers of the implementation studies reviewed in Chapter 3 mostly initiated their research by analysing documents related to their research questions (Kimpston, 1985, Adamu, 1990). The purpose of this initiation was to identify the requirements set by policy makers. Merriam (1988) also recommends this approach to the case study researcher. The idea behind her recommendation is based on the notion that a researcher should establish his/her basis of research questions on factual issues rather than imaginative ones. It also facilitates the researcher's work at the start of his/her investigation.

However, Merriam (1988) warns researchers that before the stage of analysis and interpretation of the documents, the documents should be assessed and their authenticity should be verified.

In this research, official documents were mainly used. (see appendix 3).In the review process, the researcher interpreted documents in order to define the issues relevant to the instruments.

The following information concerns the types of documents reviewed and their purposes, as well as their relationship with the research questions. These include Curriculum Development Model, Curriculum Guide, Curriculum Implementation Guide, Subject-Colleagues' Meetings Minutes and Teachers' Daily and Yearly Plans. The purpose of using each document is presented below:

- **Curriculum Development Model:** used in this study for determining curriculum development and the dissemination process.

- **Curriculum Guide:** used for determining physics objectives.

- **Curriculum Implementation Guide:** used in this study for determining what is required of teachers in the implementation process of the curriculum.

- **The Minutes of Subject-Colleagues' Meetings:** used for determining the content of the meetings that take place in Local Educational Authorities and Schools.

- **Teachers' Daily and Yearly Plans:** used for determining how the teachers interpret the curriculum objectives in their daily and yearly plans.

4.2.2 Questionnaire Methods

Questionnaire methods are commonly used to obtain information. A questionnaire is inexpensive to administer and relatively easy to analyse. However, designing questionnaires is most difficult. Youngman (1984) indicates that there may be some problems associated with the structure of questionnaires. Therefore, those who want to use the questionnaire method should give careful consideration to aspects of item specification on the questionnaire.
In particular, the structure of the questionnaire must include all aspects deemed to be necessary for a successful analysis (Youngman, 1984). For example, the treatment of various types of non-response should be considered.

In this study, student questionnaires were adapted from international science studies (Keys, 1987) and teachers questionnaires were constructed by the researcher with particular reference to the process of dissemination of curricula in the Turkish context. This questionnaire is based on Cohen and Manion (1992) recommendation. They gave a useful guide for designing questionnaires. In the process of developing questionnaires for this investigation, Cohen and Manion's (1992) recommendations were taken into consideration.

Two questionnaires (one for teachers and one for students) were employed for this study. The purpose of the teacher questionnaire was to clarify the following questions:

1- What are the aims and objectives of physics teaching-learning in the lycees of Turkey as perceived by teachers?

2- What activities do teachers use in the implementation process?

3- What are the main problems which prevent teachers from implementing a new physics curriculum as perceived?

The purpose of the student questionnaire was to describe types of teaching-learning activities taking place in physics lessons.

The statistical analysis of the data obtained from the questionnaires were undertaken by means of the Statistical Package for Social Sciences (SPSS) (SPSS Data Entry II Notes).

4.2.3 Observation

The studies reviewed in chapter 3 mainly employed classroom observation. Nisbet and Watt (1984) also reported that frequently used method in implementation studies was observation method. In addition, before observation, some preliminary preparations regarding what events and behaviours should be observed has to be decided (Merriam, 1988; Nisbet and Watt, 1984). Nisbet and Watt (1984) indicated that it is not possible to observe and record everything which takes place in the classroom, and thus the researcher has to decide what to observe and how he/she is going to record it. It requires an arranged observation schedule to fit the purposes of the investigation.

There have been a number of published observation schedules for classroom observations (Flanders, 1970; Eggleston et al., 1975). However, the majority of the published observation schedules include only quantitative coding systems. These types of observation schedule were not able to provide information which described the context in depth.

The observation schedule developed for this study takes into account the Turkish classroom context in relation to research questions. Two issues were the main targets of the observation schedule. These were: teaching activities lycee teachers apply in their classroom, and an examination of the academic work implemented in the classroom.

The activities which take place in the classroom were recorded by using a structured observation schedule (quantitative data) while the level of academic work was recorded by using qualitative methods. Therefore, the researcher believes that a semi-structured observation schedule was appropriate for the purpose of this study. The contents of the structured part of the observation schedule included classroom activities which were expected to take place in the implementation stage. The contents of the observation schedule were determined after examining the related documents mentioned in page 87 and pilot observations in the Turkish Lycees as well as preliminary analysis of pilot teacher questionnaires.

In the process of data analysis, Gump's (1982) approach was used. Gump(1982) divided activities into different categories according to type and activity frequencies. The quality of each activity was also written down in the observation process.

4.2.4 Interviews

Interviews tend to dominate case study research methodology. An interview may be described as a conversation but a "conversation with a purpose" (Webb and Webb quoted in Merriam, 1988, p.72). Interview methods are usually applied for the purpose of finding out the feelings, thoughts, and intentions of the people. This type of information cannot be obtained from other types of research methods such as observations and questionnaires (Merriam, 1988), because the researchers are able to probe during the interview process. The interviewing process also allows the researcher to penetrate the other person's mind. In this process, while some researchers prefer to use highly structured interview techniques, some prefer to employ a less structured interview schedule. Choosing either one largely depends on the nature of both sample and research questions. In this study a less structured interview schedule was used (see appendix 7).

Merriam (1988) outlined the three basic ways to record interview data. The first and most common one is to tape-record the interview. The second way to record interview data is to take notes during the interview. This method is recommended when mechanical recording is not practical or will produce undue interference. The third and least desirable way to record interview data is to write down as much as can be remembered as soon as after the interview as possible. The second method was employed for this study because the researcher believed that it was more appropriate for the Turkish context (the teachers were more willing to accept this method of interview).

The purpose of the interviews was to obtain information about the factors in dissemination which affected the implementation process and to find out the reasons why the teachers applied the activities as they did.

In the literature, many methods have been used in the process of analysing interview data. However, two approaches were often used: putting the frequencies of the statements into the categories for comparing and contrasting each interviewer response, and taking direct quotation from the interviews (Merriam, 1988; Yin, 1989). The first method was mainly employed for this study. The following paragraphs present the sample of interviews as well as the purposes of interviews.

Four Physics Teachers Observed: a formal, partly structured interview was conducted with them. The purpose of the interview was to obtain information in more detail from the teacher on implementation processes, and particularly to explore the reasons behind their ways of teaching.

Informal, opportunistic interviews were conducted with the following related bodies: physics teachers at the visited schools, the Vice-Directorate of the Local Educational Authorities, related people from the curriculum development and implementation unit in the National Ministry of Education. The purpose of these informal interviews was twofold as indicated in chapter 1 (p.6): (a) to get a global picture about curriculum innovations and (b) to investigate encountered problems in the implementation process as observed in the informally interviewed sample.

4.2.5 Validity and Reliability

Guba and Lincoln (1981) recommended that case study researchers should assess the validity and reliability of a case by examining its components one by one, rather than the study as a whole.

Validity refers to the extent to which the findings reflect what is really there (Wragg, 1984). However, with case study, the investigator's experiences can have a considerable influence and, without appropriate safeguards, can undermine validity.

Merriam (1988) suggests five techniques to increase the validity of a study.
These are:

"1- Triangulation: using multiple sources of data, or multiple methods to confirm the emerging findings...

2- Member checks: taking data and interpretations back to the people from whom they were derived and asking them if the results are plausible..

3- Long term observation: repeating observations of the same phenomenon...

4- Peer examination: asking colleagues to comment on the findings as they emerge.

5- Research biases: clarifying the researcher's assumptions, world-view..." (p.169-170).

An attempt was made to take into consideration these above mentioned points in the case of this investigation.

Reliability shows to what extent the findings are replaceable. That is, if the study is undertaken a second time, does the study show the same results? Since human behaviour is not stable, the reliability issue in educational research in many cases is problematic (Merriam, 1988). Reliability and validity should be considered as interwoven in carrying out research because it is impossible to have internal validity without reliability. It was argued that reliability does not fit in with qualitative research and it was suggested that consideration of the consistency of the results is more logical (Merriam, 1988). The following techniques were recommended by Merriam (1988) to increase the consistency of the study.

"1- The investigator's position: The investigators should explain the assumption and theory behind the study, and his/her position vis-a-vis the group being studied..

2- Triangulation: Especially in terms of using multiple methods of data collection and analysis, triangulation strengthens reliability as well as internal validity" (p.172).

These recommendations were followed as far as possible for this study.

4.2.6 The Weaknesses of Case Studies

Subjectivity and generalisabilty are the two main weaknesses in the handling of case studies. However, Stake (1985) argued that if the cases are similar, there is a probability that the results obtained from them could be generalized. However, Stenhouse (1978) indicated that the purpose of choosing a case study is not to make generalization but to understand the subjects in depth.

4.3 Summary

Research approaches related to curriculum implementation were reviewed. It led the researcher to the conclusion that qualitative and quantitative approaches should be combined for curriculum implementation studies. In order to give more theoretical information concerning the methodology chosen for this study, which is a case study, a definition of case study, and the various types of methods used in case studies were discussed with reference to the nature of this investigation. Validity and reliability issues were also discussed. The concept of triangulation was defined, and its application in this investigation was also described. The methods and instruments used in this research were also explained in detail. The purpose of the each instrument was also given. Analysis of the instrument was also mentioned.

The next chapter deals in more detail with how instruments were developed and used in the piloting stage.

CHAPTER 5

DEVELOPMENT OF DATA COLLECTION INSTRUMENTS

5.0 Introduction

This chapter describes the development process of the data collection instruments. The first section deals with the necessity for a pilot study to be undertaken before the main study. It deals with reliability and validity issues and describes the sample used in the pilot study. The following section describes the development process of each instrument, in particular its contents and purposes. Subsequently, the piloting process of the instruments is introduced. Finally, this chapter discusses the relevance of each instrument with reference to the research questions (as set out in Chapter 1, section 1.2.2 page 4).

5.1 Pilot Study

A pilot study can be described as a preliminary study undertaken prior to some major project or investigation. It may be intended as a feasibility study or it may be used to practise the proposed methods, or to try out alternatives while there is still an opportunity to make modifications to the research questions, as well as the content of the instruments (Rowntree, 1981).

In this investigation, the intention in conducting a pilot study was:

1- to test whether each statement in the instrument had the same meaning for the students and teachers.

2- to test whether instruments were appropriate for the Turkish Context.

3- to define the timing of the instrument

5.2 The Process of Piloting and Analysing Research Instruments

5.2.1 Teachers' Questionnaires

This instrument included five sections namely: biographic information, awareness of new physics curriculum, training of teachers, implementation of the course, evaluation of the implementation. The items on the instruments were derived from the documents. These documents are mentioned in section 4.2.1. Table 3 gives detailed information about the categorisation of the items.

Table 3

Teachers' Questionnaire Items

Sections of Instrument	Item Numbers
1-Bibliographic Data	1-9
2-Awareness of Curriculum	10-12
3-Training of Teachers	13-19
4-Implementation Process	20-25
5-Evaluation of Implementation	26-27

(for more detail see appendix 4).

The purpose of section one was to obtain general information about physics teachers in schools of the Black Sea Region of Turkey. Their sex, age, experience, numbers of students and teachers in their school were some of the variables of the first section.

In section two, the intention was to obtain feedback from teachers about the usefulness of information sources in relation to the implementation of the new physics curriculum.

The aim of section three was to collect teachers' ideas about their pre- and in-service education with regard to the implementation of the curriculum.

Section four was designed to find out the quantity and quality of the materials used for the physics courses. In addition, the types of activities used in the classroom were also the subject of this section.

In the last section, teachers were asked to evaluate their teaching in terms of achievement of curriculum objectives and in terms of obstacles in the implementation process that limited achievement of the perceived objectives.

5.2.1.1 Relevance of the Teachers' Questionnaires to the Research Questions

The teachers' questionnaire was used more directly to help to answer the first and second of the research questions (namely: (i)- How do physics teachers perceive and interpret the objective of the new curriculum?, (ii)- To what extent are the intended objectives implemented?) as well as indirectly the third, fourth and fifth research questions (namely: (iii)- What are the main activities which physics teachers employ in implementing the new physics curriculum, (iv)- What are the main external factors which influence the implementation of the new physics curriculum?, (v)- What are teachers' perceptions about remedial changes for effective implementation of the new physics curriculum?) as indicated in Table 1, Chapter 1 (p.8).

5.2.1.2 Pilot Study of the Teachers' Questionnaires

The pilot sample covered seven physics teachers from four general lycees. These teachers filled in the questionnaires and a group discussion with three of these teachers was also carried out. Having completed this process, some items were redesigned and some items deleted on the instrument. For example, some items needed rewriting because the translation did not convey the same meaning to the teachers as intended by the researcher.

5.2.1.3 Analysis Techniques used on Teachers' Questionnaires

Two statistical procedures were used to analyse the findings of the teacher questionnaires.

Firstly, the mean value and standard deviation of each item was calculated by using the Statistical Packages for Social Sciences (SPSS).

Secondly, the five responses to each item were aggregated into two groups in order to determine the percentage of the positive responses of each item. The following criteria were employed in this process.

Items on the questionnaire are scored on a five or four point scale (see appendix 4, Teacher's Questionnaire). In the analysis process, these responses were reduced to a two point scale which indicated either positive or negative responses to the items on the questionnaire. The percentage of the positive responses is given in all the relevant tables.

5.2.2 Students' Questionnaires

The students' questionnaires were adapted from international science studies (Keys, 1987). They consisted of two sections. The first section aimed to find out the students' perception of types of activities and sources employed in the classroom. The purpose of the second section was to find out students' attitudes towards physics teaching-learning. More information about the questionnaires is given in section 7.3, p.203. (see also appendix 5).

5.2.2.1 The Relevance of Using Students' Questionnaires to the Research Questions

The purpose of the students' questionnaires was to help to collect data more directly relevant to the third research question (which is, (iii)- What are the main activities teachers employ in implementing the new physics curriculum?) and indirectly relevant to the first research question ((i)- How do physics teachers perceive and interpret the objectives of the new physics curriculum?), as indicated in chapter 1, p.8.

5.2.2.2 Piloting Students' Questionnaires

A group discussion with six students was carried out. This process aimed at increasing the readability and the face validity of the questionnaire. Having completed the pilot study, some of the questions were rewritten and other necessary corrections were also completed on the questionnaires.

5.2.2.3 Analysis of Students' Questionnaires

The first of the students' questionnaires, 'Students' Perception of Teaching Learning Activities', was analysed by determining how often, in terms of percentage of responses to the categories 'Often', 'Sometimes' 'Never' and 'Missing' were given to each item on the questionnaire.

The second students' questionnaire, "Students' Attitudes Towards Physics Teaching-Learning", was analyzed case by case (each class was considered as a case). The responses were on a five-point scale; these were later reduced to negative and positive responses (two-point scale). The percentage of positive responses was determined and shown in the relevant tables (section 7.3) for each item. In the process of analysis, interpretations were derived from these tables .

5.2.3 The development of the Observation Schedule

The observation schedule was adapted from the schedule of the University of California, Berkeley (CEPUP). The Observation Schedule used in this study consisted of two main parts: structured and commentary parts. The reasons for choosing a semi-structured observation instrument for this study are given in more detail in Chapter 4 in which the researcher reviewed the well known classroom observation schedules. Detailed information regarding the structure and usage of observation schedules is also given in chapter 4.

The structured part of the observation schedule was designed for the purpose of recording types of activities as well as their frequencies. Document analysis and pilot results from teachers' questionnaires were taken into consideration in the process of identifying activities in the observation schedule.

The commentary part of the observation schedule included the topic, level of organization, number of active students, quality of discussion, and unusual teaching methods. The purpose of this part of the observation schedule was mainly to describe the level of academic work implemented in the classroom in relation to intended curriculum objectives. The other purpose of this part was to describe classroom context in relation to classroom practice.

5.2.3.1 The Relevance of Using an Observation Instrument to the Research Questions

The instruments used for the purpose of observation as indicated above helped to answer directly the first and third of the research questions (namely: (i)- How do physics teachers perceive and interpret the objectives of the new curriculum?; (iii)- what are the main activities which physics teachers employ in implementing the new physics curriculum?) and indirectly the second research question ((ii)- to what extent are the intended objectives implemented?) as indicated in Chapter 1, p.8.

5.2.3.2 Pilot Study of Observation Schedule

An experienced science teacher at a Southampton School was observed by the researcher over a period of six weeks. The purpose of the pilot observation at the Southampton School was twofold: the researcher wanted to get used to using the observation schedule in a real classroom situation and to have some experience of analysing data obtained from observations.

The second pilot study of the observation schedule took place in a Turkish Secondary Physics Classroom before starting the main study. In this process, the semi-structured observation schedule, which was being developed with reference to the new physics curriculum guide, as well as a set of descriptions of expected classroom activities, were piloted by the researcher and two research assistants from the Faculty of Education. Afterwards the findings of the three participants were compared. In this process, physics lecturers from the Faculty of Education and the physics teachers who were observed also commented on the form of the observation schedule. Their main consensus was on the structured part of the observation schedule.

After the pilot study, the following activities for the structured part of the observation were defined.

1- **Written Teacher Explanation** : in this activity, the teachers write the explanation of the subject matter on the blackboard, while students either listen or take notes from the blackboard.

2- **Teacher Oral Explanation:** in this activity, the teacher gives information and an explanation about the topic without either writing on the black board or giving any demonstration.

3- **Dictation:** in this activity, teacher asks his\her students to write down every word that he/she says or writes on the blackboard.

4- Teacher Asks Questions: in this activity, the teacher asks questions either to individual students or to the class as a whole.

5- Students Ask Questions: in this activity, students ask the teacher questions.

6- Student Problem Solving: in this activity, students solve problems by themselves. In some cases a student is invited to the black board to solve the problem.

7- Teacher Problem Solving: in this activity, teachers solve problems either from student textbooks, or past university entrance examinations.

Based on a review of documents (see appendix 3), the researcher's professional interpretation of the curriculum guide and pilot observation, the form of the academic work was defined for the Turkish context as follows:

1- Information: facts, principles and concepts

a) Knowledge: teachers give the information about the topic (facts, principles, laws, and formulae).

b) Understanding: teachers give the information and at the same time provides explanations about the subject matter and relate it to previous topics as much as possible.

2- Operation of basic and scientific processing skills

a) Application of knowledge: in this situation, after the teacher's explanation, students are required to use their skills (basic, integrated) in order to solve more complex problems.

b) Conduct of experiments (theoretical or practical): In order to give more explanation about the topic, the teacher undertakes demonstrations, either practical or theoretical; or supervises student practical work.

c) Analysis and evaluation of information: in this part, teachers want their students to analyse and to evaluate the problems.

This pilot observation enabled the researcher to construct the final form of the semi-structured observation schedule. The adopted schedule was modified changed after the pilot observation. Expected activities such as students' practical work did not take place in the class, so therefore this part was deleted from the schedule. The final version of the schedule was appropriate for the topics of the research questions and the definition of activities and academic work in the classroom (see appendix 6).

5.2.3.3 Analysing the Observations

Observation analysis consists of two parts. One concerns the structured part of the observation schedule. This part is analyzed by calculating the duration of each activity for each lesson (each lesson lasted 40 minutes). The same calculation was done for a total of six lessons for each activity for the individual teacher observed.

The second part of the schedule was used to obtain qualitative data in order to determine the quality of each activity and to describe the class atmosphere, for example the number of students active, unusual teaching methods, quality of discussion. The above aspects of the obtained data were interpreted for each case under the qualitative findings of the teaching process, and a comparison made with the intended and implemented curriculum.

5.2.4 Development of Interview Schedule

The items relating to classroom implementation were the main concern of the interview instruments. Additionally, the factors which influenced classroom practice were also investigated in the interviews (see appendix 7).

In particular, the ways in which the teachers became aware of the curriculum requirements was the first issue in the interview process. The second issue was to explore teachers' beliefs about the factors which mostly influence curriculum implementation. Another issue was to obtain the teachers' opinions about the characteristics of the textbooks as well as the curriculum guide in relation to classroom practice. The final subject of the interview was to discover the teachers' beliefs about teaching activities.

5.2.4.1 The Relevance of Conducting Interviews to the Research Questions

The purpose of conducting interviews was to collect data relevant directly to the first and fourth and fifth of the research questions (namely: (i) How do physics teachers perceive and interpret the objectives of the new curriculum? (iv)- what are the factors which influence the implementation of the new physics curriculum? (v)- What are teachers' perceptions about remedial changes for effective implementation of the new physics curriculum?).

5.2.4.2 Pilot Interview

The purpose of the pilot interview was to have some experience in determining teachers' perceptions and feelings concerning the implementation process. The teachers were asked about the particular methods they used in the process of implementing the curriculum in the classroom and the factors which facilitated or inhibited implementation. This process took place in a corner of the staff-room so that during the interview other teachers did not disturb the interviewee. The interview time was arranged with the involved teachers before, and the teacher already knew the content of the interview. Nevertheless at the beginning of the interview, the purposes of the study were repeated. The questions proceeded in the order general to specific. Each interview took one lesson time (40 Minutes). The time was arranged so that the staff-room was not very crowded -during lesson times, when most of the teachers were teaching. This process helped the researcher to understand the realities of the Turkish classroom context as well as what types of techniques could be used in the process of interviewing, For example, one of the teachers interviewed told the researcher: 'I do not feel very comfortable when the researcher uses a tape-recorder'. The rest of the teachers who were interviewed were also reluctant to be tape-recorded. Thus, it gave the impression that in order to have the Turkish teachers speak freely about the issues of interest to the researcher, other techniques, in which teachers felt free to express themselves, should be used. Consequently, the researcher preferred to take notes during the interview process.

5.3 Experience During the Pilot Study

As inferred above, restrictive circumstances were encountered during the field work process. For example, it was understood that it was almost impossible to use a tape recorder during the interview process with the teacher. Moreover, it was also the case that teachers were not familiar with this kind of research, specifically observation. Another difficulty was to convince the teachers about the benefit of the study. For instance teachers had filled in questionnaires when asked by the Ministry of Education on many previous occasions, yet they believed that their responses would not be taken into consideration.

The experience gained from such circumstances gave the researcher the perception of how best to conduct the main field work. The problems confronted in the pilot study, on which two weeks more than planned were needed to complete the main study. The official appointment of schools and teachers for observation and interviews helped the researcher to avoid the problems mentioned above.

CHAPTER 6

MAIN STUDY DESIGN

6.0 Introduction

The main study was implemented between February and May 1992 in the Black-Sea region of Turkey. The field work consisted of three parts. In the first part, 80 questionnaires were handed to physics teachers working in the Black-Sea area. In the second part, 4 teachers were observed for a period of 10 weeks. Each teacher was observed for more than 10 lessons, and of these, six lessons were tape-recorded. In the third part formal interviews with observed teachers, and informal interviews with the physics teachers at the visited schools, and with the local education authorities, and inspectors and policy makers from the national ministry of education (curriculum development, implementation units) were also carried out. In order to implement this study, official permission was obtained from the Ministry of Education as well as from the Local Education Authorities. The transcripts are attached to appendix 8.

6.1 The Process of Conducting Teachers' Questionnaires

The main characteristics of the teachers were that they were all physics teachers and that they taught at the general lycees in the Black-Sea Region of Turkey. These teachers were chosen from six provinces as well as their sub-provinces, which are located on the coast of the Black-Sea Region. The reason for choosing these provinces was that access to these places was not problematic.

The researcher visited the general lycees in these six provinces to hand the questionnaires to the physics teachers. In this process, it was necessary for the researcher to explain the purpose of the study to the Heads of the schools. However, the delivery of the questionnaire took place mostly in the school staff-rooms.

6.2 Teacher Observations

Four general lycees were chosen from one city, Trabzon, for the purpose of in-depth observations of four physics teachers. The four schools in Trabzon were chosen partly because of the researcher's familiarity with the context.

Special permission was obtained from the Ministry of Education as well as the Local Educational Authority to make observations in the classes of these teachers. Permission was also asked of the Heads of schools as well as the physics teachers to enter and make observation in their classrooms.

Having obtained permission, a time table was arranged with the four physics teachers and they were observed for a period of ten weeks.

In the process of observation, the researcher and the teacher observed entered the classroom together. In this process, some of the teachers introduced the researcher and his position to the class. However, some of the teachers did not introduce the researcher to the class. The researcher sat at the back of the classroom. During the observation, a tape recorder and a semi-structured observation schedule were used. Some qualitative data were also taken during the observation period. After the observation of each 40-minute lesson the researcher discussed some of the issues with the teacher.

6.3 The Process of Conducting Students' Questionnaires

Questionnaires were delivered to the classroom in which observation took place. The class teacher was asked to help the researcher administer questionnaires to the students. The administration of the questionnaires took place in a classroom during the students' free periods.

6.4 The Process of Conducting Interviews

The observed teachers were also interviewed after the completion of the classroom observation. The interviews were conducted in the staff-room during class-time periods so that there were not as many teachers in the room. The teachers did not give permission to the researcher to use a tape recorder, but rather they recommended the researcher to take notes during the conversation.

In the process of informal interviews, the researcher could not use any recording instrument with the sample visited. This sample included physics teachers from the visited schools, staff at the curriculum development and implementation unit from the Ministry of Education and the vice-directorate of the Local Educational Authority.

CHAPTER 7

DATA ANALYSIS

7.0 Introduction

This chapter includes three sections presenting data obtained from teachers' questionnaires, class observations and interviews with observed teachers, and students' questionnaires.

The first section presents the findings of the questionnaires filled in by 50 physics teachers working in the schools of the Black-Sea region of Turkey. Information about teachers' perceptions of curriculum dissemination in relation to the curriculum implementation process was obtained. The findings of this section are presented under five categories. It was hoped that these findings would provide a basis for forthcoming observations and interviews. The issues or obstacles which prevented curriculum implementations in the Turkish context were examined from the teachers' perspectives.

The second section gives more detailed information about the context in which the teachers implement the curriculum. The types of activities the teachers employ in their class were examined. Interviews with the observed teachers were conducted specifically to determine the reason behind the types of activities they employed. Other issues arising from these interviews, like teachers' perspectives on the dissemination process, are also discussed and presented in this chapter. Subsequently, the data obtained from the teachers observed and interviewed are compared and contrasted.

In section three, the focus is on the students' questionnaires. The students studied were in the same classes as the observed teachers. This section analyses students' perceptions and attitudes towards physics teaching and the learning process.

The chapter ends with a summary of the findings emerging from the three sections.

7.1 The Findings of the Teachers' Questionnaires

7.1.1 Introduction

The purpose of this section is to analyse the findings from the teachers' questionnaires, to obtain information about curriculum dissemination and the implementation processes in the Turkish context. The questionnaires are divided into five categories. These are concerned with (1) biographic information about the teachers surveyed, (2) teachers' awareness about the usefulness of information sources about curriculum, (3) teachers' previous preparation and its relevance to current curriculum implementation, (4) sources and laboratory equipment used in the classroom and their relevance to the types of activities employed, and (5) teachers' own evaluation of curriculum implementation. The organisation of the questionnaires, which were arranged in the sequential order above, is mainly based on the curriculum process in the Turkish context (see 2.4). The significant findings of the teachers' questionnaires are described as a whole in relation to classroom practice.

7.1.1.1 Biographic Information about Teachers Surveyed

As indicated in Chapter 3, the teachers' background and aspects of their school context such as class and school size are influential factors in the implementation of curriculum innovation. Therefore, information was obtained about the pre-mentioned related variables. This information was collected in the biographic part and divided into two subcategories. The first was information related to sex, age, and length of teaching experience (see Table 4). The second was information relating to the educational background of the teachers.

The results of the survey showed that the physics teachers were predominantly males (76% males, 24% females). Table 4 below shows the range in ages of the teachers, the percentage of teachers in the various age-bands and their total teaching experience.

Table 4

Ages of Teachers and Total Number of Years Experience

(N= 50 Physics Teachers)

Teachers' Age Range	Percentage of Teachers	Number of Teachers	Total Teaching Experience (Years)
23-26	16	8	0-3
28-30	30	15	3-5
31-34	14	7	5-7
35-37	16	8	8-10
38-40	14	7	10-13
40-44	10	5	13 +

Table 5 below shows the types of institutions from which the teachers had graduated. As can be seen from Table 5, almost half of the teachers surveyed had graduated from institutions other than the Faculties of Education.

Table 5

Teachers' Qualifications

(N=50 Physics Teachers)

Teacher's Institution	Percentage of Teachers	Number of Teachers
Faculty of Education	56	28
Three Year Teaching College	28	14
Faculty of Arts and Sciences	12	6
Four Year Teaching College	4	2

As can be seen from Table 6, the smallest class-size was 25 students, the largest class-size was 72 students, while a class size of around 40 was the most frequent.

Table 6

Class Size

(N=50 Physics Teachers)

Class Size	Percentage of Teachers	Number of Teachers
25-30	22	11
34-37	10	5
39-40	24	12
45-52	14	7
56-60	18	9
65-72	12	6

Table 7 shows student numbers at the schools surveyed. A student population of between 500 and 850 students was the most frequent.

Table 7

School Size

(N= 50 Physics Teachers)

School Size	Percentage of Teachers	Number of Teachers
200-450	14	7
500-850	30	15
900-1200	16	8
1300-1800	10	5
2000-2600	10	5
2800-3500	20	10

As can be seen from Table 8 below, more than half of the teachers indicated that they had had only three or fewer years' experience in their present schools. It could be said that a substantial number of teachers move frequently from school to school. This might negatively affect curriculum implementation in schools.

Table 8

Physics Teachers' Length of Service in their Present School

(N=50 Physics Teachers)

Length of Service in Present Schools (Years)	Percentage of Teachers	Number of Teachers
0-3	60	30
4-6	20	10
9-10	8	4
12-13	12	6

7.1.1.2 Teachers' Awareness

The following three issues were perceived by the researcher as important factors relating to teachers' awareness in implementing curriculum in the Turkish context. (To obtain the required information, the teachers were asked to express their opinions on these components). The issues are: variety of sources and teachers' perceptions about their usefulness, teachers' views concerning the quality of the textbooks and curriculum guide and their applicability in the classroom context, and the level of importance of the prescribed curriculum objectives.

Table 9 below shows teachers' assessment of the usefulness of the variety of sources.

Table 9

Usefulness of Variety of Sources

(N=50 Physics Teachers)

Sources	Percentage of Teachers giving Positive Response	Mean	Standard Deviation	Rank Order
Physics books other than students' text books	86	3.40	.049	1
Senior physics teachers	72	3.02	.063	2
Science magazines and journals	70	2.92	.064	3
Radio and television programmes	60	2.70	.069	4
School administration	36	2.24	.067	5
Material from school library	28	2.04	.063	6
Student Teachers in school for teaching practice	18	1.70	.054	7

As can be seen from Table 9 above, the top three items were considered more useful than the others. A relatively high ratio of teachers found the first item to be particularly useful. There was evidence that supplementary books were found helpful to the teachers. These materials helped them to find examples of problems set mostly in the University Entrance Examinations. As far as the researcher is aware, these materials do not include information about the requirements of the new curriculum. Rather, they cover examples enabling the student to rote-learn the subject for the purpose of passing examinations.

Although a minority of the teachers surveyed found the last three sources useful, the least useful source was student teachers on teaching practice in schools.

Table 10 shows the teachers' opinions concerning the quality of the textbook and curriculum guide and their applicability in the classroom context.

Table 10

Teachers' Opinion about Students' Textbook and Curriculum Guide

(N= 50 Physics Teachers)

Textbook and Curriculum Guide	Percentage of Teachers giving Positive Response	Mean	Standard Deviatio n
Illustration and graphs in the textbook	64	2.78	.067
Appropriateness of content of the textbook for the grade level	56	2.68	.070
The relationships between the textbook's objectives and teachers' own priorities	54	2.66	.070
Comprehensibility of aims of the curriculum guide	52	2.68	.070
The relationships between aims and suggested activities	38	2.60	.070
Practicality of suggested activities	26	2.58	.062

As can be seen from Table 10 above, more than half of the teachers found the textbook and curriculum guide appropriate. However, around 60 percent of them responded negatively to the relationships between aims and suggested activities. Thus, there is evidence from this table that some of the suggested activities in the curriculum guide and textbook are not applicable in many classes.

Table 11 represents the importance of curriculum objectives as interpreted from the teachers' point of view.

Table 11

Teachers' Opinions about Importance of the Objectives

(N= 50 Physics Teachers)

	Percentage of Teachers giving Positive Response	Mean	Standard Deviation	Rank Order
Developing basic scientific processing skills	68	3.80	.065	1
Developing integrating science processing skills	60	3.58	.060	2
Understanding practical application of physics	52	3.52	.070	3
Understanding scientific facts, principles and laws	50	3.14	.070	4
Understanding the development of scientific knowledge	32	3.08	.065	5

More than half of the teachers surveyed gave positive responses to the top four items on the questionnaire while the least emphasis was given to the objectives of "understanding the development of scientific knowledge". There is evidence from Table 11 above, that teachers know the intended objectives of the curriculum.

7.1.1.3 Teachers' Preparation

This section investigates the effects of teacher training on curriculum implementation at classroom level. It covers three main issues, namely pre-service teacher education, subject-colleagues' meetings, and in-service programmes.

Table 12 below shows to what extent pre-service teacher education was perceived to be helpful to teachers with regard to items in the table.

Table 12

Helpfulness of Pre-service Education

(N=50 physics teachers)

	Percentage of Teachers giving Positive Response	Mean	Standard Deviation	Rank Order
Acquiring scientific facts	68	3.08	.065	1
Acquiring basic science processing skills	46	3.00	.070	2
Acquiring teaching skills	44	2.72	.070	3
Acquiring integrated science processing skills	34	2.66	.066	4
Acquiring skills on lesson planning	26	2.26	.062	5

As can be seen from Table 12 above, the first item was found to be significant, with positive responses from teachers indicating a majority agreement. Their responses to this item show that their pre-service education provided them with the relevant knowledge. On the contrary, their pre-service programme did not develop their science processing skills.

The second issue of the teachers' preparation concerns meetings taking place either at school or at local education authority level. Table 13 below shows the usefulness of these meetings to teachers in their professional development with regard to the implementation processes.

Table 13

Usefulness of Meetings to Physics Teacher

(N= 50 Physics Teachers)

	Percentage of Teachers giving Positive Response	Mean	Standard Deviation	Rank Order
Informal meetings with colleagues	50	3.00	.070	1
Formal meetings with colleagues	48	2.88	.070	2
Meetings convened by Local Educational Authority	30	2.56	.070	3

As can be seen from Table 13, no form of meeting was considered by a majority of the teachers to be useful, although meetings with colleagues were seen to be more useful than meetings called by the Local Educational Authority.

As regards the third issue of the Teachers' Preparation Section, teachers were asked: "Has an in-service programme for physics teaching-learning taken place in your region?" Only 40 percent of the teachers replied positively to this question. Another question under this section was: "Have you attended an in-service programme for physics teaching-learning?". Twenty-four percent of the teachers responded positively. Thirty-five percent of those who attended an in-service programme indicated that their in-service programme was effective. It could be argued from the above findings that, although over the last ten years curriculum changes have been taking place in Turkey, there were insufficient in-service programmes both qualitatively and quantitatively and that those which were held were not very helpful.

Teachers were also asked to give their opinion about their needs concerning in-service education. Their responses are categorised in the following order.

1- **Content oriented needs:** More than a third stated their needs on the subject of new topics that had not been covered in the previous physics curriculum (topics relating to atomic and nuclear physics).

2- **Pedagogically oriented needs**: About 40 percent of the teachers indicated their needs regarding the effective use of the laboratory, the teaching of the most difficult topics in physics, and the use of computers in physics teaching-learning.

7.1.1.4 Teachers' Views about Components of Implementation

Section four investigated the following issues: the role of the textbook, the curriculum guide and other sources in preparing the daily and yearly plans and test questions asked in the course examination, as well as the teaching-learning activities teachers employed in their classes. The other aim of this section was to obtain information about the school context in terms of equipment and classroom space.

Table 14 below shows the suitability of the following sources in the process of preparing the daily and yearly plans, and test questions.

Table 14

The Suitability of Sources in Preparing

Daily and Yearly Plans, and Test Questions

(N=50 Physics teachers)

	Percentage of Teachers giving Positive Response	Mean	Standard Deviation	Rank Order
Student textbook	76	3.66	.060	1
Curriculum guide	62	2.84	.068	2
Other sources (supplementary books)	60	2.83	.069	3

Table 14 above indicates that the 'student textbook' was the main source used, alongside others, in preparing daily and yearly plans as well as test questions. More than half of the teachers positively responded that the curriculum guide and other sources were used in the lesson preparation process.

The teachers were asked to rate the following activities in accordance with how frequently they used them in the teaching-learning process

Table 15

Teaching Learning Activities in the Classroom

(N= 50 Physics Teachers)

Teaching Activities	Percentage of Teachers giving Positive Response	Mean	Standard Deviation	Rank Order
Teachers Ask Questions	80	3.00	.056	1
Teacher Oral Explanations	74	3.00	.062	2
Problem Solving	74	2.94	.062	3
Dictation	60	2.70	.069	4
Written Teacher Explanation	56	2.62	.070	5
Laboratory Work	34	2.32	.066	6
Students Ask Questions	12	1.92	.046	7

It may be observed from Table 15 above that teacher dominated activities were used much more than student dominated activities in implementation processes. It is interesting that only around one third of the teachers replied that they included laboratory work as part of their physics lessons. In addition to the above information, teachers were also asked to describe their teaching context. The following information was obtained from them concerning their classrooms and laboratories, and the quality and quantity of the equipment at their disposal.

Fifty percent of the teachers had in their school a 'normal classroom and general laboratory', forty-four percent of the teachers said that they had in their school a 'normal classroom and designated physics laboratory', while only six percent of the teachers had in their school a 'designated classroom and a designated laboratory'.

Fifty-six percent of the teachers indicated that laboratory supplies and equipment were inadequate; 34 percent responded that a few items of laboratory equipment were lacking, while only 10 percent indicated that there were sufficient laboratory supplies in their schools.

In response to the questions regarding the quality of facilities and equipment, 40 percent of the teachers indicated that the quality of the facilities and equipment were 'very poor' while 60 percent of the teachers responded that the quality of the existing equipment was 'good'.

It could be argued as a result of teachers' responses regarding the contextual issues as indicated above that although the practice of laboratory work is recommended to the teachers, schools are not well equipped with the necessary materials.

There is also evidence from the visits made to schools that schools in the provinces have much more equipment than in sub-provincial schools. However, due to class size in the provincial schools, laboratories are relatively more used in the sub-provinces.

7.1.1.5 Evaluation

The purpose of this section was to obtain information concerning teachers' opinions about curriculum objectives. Two main issues are covered: one concerning teachers' perceived achievement of the intended objectives, the other concerning teachers' opinions about the obstacles which hinder achievement of the intended objectives.

Table 16

Perceived Achievement of the Intended Objectives

(N=50 Physics Teachers)

	Percentage of Teachers giving Positive Response	Mean	Standard Deviation	Rank Order
Understanding of scientific facts, principles and laws	60	2.86	.069	1
Developing basic science processing skills	34	2.68	.066	2
Developing integrated science processing skills	32	2.64	.065	3
Understanding of development of scientific knowledge	30	2.56	.064	4
Understanding practical application of physics	26	2.50	.062	5

There is evidence from Table 16 above that the objective rated most highly by teachers as being possible to achieve is 'understanding of scientific facts and laws'. On the other hand, it could be argued also from the Table 16 that intended objectives unlikely to be achieved by students in the opinion of a large number of teachers.

In this part, teachers were asked to rate the following items as perceived by them as obstacles to the implementation process.

Table 17

Obstacles to the Achievement of the Intended Objectives

(N=50 Physics Teachers)

	Percentage of Teachers giving Positive Response	Mean	Standard Deviation	Rank Order
Lesson Time	90	3.52	.042	1
Class Size	84	3.50	.051	2
Student Abilities	84	3.30	.051	3
Facilities	68	3.16	.065	4
In-Service Programmes	64	3.04	.067	5
Pre-Service Programme	54	3.02	.070	6
Physics Programme	50	2.52	.070	7
Colleagues Meetings	36	2.28	.067	8

As can be seen in Table 17 above, there were a number of factors perceived by a large percentage of teachers either as being obstacles hindering achievement of the recommended objectives or as being unproductive. It could be argued from this result that some of the expectations of the Ministry could not be met within the actual class context. A significant number of teachers responded that in order to reach the intended objectives, classroom conditions as well as other factors needed modification. In other words, the intended objectives are unlikely to be achieved in the existing conditions.

Another result emerging from Table 17 above is that half of the teachers surveyed experienced some inhibiting effects from the in-service programme, the pre-service programme and the physics programme. At the bottom of the table, about one third of the teachers surveyed indicated that they considered the subject-colleagues' meetings to be not constructive and therefore a minor obstacle as regards the achievement of the intended objectives.

7.1.2 Main Issues Emerging from the Findings of the Teacher's Questionnaires and their Discussion

As indicated above, the teacher's questionnaire survey revealed the following evidence.

Biographical Information:

- Physics teachers who work at schools in the Black-Sea Region of Turkey are mostly male (76%) and their age range is 26-44. There is a lower proportion of older teachers. The highest proportion of teachers are aged 28-30 (see Table 4).
- Teachers working in schools have graduated from four different institutions. However, just under half of them

have graduated from institutions other than faculties of education (44%).

- In general more than half of the teachers surveyed do not have more than three years of experience in their present schools, and this proportion decreases in sub-provincial schools. Similarly, teachers in provincial schools have a relatively much longer service record in their present schools than those in sub-provincial schools.

Awareness:

- A minority of teachers responded positively to the practicality of suggested activities in their class context (see Table 10, p.125). Therefore, it can be argued that some of the suggested activities in the curriculum guide and textbook are not applicable in many classes.
- A majority of teachers surveyed responded positively that their main intention in teaching physics was to develop students' science processing skills (see Table 11, p.126). Therefore, these findings reveal that teachers know the intended objectives set by the Ministry of Education. However, this does not indicate whether or not teachers are well-informed about their chances of success in fulfilling the intended objectives. Similarly, it cannot be determined whether or not these objectives are achievable in the class context.

Teachers' Preparation:

- Teachers' responses reveal that pre-service education did not develop the necessary science processing skills (see Table 12, p.127). From these results, it could be interpreted that some teachers might still have problems in helping students to develop their science processing skills.

- There is some evidence that subject-colleagues' meetings are not a very useful source of information regarding the requirements of the new curriculum and possible teaching activities that could attain the intended objectives (see Table 13, p.128).
- Forty percent of the teachers surveyed gave evidence that in-service programmes took place in the regions where they worked. However, the same teachers' responses reveal that only twenty percent of them attended these in-service programmes. Therefore, it is argued that although curriculum changes have been taking place for the last ten years in Turkey, in-service programmes have not been adequately conducted in parallel to these changes.
- There is evidence that teachers need to follow in-service programmes for the new content of the programmes and pedagogical needs. These findings also support the above argument regarding the inadequacy of in-service programmes.

Teachers' Views:

- There is evidence that a majority of number of teachers follow 'students' textbooks' as a main source in preparing daily and yearly plans as well as constructing test questions.

- The teachers' questionnaires also revealed that teaching activities were mostly based on teacher dominated activities in the classes where this survey was conducted (see Table 15, p.132).
- There is evidence that schools in the provinces have much more equipment than those in the sub-provinces.

Evaluation:

- Teachers' responses showed that students are more likely to achieve understanding of scientific facts than to develop science processing skills in the class context where this survey was conducted (see Table 16, p.134).
- There is further evidence that although teachers are aware of the intended objectives of the new curriculum, they want to see a variety of changes in order to reach these objectives in the existing class conditions (see Table 17, p.137). Therefore, it could be argued that some expectations of the Ministry of Education are unattainable in the existing class context. Perhaps, it could be argued that teachers need to change their teaching methods.

Physics teachers were found to be mostly junior, with little service experience. However, after some years gaining experience, these teachers will either move to or open their own private courses, if possible. In both cases they will be substituted by other inexperienced teachers. Experienced teachers leave state schools for private courses for many reasons. Firstly, placements and transfers of teachers in Turkey do not always match the wishes of the teachers, causing them some problems of adaptation to new environments. Secondly, the financial status of state schools does not provide the motivation for teachers to settle in a job for a long period of service. Salaries in state schools are lower than in private courses. Since private courses are located in the provinces, teachers prefer to move from sub-provincial state schools to provincial ones. Subsequently, they have easier access to jobs on private courses. Clearly, the inexperienced teachers remaining in the state schools will apply a qualitatively lower standard of teaching activity.

The findings show that a minority of physics teachers are female. The low figure may be attributed to the fact that their families interfere where choice of career and social status are concerned. It is also because they wish to avoid the inconvenience caused to their male counterparts by the problems of placements, living centrally, mobility and transfers. Moreover, it seems that the choice of physics as a field of specialisation is low among females.

The difference between suggested and actual teaching activities may be attributed to the nature of pre-service education. Teacher questionnaires revealed that pre-service education did not help them to develop their science processing skills. This issue needs further investigation, and changes may have to be made to develop pre-service education in that respect. More practical preparation should be given to the programme, since the findings show a shortcoming in that area of preparation. Furthermore, pre-service programmes need to exploit appropriate teaching activities that teachers can adapt in the real classroom setting.

In in-service programmes, it was found that the new curriculum covered content which the previous ones lacked, thus calling for continual follow up work. Some deficiencies were found in the Turkish in-service programmes which are organised nationally. These are mainly caused by the local implementation of these programmes. Teachers are called to attend the training sessions of these programmes in a regional centre which they cannot access easily. Other reasons need also to be considered. Firstly, financial resources are limited, since no financial incentives are given for teachers to attend such programmes. Secondly, bringing teachers together in regional centres is difficult, because in-service programmes take place after the academic year, during the summer time, which many teachers consider to be leisure time. Therefore, the number of teachers attending such programmes is not at the desired level. It is then suggested that national in-service programmes as such should be organised during the academic year itself. In this way, the financial burdens would be attenuated from the

Ministry side and the problems of teachers' attendances could be solved as well. Thirdly, although the new curriculum has new concepts, it was found that the content of the in-service programmes rarely give appropriate attention to these new concepts. Moreover, the teachers feel that these programmes do not meet their requirements since the content is not sufficiently adapted to their needs. Fourthly, the initiative for these programmes has obviously been taken by the Ministry, but never by the teachers. The centre's initiative may or may not be accepted by the teachers depending on the content of the programmes. However, if these initiatives were set up following a request by the teachers as a function of their needs, it would be more acceptable and effective for both sides. Inadequacies in in-service programmes affect the curriculum implementation process.

It can be argued that one important cause of inadequacies in in-service programmes is that teachers are not paid a sufficient salary. The salaries which do not allow the teachers to cover their families' basic needs, in addition to giving little financial incentive, make the struggle for survival a priority over other interests. This results in wide-spread non-participation in the programmes. Even though teachers have the opportunity to attend in-service programmes initiated by the centre, it is unlikely that they benefit from them.

The teachers, in order to obtain additional financial resources to sustain their lives, exploit the free time they have outside classes. A substantial number of teachers give private tuition to the children of rich families. The Ministry's rules allow teachers to leave school whenever they have free time, but they are not allowed to take any other job according to constitutional article no: 257. However, teachers see this time as their best chance to improve their financial status, even though it is illegal. Accordingly, many teachers who are involved in this kind of activity prefer to keep up their regular sessions of private tuition rather than attending the in-service programmes, especially if the appointed regional centre is far away from where they live. It could be argued that the knowledge and teaching activities of these teachers are of lesser quality than their colleagues', since they do not attend in-service programmes and rely merely on an unsubstantial educational background.

The findings show the ineffectiveness of subject-colleagues' meetings from the point of view of how they function and the degree of communication between teachers. In the meetings, teachers do not get helpful information about the activities that they could adopt in class teaching. Due to their formality these meetings do not encourage teachers to communicate and share ideas. Academic interaction between the chairpersons and the teachers, or between the teachers themselves is not effective. Moreover, informal conversations with teachers from the visited schools show that some negative social relations among teachers affect these meetings.

Since senior teachers preside at these meetings, their beliefs are an influential factor, usually defying the issue of changes and modifications. This is because of age difference and old educational values. This overpowering influence renders the meetings un-useful to the other teachers. Good junior teachers react to this and other pre-mentioned issues, by deciding to move to private courses. It is worth mentioning that private courses in Turkey do not accept teachers with low performance. This clearly shows that the majority of teachers remaining in state schools have a relatively low performance in teaching.

This also explains why senior teachers constitute a minority in the state schools because most of the junior teachers move after gaining some experience in order to improve their socioeconomic positions and to gain seniority in the private courses. The state schools, as has been mentioned above, substitute the junior teachers that have resigned with other inexperienced junior teachers, thus repeating the cycle. It is therefore suggested that junior teachers should be given higher socio-economic standing, thus encouraging them not to move to private courses. At the same time, it is suggested that the rich social experience of senior teachers (which has been found as a distinctive feature of this group of teachers) should be made use of. In conclusion, a balance between seniority and juniority in the

Turkish state schools needs to be carefully established through research planning.

Finally, the subject-colleagues' meetings occur too regularly. This regularity leads to bureaucracy, routine and boredom. Furthermore, attendance is compulsory, which means that some teachers who are busy come against their will. The meetings as a whole are in the end of little or no benefit for the teachers who are really interested in learning the new curriculum content and teaching activities.

Regarding curriculum materials, the findings from the teachers' questionnaires show that the majority of teacheerss' consider supplementary books to be helpful. Common experience shows that teachers instruct students about problem solving rather than helping them to understand the topic in depth. This means that the teachers do not implement the objectives of the curriculum as the Ministry intended. In fact, teachers still perceive the objectives as impractical to implement in the classes. However, problem solving as a teaching activity in the above mentioned context is intentionally performed by the teachers for the purpose of helping their students to pass the National University Entrance Examination in which problem solving is required. Accordingly, the supplementary books are seen to be helpful from that point of view since they include many examples of the examination questions.

The findings of the teachers' questionnaire show that student textbooks, the curriculum guide and supplementary books are each followed by almost the same number of teachers for the purpose of preparing their daily and yearly plans.

Despite the fact that the content of the textbooks should officially be followed, the Ministry asks teachers to refer to other resources for the purpose of elaboration and explanation to make physics easier for students' understanding (MEB, 1987). The student textbooks form a summary of the content of the curriculum. The teachers continuously use the student textbooks as the main source to follow in order to finish in the prescribed time. They turn to other references only for problem solving examples. Therefore, teachers should follow the Ministry's regulations whereas the Ministry should be more flexible about the suggested length of lessons in the schools.

From the researcher's discussions with the visited school teachers and from the findings of the teachers' questionnaires, it is understood that equipment insufficiency exists in both the provincial and sub-provincial schools. However, more laboratory equipment is allocated to the provincial schools than to the sub-provincial ones. Two considerations have to be made about equipment issue. Firstly, class sizes are usually large in the provincial schools so teachers are not able to apply laboratory work as suggested except for some demonstrations. Secondly, sub-provincial schools have small classes but they do not have sufficient equipment to conduct experiments.

Besides the above mentioned shortage, local assessment of the equipment needs of schools is generally not properly approached. Some misunderstandings among schools and local authorities continue to exist regarding equipment requests. The researcher was told informally by teachers that their requests had not been met in the right way. Many times, the local authority had sent them the wrong equipment. In conclusion, the inadequate supply of equipment stems on the one hand directly from financial reasons and on the other hand indirectly from administrative reasons, a lack of communication and organisation.

The findings of this study show that the majority of teachers negatively responded as to the practicality of suggested activities. These include involvement of student-dominated activities, which are not favoured by teachers. The reasons for this can be attributed to three factors. Firstly, teachers feel under pressure to cover the prescribed topics in the yearly plan. Secondly, students are not active, since the way they were brought up and educated makes them passive listeners. Thirdly, some classes are so large that they are not controllable especially if student-dominated activities are to be applied. Therefore, the teacher-dominated activities are easier to adopt. The dictation activity, for example, engages the students in listening and writing. Thus they do not disturb each other. The consequence is that students are more likely to achieve understanding of scientific facts than to develop science processing skills. Furthermore, for some teachers, it is less demanding to teach theoretical scientific facts. However, this endangers the students' abilities to attain the intended objectives of the curriculum regarding science processing skills. The teaching activities should encourage student involvement in such a way that they gradually overcome their passive tendencies. To optimise achievement of these targets within the existing educational system, the Ministry needs also to give the teachers some sort of autonomy and flexibility of teaching according to their abilities.

The findings of the teachers' questionnaires support the above suggestion. It was found that teachers requested a variety of changes with a view to facilitating implementation of the curriculum. However, the implications of such change need to be reviewed in detail. The findings of this study only pointed out these areas of change from the teachers' point of view.

It seems from the above discussion that curriculum implementation is affected by lesson times, class size, and facilities, in addition to factors such as in-service programmes and subject-colleagues' meetings. Further class observations and interviews are needed in order to highlight the most significant factors among the above mentioned. Furthermore, a clearer definition of teaching methods and their rationale should be established.

7.2 Findings of the Observations and Interviews with Teachers

7.2.0 Introduction

This section presents data obtained from four physics teachers who were observed and interviewed in depth for this study. These investigations are presented as case studies, one for each teacher. Characteristics of context and biographical information about each teacher are given at the beginning of each case study.

Six lessons for each teacher were observed and analyzed in terms of the types of activities undertaken and the proportion of time that each teacher devoted to these activities both for each individual lesson and for the six lessons as a whole. In addition, information about the quality of each activity as well as the level of academic work that the teacher engaged in is presented.

The section also presents the formal interviews which were carried out by the researcher at the end of each observation period. The section ends with a comparison between the intended and implemented curriculum for each case study.

7.2.1 Case One: Teacher A at School I

7.2.1.0 Context and Biographical Information

This teacher was a 44 year old male physics teacher who had been teaching for 20 years. He graduated from a four-year teachers' college. He taught first and second year in the general lycee. The school where he was teaching had 3,000 students, and was located in the city. It had ten other physics teachers. The class sizes varied, but the observed one had 60 students. Teacher A was senior physics teacher in his school. He used to work as the deputy director for science teachers in the directorate of the local educational authority. He was appointed head of physics teachers because of his total physics teaching experience.

The school in which observations took place is the largest one of the three general lycees in the city, and was established in about 1970. It is a three storey building. The offices of the principal and his two assistants are located on the second floor. The classrooms and laboratories are on the first floor. A large teachers' room is located on the third floor where, as in other schools, every teacher has his own drawer. In most cases teachers keep students' exam papers and some teaching materials in these drawers. The room also has a television for leisure purposes.

The school's administration seemed very strict. The researcher witnessed a case where some teachers arrived in class five minutes late, and one of the vice-principals was instructed by the principal to investigate the matter officially. The vice-principal asked the teachers involved to give their reasons for being late. The researcher was surprised by this procedure, and asked the vice-principal why it was so important to pursue this simple matter in such a formal way. The reply was that the noise in the corridors was disturbing other classes. The researcher got the impression that a high emphasis was placed on the administrative control of the school's discipline. Another example of administrative control is that one teacher each day is on 'floor duty'. It is his/her responsibility to control the teachers and students, and report to the administration if teachers do not attend their classes on time or if students are seen outside their classes during study sessions.

The school has a large physics laboratory. A Physical Study Science Committee (PSSC) course was implemented at the school for 6 years (see p. 26). There is sufficient laboratory equipment and enough space to conduct experiments at least in the form of group demonstrations. However, physics teachers working at the school told the researcher in the discussion in the staff-rooms that they rarely demonstrate experiments because of time and other formalities such as the process of filling in special forms after conducting the experiments to show that they have already been done.

The class sizes seemed large, with three students sharing each desk. In the classroom, the blackboard was a very important item. Near the blackboard there was a teacher's table in front of the students' desks. There were three rows of desks, each row had 7 desks.

At the beginning of the process of observation, the researcher and the teacher entered the classroom. The teacher introduced the researcher and explained the reason for his presence. Then the researcher sat at the back of the classroom in a place that enabled him to observe the class more easily. When course implementation started, the researcher collected data using the semi-structured observation schedule. The findings are presented according two categories: (1) findings related to the qualitative aspects of the implementation process;(2) findings related to the quantitative aspects of implementation process.

7.2.1.1 Qualitative Findings of The Teaching Process

Teacher A used unique and distinctive teaching method. When he gave a lecture, he appointed a student to be at the blackboard. Most of the time, he asked that student at the blackboard. Most of the time, he asked that student to point out the content and solve some problems. The rest of the class took notes from the blackboard.

Although the class size was large, he had managed to learn the name of every student. So, most of the time he would call the students by name. It was observed that whenever he asked questions, the number of most active students was seven to nine. However, he tried to encourage other students, who did not seem to be involved in the lesson, to participate.

7.2.1.2 Types and Duration of Teaching Activities

Teacher A was observed during a ten-week period. Six lessons were tape-recorded and transcribed to provide an account of how the types of activities and level of academic work were implemented in his class. Table 18 below shows the types of activities he used during each of the six lessons that were tape-recorded. Table 19 shows the activities and their total duration for six lessons. In addition, notes made on the commentary parts of the observation schedule are used to provide additional information on how the activities took place in the class.

Table 18

Teaching Activities in Teacher A's Classroom

Teacher A's Classroom Teaching Activities	Lesson 1 Duration		Lesson 2 Duration		Lesson 3 Duration		Lesson 4 Duration		Lesson 5 Duration		Lesson 6 Duration	
	Min	%	Min	%	Min	%	Min	%	Min	%	Min	%
Written Teacher Explanation	3	7.5	5	12.5	0	0	3	7.5	3	7.5	5	12.5
Teacher Oral Explanation	10	25	13	32.5	14	35	11	27.5	11	27.5	12	30
Dictation	7	17.5	6	15	11	27.5	7	17.5	11	27.5	10	25
Teacher Asks Questions	6	15	7	17.5	9	22.5	6	15	10	25	8	20
Students Ask Questions	0	0	0	0	3	7.5	3	7.5	2	5	3	7.5
Students' Problem Solving	11	27.5	7	17.5	0	0	7	17.5	0	0	0	0
Other Activities	3	7.5	2	5	3	7.5	3	7.5	3	7.5	2	5
Total	40	100	40	100	40	100	40	100	40	100	40	100

Table 19

Teacher A's Classroom Teaching Activities and Their Total Duration for Six Lessons

Teacher A's Classroom Teaching Activities	Duration of Total Six Lessons		Range of Activities Duration in Minutes	Rank Order
	Minutes	Percentage		
Teacher Oral Explanation	71	29.58	10-14	1
Dictation	52	21.66	7-11	2
Teacher Asks Questions	46	19.16	6-10	3
Students' Problem Solving	25	10.41	0-11	4
Written Teacher Explanation	19	07.91	0-5	5
Other Activities	16	06.66	2-3	6
Students Ask Questions	11	04.58	2-3	7
Total	240	100		

1- **Teacher Oral Explanation:** The teacher spent a relatively large amount of time on oral explanation, about one third of the total time, and the range did not vary much in the six lessons. In this activity, he usually either explained formulae from the blackboard or gave more details relating to principles or laws.

2- **Teacher Asks Questions:** He also asked questions at every step of the lesson (his personal style being that one student should be at the blackboard while he was giving either explanations or involved in other activities). He used in this way about 20 percent of the total time, ranging from 6-10 minutes per lesson.

3- Dictation: After each explanation of a principle or law, he dictated the subject matter to the class. He spent about 20 percent of the total time on this activity and the range was 7-11 minutes. The exact duration depended on the topic.

4-Student Problem solving: The teacher asked the class as a whole to solve problems from the textbook. If he was not able to find a volunteer student, he randomly picked a student (in many cases, he did manage to find a volunteer student to solve the problem on the black board). While one of the students was solving the problem at the blackboard, the rest of the students were solving the same problem at their desks. However, if the student at the blackboard had difficulties in the process of solving the problem, the teacher helped him in a step by step manner.

5- Written Teacher Explanation: The teacher tried to explain the formulae or diagrams to the students by writing on the blackboard. He used this activity mainly when he felt that the students could not grasp the steps in producing a formula. This activity took a relatively small amount of time.

6- Students Ask Questions: Students rarely asked questions although the teacher devoted much of his class time to encouraging class interaction. Students asked questions which mainly required explanation of the formulae or principles.

7- **Other Activities** in Table 18 mostly include teacher counting students, giving assignments for the next lesson or giving explanations about the coming exam (students in Turkish secondary school have three exams in each term for individual subjects).

In summary, 78.3 percent of the total time was taken up with teacher initiated and dominated activities. The rest of the time was taken up by the other three activities: 'students' problem solving', 'students' ask questions' and other activities.

The teacher had a class textbook and a notebook with him and during the lecture walked round the classroom. Whenever he wanted to explain something on the blackboard he went there; otherwise he engaged the students with questions and checked their notebooks to see how they were solving the problems etc..

The researcher had the impression from his class that the teacher was very patient in his teaching and was trying to utilize the time for students' learning as much as possible in that context.

The implementation process as described above could help students to rote-learn the subject more than to understand it, and much more than to develop their science processing skills. This process, to some extent, differs from the activities intended by the Ministry of Education. This issue is discussed in more detail in section 7.2.1.4.

7.2.1.3 Interview with Teacher A

The following information was obtained: he became familiar with the requirements of the new curriculum via the Journal of Communications as well as television and radio programmes. He also attended a meeting arranged by the Director of the Local Education Authority.

He believed that if in-service programmes were organized in parallel with the new curriculum, they would be very useful. However, he thought that experienced subject teachers could become aware of the content knowledge of new programmes by themselves. He thought that, in practice, new teachers were not able to interpret and apply the objectives of the new curriculum in the classroom context. He thought that the programmes in pre-service courses did not make new teachers aware of the objectives and their application in the ordinary Turkish classroom. He saw this condition as the main factor affecting the implementation process. He believed that newcomers are not able to be informed easily as to objectives and their application in their schools, in spite of the meetings which take place at the schools each term. He also believed that newcomers' awareness of the curriculum requirements are largely based on their own efforts and interests. These difficulties arise mostly from the nature of the programme and class context, and he believed there to be big gap between the intention of the programme and class conditions.

He believed that the meetings which take place at the local directory of education could be more beneficial if they focused on the implementation of the new curriculum. In those types of meetings, teachers do not reveal their weaknesses, but rather they focus on students' lack of achievements. Since the chair of these meetings in many cases is not familiar with the physics courses and their teaching, the discussions do not produce more academically sound solutions to the problems encountered in the implementation process.

He thought that there had not been very good relationships among science teachers in his school. However, the year plan of the curriculum covers a requirement in which it was indicated that a physics teacher should work in consultation with his/her colleagues. However, he believed that this requirement was not logical. The reason he gave is that there is little probability that a teacher could influence other teachers in terms of teaching methods or any other issues.

He believed that the objectives of the new curriculum are very general and thus difficult to interpret in terms of teaching behaviour. He also believed that some of these objectives have little applicability in the majority of Turkish classes. He believed that explanation of topics should be given in more detail in the textbooks. He was of the opinion that the student textbook should not be the only book used to implement the physics course. He believed that a book should be written for teachers as well.

He expressed his concern about the factors that affect curriculum implementation as follows: he believed that the university entrance examination system affected the style of teaching which teachers employ in the classroom. He explained that the main aims of teachers was to cover the topics in the prescribed time rather than to make sure that the topic was understood by the students. Additionally, he said that students' abilities, class size and lesson time are the other obstacles to achieving the intended objectives of the curriculum.

His own beliefs about teaching physics could be summarized as follows: he believed that he should not solve the problems for the students; on the contrary, he wanted students to solve the problems at the blackboard; he argued that physics teachers should prepare lesson plans, and he requested colleagues to do some preparation before giving lessons; since he believed that the new curriculum was not very different from the previous one, he was not very enthusiastic about explaining the objectives of the new curriculum; he also did not believe that the reports prepared by inspectors made any significant contributions to the implementation process of the curriculum.

He expressed his views about the technique he used in class as follows: 'I use this technique because I believe that it makes it easy to interact with students on the one hand, and on the other hand to stimulate students who are normally lazy by engaging at least one of them'.

His views could be summarised as follows: although the intended objectives are not totally attainable in the real class context, teachers could be better informed about the activities which could be best applied in the implementation process by means of colleagues-meetings; he believed that each teacher should find some way to cope with class control and teaching; his personal method was to call one student to the blacethod was to call one student to the blackboard and ask him to write some explanations or solve problems.

7.2.1.4 A Comparison between the Intended and Implemented Curriculum

1-In Teacher Oral Explanation. Implementation guidelines recommend to science teachers that this activity should be employed as little as possible (it covers only teachers' talking). However, in the case of this teacher, in about 70 percent of the total time, the "teacher oral explanation" activity was used. The interview with the teacher reveals that the intention of using oral explanation is to emphasize the topic and make students understand the key points and concepts or the logic behind the problems, whereas, the curriculum guide suggests, as indicated above, that teachers should not make very long explanations and rather leave students some points to think about and work out themselves. The interview findings also reveal that this teacher believed that after class time the majority of his students did not study. That is why he placed so much emphasis on explanation, he said.

2- Dictation: The curriculum guideline recommends that the teachers do not use dictation in implementing physics lessons. However, the observation findings indicated that this teacher used the activity in almost 50 percent of the time (six lessons). The interview with this teacher revealed that he believed that the majority of his students do not read their textbooks and are not able to take notes from his explanations. Moreover, if students take notes during the explaining of the subject matter, they will not participate in the discussions. Furthermore, he believed that during the explanation process, students can think about the subject matter and understand the content more easily. Although the curriculum guideline suggests that the teacher should not use this activity, the teacher did use it and explained the rationale behind its usage. The researcher had the impression from the interview and observation that under the existing class context the use of dictation was unavoidable. It could be argued from this result that the recommendation to the teachers was not valid on this occasion. Basically, the recommendation does not relate to the class context.

3- Teacher and Students Ask Questions: Question methods employed in the classroom were mostly teacher-initiated forms (46% of the total time, teacher asks questions; 11 % of the total time, students ask questions). However, the Ministry of Education in the curriculum guide advised the teachers that more opportunity should be given to students to ask questions (TED,1987). Questions asked by students mostly asked for definitions, rather than reasoning. For example, they asked 'Would you repeat what you have just said?'. Moreover, the amount of time for students to ask questions was in small proportion. The interview with the teacher revealed that the majority of the students do not study the topic before the lessons; therefore in class time they do not ask questions.

The interview with the teacher revealed the reasons why he asks questions; to link the subject matter with the previous lesson; to confirm whether the students understand the subject matter; to motivate the students to think about the subject matter.

The researcher had the impression from the observation and interview that the "teacher asks question" activity was in line with the requirement by the Ministry of Education. However, the Ministry of Education requirement was not fully applicable in this class context with reference to "students ask questions".

4- Student Problem Solving: The Ministry of Education in the curriculum guideline recommended that the teachers should not give much time to the 'problem solving activity' in the implementation process. This teacher used one quarter of the total time for this activity. In the problem solving process, the teacher used the following routines: when the related topic was finished the teacher would ask the students to solve a problem from the student textbook. He also gave some problems for homework. In the interview the teacher stated that the problem he set for homework was not very different from that solved in the classroom. He told the researcher that, having examined the problems at the end of the unit, he found that the problem in the students' textbook was not so complicated, but rather easy to solve, if the students understood the fundamental rules of the given topic. However, the observation data revealed that, in the class, only a few students were willing to solve the problem when the teacher asked. The researcher had the impression that the majority of students viewed the problem solving activity as a way of using the formulae and not as a means to understanding the physical idea (mathematics rather than physics). The researcher came to this conclusion from the students' responses to problems that they were concerned with the result rather than the process.

The important findings emerging from case 1 can be summarised as follows: (1) the existing class size was very large, (2) only a few students were active in the class; (3) the majority of time (about 80 %) was spent on activities which were teacher-dominated; (4) one student was present at the blackboard during the implementation process; (5) the teacher believed intended activities to some extent could be implemented in the existing class; (6) the dissemination process could be enhanced by emphasizing the relevant points during subject-colleagues' meetings.

7.2.2 Case Two: Teacher B at School II

7.2.2.0 Context and Biographical Information

Teacher B was 39 years and had been teaching for 15 years. He graduated from a four-year teacher college. He had been teaching second and third years of general lycee students for the last three years. The school in which he was teaching was located in a sub-province and had two other physics teachers. The school population was about 720; his class size was 40. He was senior physics teacher.

The school in which the observation took place is one of four lycees in one of the twelve sub-provinces. It is located on the Black-Sea Coast in a town with a population of 45,000. There are three other lycees in the town, but the others are not general lycees; they are trade, vocational and religious lycees. The school was relocated in 1978 in a new 3-storey building.

The principal had his own office and the teachers their own room. In the teachers' room every teacher had his/her own small private drawer to keep teaching materials and especially students' exam papers. The 'Journal of Official Communication' was kept in that room, so that each teacher had time to read it and sign it. When the researcher visited the school for the first time, the principal was about to be appointed as the head of the Local Educational Authority.

There were school vice-principals who monitored and controlled the process of informing teachers either with the 'Journal of Official Communication' or with school administration-issued memoranda.

The school had its own physics laboratory, but the researcher was told by the school physics teachers that there was not enough equipment to conduct the required experiments in the laboratory.

The classroom size seemed reasonable and adequate to the students' needs. Four rows of desks were placed in the classroom, each desk being shared by two students. There was a wall blackboard with a nearby high stage and a teacher's table. There were coloured windows on one side of the classroom which meant that the students were unable to see outside.

When the researcher and the teacher entered the classroom, all the students stood up; then the teacher introduced the researcher to them. They then sat and waited to hear what the teacher would say. For the first 2 or 3 minutes there was noise in the class with students speaking to each other, but they soon stopped.

The teacher started his lesson. The process of data gathering took place as applied in case 1. Information obtained from the lesson can be classified into two categories (1) findings related to the qualitative aspects of the implementation process (2) findings related to the quantitative aspects of the implementation process: types of activities and their duration.

7.2.2.1 Qualitative Findings of the Teaching Process

There were five or six students who responded to his questions in the teaching process. He tried to give as many examples as possible. The researcher had the impression that the teacher was under pressure to cover the topic.

Another interesting point in his teaching was that he did not follow the same order as the textbook. This is permitted by the curriculum guide, although informal talks with other physics teachers indicated that they were not aware of it.

7.2.2.2 Types and Duration of Teaching Activities

This classroom was observed during a ten week period. Six lessons were tape-recorded and transcribed to give an account of how the types of activities and level of academic work were implemented in the classroom. Table 20 below shows the types of activities employed in the implementation process in each of the six lessons. Table 21 shows the combination of these activities.

Data collected with the commentary part of the observation schedule are used for describing the activities which took place in the class.

Unusual teaching activity: at the end of each unit he gave a hand-out to the students. He did not tell the students to take notes using the "dictation activity" but some students did take notes from his explanations.

Teacher B had a unique style of teaching. He did not use the 'dictation activity' in the teaching process. Instead he spent that time for 'Teacher Oral Explanation','Written Teacher Explanation' and 'Teacher Asks Questions' activities. These activities depend more on the teacher's personality. The other activities depend more on the topic and the nature of the class.

Table 20

Teaching Activities in Teacher B's Classroom

Teacher B's Classroom Teaching Activities	Lesson 1 Duration		Lesson 2 Duration		Lesson 3 Duration		Lesson 4 Duration		Lesson 5 Duration		Lesson 6 Duration	
	Min	%	Min	%	Min	%	Min	%	Min	%	Min	%
Written Teacher Explanation	11	27.5	10	25	7	17.5	9	22.5	8	20	5	12.5
Teacher Oral Explanation	9	22.5	8	20	10	25	12	30	12	30	10	25
Teacher Asks Questions	18	45	6	15	5	12.5	0	0	10	25	8	20
Students Ask Questions	0	0	2	5	2	5	3	7.5	7	17.5	7	17.5
Students' Problem Solving	0	0	5	12.5	6	15	5	12.5	0	0	3	7.5
Teacher Problem Solving	0	0	6	15	8	20	8	20	0	0	5	12.5
Other Activities	2	5	3	7.5	2	5	3	7.5	3	7.5	2	5
Total	40	100	40	100	40	100	40	100	40	100	40	100

Table 21 below shows the types of activities Teacher B engaged in and total amount of time.

Table 21

Teacher B's Classroom Teaching Activities and Their Total Duration for Six Lessons

Teacher B's Class Teaching Activities	Duration of Total Six Lessons		Range of Activities Duration in Minutes	Rank Order
	Minutes	Percentage		
Teacher Oral Explanation	61	25.41	08-15	1
Written Teacher Explanation	50	20.83	05-12	2
Teacher Asks Questions	47	19.58	00-10	3
Teacher Problem Solving	27	11.25	00-08	4
Students Ask Questions	21	08.75	00-07	5
Students' Problem Solving	19	07.91	00-07	6
Other Activities	15	06.25	02-03	7
Total	240	100		

As Table 21 above shows the following activities were recorded in the classroom.

1- **Teacher Oral Explanation**: This teacher devoted a quarter of his time to oral teacher explanation. In this activity, the teacher explained the topic. The duration of this activity varied from lesson to lesson. He would give explanations about the topic, in order to make sure that the concept was understood by the students. He would gave examples from real life situations and making an analogy e.g.

'the movement of the electron is similar to the idea of students' movement in the corridor of the school'.

2- **Written Teacher Explanation:** He used this activity during a relatively large proportion of his class time. In this activity the teacher would write some explanation on the blackboard. Some students would take notes from the blackboard. This teacher did not use the "Dictation Activity". Instead, at the end of each unit he gave the students a hand-out covering the content of the unit. In this activity he placed more emphasis on producing formulae. Since students knew that at the end of the unit they would have the hand-out about the topic, most of them would listen and follow the teacher's explanation which was elaborated on in the hand-out.

3- **Teacher Asks Questions:** This teacher used this activity in almost 20 percent of the total time (six lessons). The questions he asked were categorised as follows: the first group of questions seemed to have the intention of drawing students' attention to the topic; the second group of questions he asked was intended to check whether the students understood the topic.

4- **Teacher Problem Solving:** This teacher used the "problem solving activity" at the end of each topic. He took problems from the students' textbook. The researcher had the impression that the problems which the teacher was solving were intended to help the students to understand the topic he had just finished. It did not take too much time for him to solve the problem since the related topic was newly finished. Again in the process of this activity, he interpolated other activities as well. While he was solving a problem he would ask questions to the whole class, then wait for the answer for one or two minutes. If the correct answer was given, he continued; if not he gave an oral explanation about the problem. During this process he would say to the students: 'My aim is to make you understand the logic behind the problem not make you memorize the formulae or the numbers or the result of the problem'.

5- Students Ask Questions: The questions that students were asking related solely to knowledge about the topic of the problems the teacher was solving.

6- Students Problem Solving: In this activity, students solved problems. This occurred in two ways: either the class would solve problems individually at their desks or one student would stand and give his opinion about the solution to the problem. If the answer was correct, then the teacher would tell the class to follow that method of solving the problem. When students were solving problems individually the teacher would go to whoever was asking for help.

7- Other Activities: In these activities the teacher would count the number of students in the classroom or give assignments for the next lesson or explanations about next term's examinations.

7.2.2.3 Interview with Teacher B

He was a senior physics teacher. He first became familiar with the requirements of the new physics curriculum via TV and Radio Programmes. Subsequently he attended some meetings at the sub-provincial Local Educational Authority.

He believed that educational change would not take place unless the structure and administration of the education system were changed. He was in favour of the privatisation of state schools. He said: 'If I had a chance to change the education system I would start with the privatisation of school administration'. He said, as head of colleague teachers: 'I do not have any power over teachers when they do not want to work as hard as they could; I cannot do anything to them, but in a private school when teachers do not work hard, their school administrator can refuse to renew their contract'.

He believed that the dissemination of the curriculum could be enhanced by giving more emphasis to in-service programmes and other related meetings. He believed that an in-service programme should be arranged according to the needs of the teachers regarding the new programme objectives. He criticized the meetings that take place at local educational authority level for the way that they put more emphasis on administrative problems. Also the chair person of the general colleague teachers may not be from the same subject as the teachers.

He told the researcher that there were not good relations between science teachers, although theoretically on their year plan they should work closely with each other.

His beliefs about the most important factors that affect the implementation process could be summarized as follows: the centralised university examination is the most influential factor in shaping classroom practice. Because of this exam the teachers in the classroom feel under pressure to cover all the topics. Parents' and students' expectations are other factors in implementing the curriculum. Of course teachers first of all try to obey the guidelines set down by the Ministry of Education, he said. However, he believed that the objectives of the guideline are very open and could be interpreted in many ways, and that most of them are adopted from curricula of other countries without considering the national class context.

He is very independent in his teaching style. For example, among the other observed and visited school teachers, he was the only one to give the students a hand-out, and also he did not follow the order of the content in the student textbook. He was aware of most of the rules set by the Ministry of Education. He tried to take advantage of these rules. For example, he knew that teachers have a right to change the order or topic. He changed some topics. He said that by doing this, the students are able to solve more problems in the university entrance examination.

7.2.2.4 A Comparison Between the Intended and Implemented Curriculum

1- **Teacher Oral Explanation:** The curriculum guideline suggests to science teachers that this activity should be used as little as possible. Interview data showed that teacher B, used oral explanation for a quarter of the total six lessons.

2- **Written Teacher Explanation:** In fact, the curriculum guideline does not specify what percentage of time should be devoted to written explanation. However, in the case of this teacher the researcher had the impression that he was trying to make students understand what the basic concept of the topic was all about. The researcher would say that in his written explanation he tried to break down the topic as much as possible. By this method in the context of that classroom, his students might reach a level of understanding of the topic.

3- Teacher Asks Questions: The Ministry of Education recommends that teachers should use this activity as much as possible in their classes. However, this teacher did not use it extensively for two reasons. The first reason he gave was that it was time consuming, although he believed that it stimulated students' thinking. The other reason is that most students do not study the topic before it is implemented in the classroom; therefore questions do not make too much sense to them.

4- Teacher Problem Solving: This activity took place in the classroom for twenty-seven percent of the total time. Although with this activity students do not have the opportunity to develop their skills, he believed that he should solve some important problems in the classroom. Actually, if the teacher had given an opportunity to the students to solve the problems in the class by themselves, it would have taken time. On the other hand, the interview with the teacher revealed that inspectors from the Ministry of Education had asked that teachers should cover the topics in the prescribed time. In fact, there is a conflict between the two requirements by the Ministry of Education; one in which it is required from the teacher to cover the topics in the prescribed time, the other in which it is required from the teacher to give an opportunity to students to solve problems in the class themselves.

5- **Students Ask Questions**: The Ministry of Education recommend in the curriculum guideline that the teachers should give an opportunity to students to ask questions. However, this intention was not fulfilled in the class most of the time.

There is evidence from the above comparison that to some extent the intended curriculum was being implemented in the class. In particular, it was found that a few student dominated activities were taking place. However, the duration of these students dominated activities was very little compared to the teacher-dominated activities.

The important findings emerging from case 2 can be summarised as follows:
(1) the class size was 40; (2) the teacher considered the university entrance examination in the implementation process; (2) the teacher took the advantage of changing the order of the topic to help students to answer more questions in the university entrance examination; (3) the teacher employed unique methods as implementation activities e.g at the end of the unit he gave hand-outs to the students; (4) almost 80 percent of the total time was spent on activities which were teacher initiated or dominated (this teacher did not use the 'Dictation Activity'; he instead allocated that time to either teacher oral explanation or written teacher explanation); (5) the teacher wanted to see some changes in the administration system.

7.2.3 Case Three: Teacher C at School III

7.2.3.0 Context and Biographical Information

Teacher C graduated from one of the Faculties of Arts and Sciences. He was 40 years old and had been teaching for 18 years. He had been working for six years in his present school. The school in which he worked is located in the province, and has 3,400 students and 10 other physics teachers. Recently he had only been teaching the second year of the general lycee.

School III in which the observation of Teacher C took place is one of the three general lycees in the province. It was built more than a hundred years ago. The province has a population of 300,000. There are seven other lycees in the province. The school has the largest student population of all the other lycees. It is a huge building, with four levels, a cafeteria, sports hall and teachers' staff rooms. There is a physics laboratory, like a lecture theatre where the teacher is able to demonstrate experiments, but the students can only see the process as a group.

In the teachers' staff-room, as in other schools, there is a TV, table and private drawers. Teachers also put teaching materials there. There is also the 'Official Journal of Communication' in the staff room.

The school has six vice-principals who are appointed to be responsible for different classes.

Class sizes in the school were around 70. The observed class size was also 70 students. Students were sitting three to a table, although a table can normally accommodate only two people.

The teacher started by first signing the class register each class has its own note book. Teachers fill in the necessary parts of the register, the class representative -one of the students- takes it to, and brings it from, the vice-principal's office each day. When the register had been called, teacher asked the class representative which students were absent; two students were absent, and he wrote the students' numbers down. Then he started to implement the lesson.

7.2.3.1 Qualitative Findings of Implementation Process

After every topic, the teacher gave an example from the university examination questions. He made a point of saying that from this topic, questions are asked in the university entrance examination each year.

Most of the time, there were seven to ten students who seemed active and willing to answer the teachers' questions.

During the 'Teacher Oral Explanation and 'Teacher Asks Questions' teaching activities, he spent most of the time in front of the blackboard. Although he brought many examples from the university entrance examination he did not ignore the students' textbook questions. He solved these problems at the end of the unit. In the 'Student Problem Solving' activity he helped the students by explaining some important points by asking them questions.

He followed the order of the content as it was in the students' textbook.

7.2.3.2 Types and Duration of Teaching Activities

Table 22 below shows the activities and their duration for each lesson. Table 23 below shows the types of activities teacher C engaged in and total amount of time.

Table 22

Teaching Activities in Teacher C's Classroom

Teacher C's Classroom Teaching Activities	Lesson 1 Duration		Lesson 2 Duration		Lesson 3 Duration		Lesson 4 Duration		Lesson 5 Duration		Lesson 6 Duration	
	Min	%	Min	%	Min	%	Min	%	Min	%	Min	%
Written Teacher Explanation	5	12.5	6	15	3	7.5	5	12.5	5	12.5	3	7.5
Teacher Oral Explanation	8	20	10	25	12	30	10	25	10	25	10	25
Dictation	0	0	5	12.5	8	20	10	25	5	12.5	8	20
Teacher Asks Questions	11	27.5	5	12.5	5	12.5	5	12.5	8	20	7	17.5
Students Asks Questions	0	0	5	12.5	2	5	3	7.5	2	5	3	7.5
Students' Problem Solving	5	12.5	0	0	5	12.5	0	0	3	7.5	5	12.5
Teacher Problem Solving	9	22.5	7	17.5	2	5	4	10	5	12.5	4	10
Other Activities	2	5	2	5	3	7.5	3	7.5	2	5	0	0
Total	40	100	40	100	40	100	40	100	40	100	40	100

Table 23

Teacher C's Classroom Teaching Activities and Their Total Duration for Six Lessons

Teacher C's Classroom Teaching Activities	Duration of Total Six Lessons		Range of Activities Duration in Minutes	Rank Order
	Minutes	Percentage		
Teacher Oral Explanation	60	25	10-12	1
Teacher Asks Questions	41	17.08	05-15	2
Dictation	36	15	00-10	3
Teacher Problem Solving	34	14.16	02-10	4
Written Teacher Explanation	27	11.25	03-07	5
Students' Problem Solving	18	07.50	00-06	6
Students Ask Questions	15	06.25	00-05	7
Other Activities	09	03.75	02-03	8
Total	240	100		

1- **Teacher Oral Explanation:** This teacher used a quarter of the total time (six lessons) for this activity. In this activity, mostly he explained the main theme of the university entrance examination questions.

2- **Teacher Asks Questions:** He allocated less than a quarter of the implementation time for 'Teacher Asks Questions'. There were not many students willing to answer his questions,and he did not give them much time to explain their ideas about the issues he was asking about.

3- **Dictation**: He used 15 percent of the time for the 'dictation activity'. In this activity he told the students to take notes. 'Wording' was very brief (in the interview he told the researcher that if they felt they needed more information, they could read from their textbook).

4- **Teacher Problem Solving**: This teacher used this activity relatively often in his class teaching. As stated above, he used many examples from the university entrance examinations. At the end of each small topic, he selected a sample problem and solved it in the classroom. At the same time, he solved problems from students' textbooks. During the problem solving activity, he tried to involve all the class, although he did not always manage to do so. The observer could easily see that a great majority of students were not involved in the process of problem solving. This was apparent from their questions too. He would explain something and, one minute later, the students would be asking questions about it again. (The researcher interviewed some of the students in this class after the class period. He asked them "Why were you not involved in the class?" The students told him: "We are taking the University Entrance Examination Courses; we will learn the same topic there").

5- **Written Teacher Explanation**: In this activity he would write some important points he wanted to emphasise on the blackboard, especially when he wanted to produce formulae and when he was solving problems.

6- Students' Problem Solving: In this activity, the teacher asked students to solve problems at their desks. He would give them one or two minutes, then if they asked for help, he helped them.

7- Students Ask Questions: This activity took relatively very little time. In the laboratory, students asked many more questions than in the classroom. The researcher observed one laboratory session by this teacher. In fact the laboratory work was mostly of the 'demonstration' type. The researcher had the impression from the 'Students Ask Questions' activity in the laboratory that students were more interested in the laboratory work. For example, the same experiment was theoretically explained in the classroom and no one asked about it, but in the laboratory, students asked questions about the logic behind the experiment.

8- Other Activities: Other activities in this class included the teacher counting the class and giving an explanation about the coming term exam.

7.2.3.3 Interview with teacher C

The following data were obtained from the interview: He first became familiar with the new physics curriculum via subject colleague meetings. He believed that the dissemination of the curriculum in the Turkish context to be very difficult, because teachers do not read what they are supposed to read. He mentioned the 'Journal of Official Communication' published by the Ministry of Education and sent to the school for the purpose of disseminating new ideas to teachers. Every teacher signs it as if they have read and understood it but they have not. He believed that in-service training should be organized in parallel with curriculum change. He criticized the in-service programmes conducted by the Ministry of Education. These programmes did not reflect the needs of the teachers and the new programmes. The Ministry of Education had decided to conduct an in-service programme, but when the administration changed, the new one did not follow the same ideas as the previous one. Therefore, programme dissemination is not a continuing process.

Teacher C said that 'subject-colleague meetings' at local and school level would be very helpful to teachers with regard to the requirements of the curriculum. However, in the existing process, he believed that these meetings were not taking place in the intended manner. He saw some shortcomings, which are: the system does not give priority to these meetings and their process; head teachers are not informed of the change process (and do not know what information to pass on).

Teacher C believed that on the one hand, teachers in the Turkish educational system are very restricted (no autonomy), and on the other hand, since the objectives are not clear, each teacher can interpret them in different ways. However, his own opinion about the intended objectives was that some of them, although imaginative, do not reflect the classroom context.

This teacher saw a number of obstacles in the implementation of the physics curriculum. The most important of them were: the central examination system, the time allocated for lessons, and students' interests and abilities.

About the implementation process, he told the researcher: "I know in this class, 5 or 6 students are involved in the lesson but the rest of them are not very interested in learning physics; they just need a mark to pass the course. Therefore, there is no need to work hard to organise the lesson". He suggested a system whereby students should have the opportunity to choose the course they want to follow. "As a teacher you can enjoy that kind of class. In most of the classes we implement the curriculum to fulfil the requirements of our duty. We know that under these conditions we are not helping the students to learn", he said. The researcher asked him what changes he would like to see in order to reach the intended objectives of the curriculum. He suggested that (a) the course should be optional, and (b) the teacher should not be obliged to cover the whole topic.

7.2.3.4 A Comparison between the Intended and Implemented Curriculum

1- Teacher Oral Explanation: The Ministry of Education recommended to science teachers (physics, chemistry, biology) that the oral explanation activity should be employed as little as possible. The reason the Ministry of Education gave in the curriculum guideline was that with this activity teachers can only teach the topic at knowledge level or at most understanding level. The teacher was aware of this fact, but he reasoned that if he followed all the rules set by the Ministry of Education, only 5 or 7 students would be able to follow the lesson and understand it. Most of the students did not prepare before the lesson. This was easy to observe from the lesson. When the teacher asked questions, most of the time only the same 7 or 10 students wanted to take part in discussions.

2- Teacher Asks Questions: This activity ranked second in percentage of total time (20 %). Most of the time, the teacher initiated this activity. In fact, the Ministry of Education suggested that teachers use this activity as much as possible. Teacher C was aware of this fact. However, as was explained in the above section, because of the sizes of classes teachers are unable to follow the rules set by the Ministry of Education.

3- Dictation: In fact the Ministry of Education recommends teachers not to use this activity in the implementation process. However, this teacher did use it. The reason Teacher C gave for doing so was that many teachers from previous years had done dictation this activity so that students expect to rely on their note books rather than other sources. Thus the teacher felt obliged to use this activity in his classroom context.

4- Written Teacher Explanation: The teacher used this activity whenever he felt he needed to explain the relationship between the previous topic and the present one or in producing formulae. He used this activity for twenty-seven percent of the total time. The use of this activity gave an indication as to the intended level of academic work. In the case of this classroom, the teacher attempted to reach the application of knowledge level with this activity. However, when the teacher asked questions relevant to the university entrance examinations, only a few students were able to understand the logic of the problems.

5- Students Ask Questions and Student Problem Solving: These activities were employed on a few occasions in the implementation processes. This is an indication that the implementation process was not going in the right direction according to the aims of the Ministry of Education, which are encourage students to participate in class activities as much as possible.

The important findings emerging from case 3 can be summarised as follows: (1) the class size was very high; (2) about 7 students were active in the class; (3) the demonstration type of experiment was conducted in the laboratory; (4) students asked more questions in the laboratory than in the classroom; (5) the teacher solved university entrance examination questions; (6) the teacher suggested that the course should be optional; (7) more than 80 percent of the time, teacher-initiated or -dominated activities were used in class.

7.2.4 Case Four: Teacher D at School IV

7.2.4.0 Context and Biographical Information

Teacher D was 29 years old and had graduated from the faculty of education. She had been teaching for seven years. She taught the first, second and third years of the general lycee students. There was only one other physics teacher in her school. The school had a special physics laboratory. School IV is located in a province. This school is one of the three general lycees. In fact there are four other lycees in the province but they are not general lycees. The size of the school is relatively small, about 750 students.

The class size in the school is around 35-40 students; the observed class was 35. It was from the second year of the general lycee.

The data obtained from observation is presented as follows, in two categories: (1) qualitative findings regarding the activities and implementation process (2) data related to the types of activities and their duration.

7.2.4.1 Qualitative Findings of the Implementation Process

The findings from observation can be presented as follows:

During the implementation process, the teacher gave emphasis to giving examples of problem solving from other sources. Although the related topic had been implemented before, during the problem solving process, she again and again made oral explanations about the concept.

The number of active students was not very high, three or four.

Although class size was relatively small, the teacher had some difficulty in managing the class. When she looked at the class, every one pretended that they were listening and involved with the lesson, but when she was writing on the blackboard, a large majority of the students engaged in other activities; for example, some were opening other textbooks to study for their exam, some were playing with paper and throwing it at each other.

7.2.4.2 Types and Duration of Teaching Activities

Tables 24 and 25 below show the types of activities used in her class.

Table 24

Teaching Activities in Teacher D's Classroom

Teacher D's Classroom Teaching Activites	Lesson 1 Duration		Lesson 2 Duration		Lesson 3 Duration		Lesson 4 Duration		Lesson 5 Duration		Lesson 6 Duration	
	Min	%	Min	%	Min	%	Min	%	Min	%	Min	%
Written Teacher Explanation	8	20	9	22.5	8	20	8	20	7	17.5	8	20
Teacher Oral Explanation	10	25	10	25	10	25	9	22.5	8	20	10	25
Dictation	15	37.5	0	0	10	25	12	30	9	22.5	8	20
Teacher Asks Questions	5	12.5	8	20	5	12.5	7	17.5	5	12.5	6	15
Students Ask Questions	0	0	10	25	0	0	4	10	2	5	4	10
Students' Problem Solving	0	0	0	0	0	0	0	0	4	10	0	0
Teacher Problem Solving	0	0	3	7.5	6	15	0	0	5	12.5	2	5
Other Activities	2	5	0	0	1	2.5	0	0	0	0	2	5
Total	40	100	40	100	40	100	40	100	40	100	40	100

Table 25

Teacher D's Classroom Teaching Activities and Their

Total Duration for Six Lessons

Teacher D's Classroom Teaching Activities	Duration of Total Six Lessons		Range of Activities Duration in Minutes	Rank Order
	Minutes	Percentage		
Teacher Oral Explanation	57	23.75	08-10	1
Dictation	54	22.05	00-15	2
Written Teacher Explanation	48	20.00	07-09	3
Teacher Asks Questions	36	15.00	05-08	4
Students' Ask Questions	20	08.33	00-10	5
Teacher Problem Solving	16	06.66	00-06	6
Other Activities	05	02.08	01-02	7
Students Problem Solving	04	01.66	00-04	8
Total	240	100		

1- **Teacher Oral Explanation:** This teacher used this activity like the other teachers, but in her case she concentrated more on the explanation of problems. Although the class size was small, most of the time she did not leave her position near the blackboard.

2- **Dictation:** In this activity, she told the students to take notes, and spoke slowly to the students. In the classroom, when this activity was employed, all students were involved in the activity, so it was easy to manage the class, as she pointed out in the interview.

3- Written Teacher Explanation: She used this activity when producing formulae, or giving explanations. She would write on the blackboard at the same time as giving explanations.

4- Teacher Asks Questions: The teacher used this activity when she was explaining a topic or solving a problem, or checking: 'Did you understand the explanation?' Also, before solving the problem, she would ask questions to give clues about the logic of the problem solving process.

5- Teacher Problem Solving: The teacher solved problems related to the topics she was implementing. After each topic she tried to bring related problems to the classroom to solve. She chose examples from supplementary books.

6- Students Ask Questions: Students did not ask difficult questions. Most of the questions they asked were "Could you please repeat what you have said? However, she did not like that type of question. (The teacher believed that most of those kinds of questions were asked because the students did not want the teacher to cover more ground).

7- Students' Problem Solving: The duration of this activity took relatively less time than others. Although the teacher solved many problems, the students did not seem to be involved with solving them by themselves.

8- Other Activity: As with other teachers, this covered a number of tasks like counting the class and giving an explanation about the coming exam.

7.2.4.3 Interview with teacher D

She was aware of the curriculum dissemination process. She said to the researcher that subject-colleagues' meetings at school and local educational level were a useful way of getting information about the intention of the curriculum. However, she believed that the intention of the Ministry of Education would be disseminated more adequately and clearly if that message was sent in a written form.

Her belief about factors that most affect the implementation process was that the central university entrance examination, expectations of parents, students and the location of the school are the most influential.

She told the researcher that when taking the pre-service course in the faculty of education, there was scope to be very imaginative. Those programmes did not say what the school context was really like. "When you enter the school to start teaching in the classroom, things change completely. Before entering the classroom you are very imaginative, but when you start to implement the curriculum, you are not able to implement it as you intended".

She told the researcher: "As you noticed, I am using the 'Dictation activity' to handle the discipline problem in the classroom".

7.2.4.4 A Comparison between Intended and Implemented Curriculum

The Ministry of Education recommend in the curriculum guide to physics teachers that classroom activities should be arranged in a way that students should be involved with the lesson as much as possible. However, the researcher's observation does not match this suggestion. The classroom observation findings showed that a great majority of students were not responding to the teacher's questions. When the researcher interviewed the teacher, she also confirmed this finding. There could be a variety of reasons for this such as:(1) students had not selected the course voluntarily and (2) the teaching activities that teachers adopted were not suitable. For example, Teacher oral explanation did not help students to be involved with the lesson. On the other hand, the teacher felt pressure to cover the topic.

After 'Teacher Oral Explanation', the 'Dictation activity' was the second ranked of the activities employed in the class. She used this activity most of the time to manage the class. Interviews with the teacher support these findings.

The 'Teacher Asks Questions' activity is recommended to be employed as much as possible. The teacher also believed that this activity is very beneficial, but because of the class situation and unresponsive students, the teacher could not employ it for long periods in her class.

The important findings emerging from case 4 could be summarized as follows: (1) few students were active in the class (only 4 or 5); (2) the teacher implemented the course more by a problem solving approach (she would solve many problems from different sources to explain the topic more clearly); (3) the teacher used the "dictation activity" to handle the discipline problem in the class; (5) teacher dominated activities took place in about 80 percent of the total time (six lesson).

7.2.5 Summary

The following information can be obtained from Table 26 below.In general, the four observed teachers spent about 80 percent of their teaching time employing teacher-dominated activities. However, there were some differences in the methods used. Some variations in terms of student-dominant activities were observed. Although the numbers of active students in classrooms varied, they remained small. There were also variations in school and class sizes.

Even though the four teachers used similar activities, their reasons for doing so were different. For example, when teachers A and C used the 'dictation activity', their intention was have the students write down explanations of the topic in their note-books. Teacher D had the same aim but used the activity for an additional purpose to overcome the discipline problem (with students writing, she was able to manage the class in an effective way).

In teacher A's classroom, one student was present at the blackboard all the time either for writing what the teacher asked him or for solving problems. This teacher, who believed that a gap existed between the nature of the physics curriculum and the applicability of its objectives did not employ the 'teacher problem solving activity'. The class's engagement with the teacher through the medium of the blackboard as a means of interaction helped effectively to achieve the lessons' objectives in terms of student involvement. The teacher managed the whole of the class in line with intended objectives.

Teacher B, did not use the 'dictation activity' whereas teacher C allowed more time for problem solving than the other teachers. Teacher B seemed to think in a quite different way from the others. He brought up the issue of privatisation of state schools. Further more, he did not follow the order of the content in the student textbook, as the Ministry absolutely allows, although this approach needs to be justified in the yearly plan and before the academic year. Teacher B was the only one among the four who took advantage of this approach in order for his students to finish the difficult topics of the University Entrance Examination first. It seemed that this teacher encouraged more students to became involved with the lesson, gave them more opportunity to perform their own activities and distributed his notes at the end of each lesson instead of using the 'dictation activity'. For teacher C, who had a bigger class size and longer teaching experience, it seemed logical to concentrate more on problem solving for the University Entrance Examination. He accepted that there was the parental pressure on schools to increase the students' abilities to pass that examination. Therefore, his comment about the need to give more balance in the classes in terms of students abilities and interests is understandable. However, due to the class size, the amount of student-dominated activities (13.75 percent) seemed reasonable because the management of the class during activities was difficult. The number of active students was not proportionate to class size. Finally, teacher C, who had the benefit of long teaching experience criticised the governmental interference in terms of policies concerning the curriculum change process. He emphasised the powerful effects of these policies on curriculum innovations.

In teacher D's classroom, supplementary books for problem solving were used. Two reasons account for this teaching activity. Firstly, she was a junior teacher with a fairly small class size. This implies more ready application of the concepts of pre-service programmes, and had a more optimistic attitude to subject-colleagues' meetings than the other four teachers. However, she acknowledged the influence of the University Entrance Examination on teaching activities by applying problem solving but with the assistance of other resources. Secondly, she commented that some teaching activities, including using supplementary books for the problem solving activity were used to handle the discipline problem in her classes. In addition, teacher D, is a female. The gender factor cannot be ignored since it has its influence on the development of teacher's personality and his/her teaching activities.

The dominant issue arising from observation of teachers that the University Entrance Examination is one of the most influential factors affecting teaching activities, in the way that it prioritises problem solving activities. The four teachers mentioned that the in-service programmes and subject-colleagues' meetings are inadequate in their organisation, functioning, administration and catering for teachers needs. Teachers A and B spoke of poor relationships among teachers in schools. Teachers C and D had suggestions to make. Teacher D believed that it might be more useful to the dissemination process if the minutes of subject-colleagues' meetings were circulated to teachers. Teacher C, on the other hand, suggested that teachers should read and understand the 'Journal of Official Communication'. He also suggested that the teachers needed more autonomy in implementing the curriculum.

Table 26

Summary of the Observed Classes

	Unique Teaching Style	Number of Active Students	Duration of Total Student-Dominated Activities (%)	Views about curriculum
Teacher A	One student present at the blackboard Does not employ 'Teacher Problem Solving Activity'	5-7	15	In-service programmes and meetings need more organization. There is a gap between suggested activities in curriculum curriculum guide and applicability of them in the classrooms. There is not good relationships among science teachers in the school
Teacher B	He does not use 'dictation activity', he gives hand-out to the students at end of each lesson Does not follow order of the content in the student textbook	7-8	16.6	Privatisation of state schools reduces the problems they faced In-service and meetings should be enhanced for better functioning There is not good relationships among science teachers in the school.University of Entrance Examination is the most influencial factor affecting the kind of teaching activities teachers adopt.
Teacher C	Devotes more time to problem solving activities (he solves problems asked in the previous University Entrance Examinations)	5-6	13.75	Teachers do not read and understand the requirements in the 'Journal of Official Communication'. In-service programmes should be arranged according to the need of teachers. Curriculum change process affected by government policies. Teachers need more autonomy for implementation There is a need to make classes more balanced in terms of students ablities and interests
Teacher D	Uses supplemantary books for problem solving	4-5	10	It might be more useful for dissemination purposes if decisions made at meetings were written and circulated to the teachers University Entrance Examination system affected teachers in their choice of teaching activities in the classes Some teaching activities used to handle the disipline problem in the classes

	Age and Sex	Teaching Institution	Total Teaching Experience (Years)	Teaching Experience at Present School (Years)	School Size	Class Size
Teacher A	40/M	4 Year Teacher College	20	5	3.000	60
Teacher B	39/M	4 Year Teacher College	15	3	720	40
Teacher C	40/M	Faculty of Arts and Sciences	18	6	3.400	70
Teacher D	29/F	Faculty of Education	7	3	720	35

7.3 Findings of the Students' Questionnaires

7.3.0 Introduction

This section covers students' responses obtained from the observed teachers' classes. Two questionnaires were administered to each class observed, namely 'Students' Perceptions of Physics Teaching-Learning Activities' and 'Students' Attitudes towards Physics Teaching-Learning'. This section presents the findings case by case.

7.3.1 Teacher A's Class at School I

This class was chosen from one of the Provincial lycees. The school size was 3,000, and the class size was 60. The characteristics of the school and class are presented in section 7.2.1.0 of this chapter. This class was the first year of the general lycee.

7.3.1.1 Students' Perceptions of Teaching Learning Activities

The following interpretation could be made from Table 27 below. There is evidence that the teacher did not manage to make the physics lessons interesting to the students because more than half of the students responded that their teacher 'never' presented interesting physics lessons to them. However, the students' responses show that during the physics lessons, the teacher gave them opportunities to ask questions. In spite of this fact, the students did not ask many questions. This result is not suprising in the Turkish context. As was discussed in section 7.1, the way in which students are brought up at home and the manner of their previous education turns them into passive listeners. Teacher A seemed to be aware of this fact. Although, as presented in section 7.2, interview and observation data show that teacher A employed a unique teaching style to involve students in the teaching activities, only limited success was achieved.

Students' responses show that laboratory work did not occur in the implementation process. The majority of students responded that the teacher did not give 'demonstrations' in the classroom either. Regarding this issue, interview data shows that, although the teacher believed in the necessity of conducting laboratory work, he did not conduct laboratory work because of the large class size. Furthermore it was very difficult to reserve the laboratory since there were many simultaneous physics classes all demanding use of the same laboratory. Though this argument was convincing, the researcher's impression, after discussing the matter with the principal and other physics teachers, was that teachers were reluctant to use the laboratory because it required extra time to set up the experiments. Preparations were difficult to complete because of laboratory time overlapping. Additionally, interview data with this teacher suggested that forms needed to be filled in after conducting experiments in order for the teacher to qualify for the higher rate of pay to which teachers are entitled for laboratory work. This was considered to be time-consuming and not worthwhile.

There is evidence that students were copying notes from the blackboard into their notebooks. A great majority of students confirmed this result. However, observation data reveal that during the process of this activity, and others, their teacher asked follow-up questions. Thus the teacher was able to exercise academic and disciplinary control.

Table 27

Students' Perception of Teaching-Learning Activities

Items On the Questionnaire	Percentage of Students' Response			
	Often	Sometimes	Never	Missing
We use sources other than student textbooks	16	26	68	-
Teacher makes physics interesting for us	2	34	64	-
We feel free to ask questions in physics lesson	22	34	44	-
We copy teacher's notes from blackboard	90	08	02	-
Teacher does demonstrations in physics lessons	00	12	88	-
We do laboratory work as part of physics lesson	0	0	80	20
Teacher follows lessons according to textbook	10	54	36	-
Teacher tests us on what he/she has taught	18	50	32	-

7.3.1.2 Students' Attitudes towards Physics Teaching-Learning

As can be seen from Table 28 below, more than half of the students in this class found physics challenging. Meanwhile, 54 percent of the same class of students responded that physics is an enjoyable subject. There is also some evidence that students were bored with physics (about 40 percent of the students responded positively to this item). Similarly, 38.2 percent of the students showed that they do not like their physics work. A high proportion of students indicated that there are many facts to learn in physics.

This picture, in summary, shows that the majority of students in this classroom did not have positive attitudes towards physics teaching-learning activities or physics subjects. Particularly, learning physics in their classroom was not very interesting to them. This appears to contrast with the findings of the 54 percent of students who said that physics is an enjoyable subject. When the researcher noticed this discrepancy, some students were interviewed. The researcher understood from the conversation that students considered physics to be enjoyable, in general, but not necessarily in their particular physics lessons.

In fact, students' responses to the questionnaire show that they were not willing to take part in physics lessons in spite of the fact that the observation data shows that their teacher wanted them to participate and interact during the lesson. In many cases, he even tried to relate topics to daily life, but many students did not respond actively to the lesson. This was clearly observed in the classroom, where only a few active students asked questions and gave answers.

Table 28

Students' Attitudes towards Physics Teaching-Learning

	Percentage of Positive Responses	*
I find physics challenging	60	
Physics is enjoyable	54	
I am bored most of the time in physics	41.8	24.3
There are many topics in physics I do not like	36.4	42.4
I generally dislike my physics work	38.2	36.4
Physics is an enjoyable school subject	26	
Physics taught in our school is interesting	12.7	
Physics is a difficult subject	29.1	26
Physics is a difficult subject when it involves calculation	31.1	26.3
Physics is a difficult subject when it involves laboratory work	25.5	26.6
There are too many facts to learn in physics	63.6	20.0

* In the negative attitudes, the disagree responses, which are really positive attitude responses, appear in the second column.

7.3.2 Teacher B's Class at School II

This class was observed in a sub-provincial school. The school size was 720 and the class size was 40. The characteristics of the school and the class are presented in section 7.2.2.0 of this chapter.

7.3.2.1 Students' Perception of Teaching Learning Activities

The following picture can be drawn from Table 29 below. The teacher used a variety of approaches for teaching physics in the classroom. For example, a majority of students responded that the teacher used supplementary books in teaching physics. Nearly half of the class said that their teacher gave 'demonstrations'. Nearly three quarters of the students found opportunities to ask the teacher questions. Another interesting finding from this class is that although the teacher did not ask students to take notes from the blackboard, the majority of students replied: "We copy notes from blackboard". There is evidence that students are not doing laboratory work as indicated in their textbook. However, more than half of the students responded that the teacher implemented the course as required by the textbook, but only in terms of content. There is also evidence that more than seventy percent of the students in this class agreed that their teacher made physics lessons interesting to them.

It can be said that students felt that the subject matter and the teacher's approach to teaching activities were both accessible. This view and other findings below are supported in the observation part of this case. The observation data also confirm a relatively high number of active students and a good ratio of student-dominant activities in this classroom. Teacher B managed to achieve interaction by using many analogies with daily life situations (as presented in the observation data). This was one of his characteristics.

Demonstration activities were used as a substitute for laboratory work, a fact which could be attributed to the shortage of equipment and space, because the laboratory was generally used for biology and chemistry as well as physics. However, the class size was relatively small which allowed for more practical work in the form of group work. On the other hand, the teacher's commitment to cover the physics curriculum within the prescribed time affected his implementation of the teaching activities, as far as following the order of the textbook was concerned.

Although the teacher did not use the 'dictation activity' and handed out notes at end of each lesson, the students took their own notes. Again, the Turkish cultural background, in addition to the students' reaction to the teacher's authority in the classroom, may provide the explanation for such behaviour. The students, although they had their teacher's notes, were not able to rely on them, and lacked confidence unless they copied what he wrote or explained.

Table 29

Students' Perception of Teaching-Learning Activities

Items On the Questionnaire	Percentage of Students Responses		
	Often	Sometimes	Never
We use sources other than student textbooks	16	70	14
Teacher Makes Physics Interesting for us	24	52	24
We feel free to ask questions	42	32	24
We copy teacher's notes from blackboard	60	36	04
Teacher does demonstrations	22	34	44
We do laboratory work as indicated in the textbook	06	10	84
Teacher follows lessons according to textbook	58	34	08
Teacher tests us on what he/she has taught	36	46	18

7.3.2.2 Students Attitudes towards Physics Teaching-Learning

As can be seen from Table 30 below, a majority of students found physics challenging. Almost half of the students found the physics lesson enjoyable. Challenging means to them difficult but not necessarily unenjoyable.

However, there is also some evidence that almost a third of the students are bored by physics lessons. Almost the same proportion of the students found that there were many topics in physics that they did not like.

These findings indicate that the students in teacher B's class are divided into two distinct groups. The first thought of physics as an enjoyable subject, may be in spite of difficulties. The active number of 7-8 students indicated in the observation data fall into this category. The second group perceived physics as a difficult subject, either partially or totally. This group includes most of the inactive students. There is an indication that some students, especially those in the second group, did not like attending the physics classes. However, they had no choice as physics is a compulsory subject.

Consequently the teacher tried his own methods in application of student-dominant activities, teaching activities, analogies and demonstrations, all in order to overcome any learning problems of the students. However, these measures did not succeed in making students enthusiastic about the subject. Also, the class size, though relatively small in this case, did not help to raise the number of active students to the expected level. Students' interest in physics might also be affected by other factors such as the unavailability of facilities and the time limitation of lessons per week (see section 7.1). Therefore, it seems that even for students who willingly choose physics, and who enjoy specifically adapted teaching activities and a reasonable class size, there are still factors that can inhibit their enthusiasm to be active in the classroom.

Table 30

Students' Attitudes towards Physics Teaching-Learning

	Percentage of Positive Responses	*
I find physics challenging	82	
Physics is enjoyable	51	
I am bored most of the time in physics	34.0	52.0
There are many topics I do not like	32.0	36.0
I generally dislike my physics work	26.0	58.0
Physics is an enjoyable school subject	44	
Physics taught in our school is interesting	45.0	
Physics is a difficult subject	32.0	50
Physics is a difficult subject when it involves calculation	14.0	50.0
Physics is a difficult subject when it involves laboratory work	22.0	50.0
There are too many facts to learn in physics	68.0	16.0

* In the negative attitudes the disagree responses, which are really the positive attitude responses, appear in the second column.

7.3.3 Teacher C's Class School III

This class was chosen from a provincial school. The school size was 3,400 and the class size was 70. The characteristics of the school and class are presented in section 7.2.3.0 of this chapter.

7.3.3.1 Students' Perception of Teaching Learning Activities

From Table 31 below, the following picture can be drawn. There is evidence that the teacher did not always make physics interesting for the students; in fact none of the students responded that the teacher 'often' made physics interesting for them. On the other hand, more than half of the students indicated that the teacher "never" made physics lessons interesting.

Although the student questionnaires show that students felt free to ask questions in this class, the observation data shows that they did not utilise this opportunity. There might be more than one reason for this result. Firstly, as students take physics as a compulsory subject, some of them are not really interested in learning. Secondly, students sometimes fail to understand the content, and then do not ask questions. Thirdly, as apparent in other cases, psychological effects of up-bringing and previous education turn them into passive listeners. More than 70 percent of the students indicated that they copied notes from the blackboard. The findings of observations confirm this. As observed in other cases, the 'note taking activity' is a feature deriving from their previous education. Students usually do not study sources other than their notebooks. They believe that, in their examination, their teacher wants them more or less to reproduce what he has explained. This habit evolves in elementary schools, develops and remains part of the students' educational background in what may be termed a 'previous education feature'.

Findings from Table 31 indicate that students in this class did not take part in teaching activities very much. This fact was confirmed by the teacher, who told the researcher that few students were directly involved in the lessons, perhaps only five or six. He therefore suggested that physics should not be compulsory, but an optional subject.

More than half of the students indicated that they did laboratory work as indicated in their textbooks. However, 9.3 percent of the students responded that the teacher performed demonstrations 'sometimes'. In fact, their laboratory is designed in such a way that the teacher can only demonstrate experiments. Since the laboratory is small in size, the students have no facilities and no space to perform experiments themselves.

On the issue of conducting experiments, teacher C was the only teacher of a large class to conduct laboratory work, even if it was only demonstrations. Demontrations, as shown in section 7.2, encourage students to ask questions. Although this seems to contradict the idea that students are passive towards lessons as was indicated above, it, at the same time, suggests that practical work, if applied even at a minimal level, can help to stimulate student activity and drive them to interact actively in the physics lessons. The reasons behind this are two-fold. Firstly, in the practical sessions, procedures and results are demonstrated before the students' eyes. The visual impact of the experiments helps the students to conceptualise their understanding of the purposes and results of the experiments. Accordingly, the 'students ask questions' activity is more frequent than in the classroom. The classroom discussion of experiments is mostly based on theoretical understanding, which means it is not effective. Secondly, teachers give more opportunity to students to ask questions because the time for experimentation is available for the topic under consideration.

This discussion leads to the conclusion that alternative methods of teaching physics could be implemented to make students active and more confident. Optional sessions of physics could be time-tabled. In this way, some of the existing sessions on the monthly physics timetable could be used for informal discussion sessions in which students would ask questions without taking notes or conducting experiments.

Discussing ideas and criticising concepts would help to reverse the effects of previous education. This method would develop the students' abilities to build their concepts in the right manner. They would by nature become more active in directly participating in teaching activities in the class.

Table 31

Students' Perception of Teaching-Learning Activities

Items On the Questionnaire	Percentage of Students' Responses		
	Often	Sometimes	Never
We use sources other than student textbooks	2.3	39.5	58.1
Teacher makes Physics interesting for us	00	40	59.2
We feel free to ask questions	11	60.5	27.9
We copy teacher's notes from blackboard	76.7	14	09
Teacher does demonstrations	00	9.3	88.4
We do laboratory work as indicated in the textbook	14.7	37.2	48.1
Teacher follows lessons according to textbook	60.8	27.9	2.3
Teacher tests us on what he/she has taught	44.2	41.9	14

7.3.3.2 Students' Attitudes towards Physics Teaching-Learning

From Table 30 below, the following picture can be drawn: as in the other cases, about 80 percent of the students found physics to be a challenging subject. At the same time, about 20 percent found physics enjoyable. However, about 70 percent of the students responded that they were bored during lessons. It could be argued from these results that some students would not willingly enrol for physics. This result is also supported by the teacher, who said that there were few students in this class who were willing to take physics.

There is another interesting indication in the responses from this class. For example, about 21 percent of the students responded that physics is, in general, an enjoyable subject. However, only about 11 percent found physics taught in their class to be interesting. This result indicates that some students want to see some changes in their physics teaching-learning process. In fact, their teacher was not totally satisfied with his teaching activities either, but there are some factors which caused him to adopt the chosen activities. One of them is the requirement by the Ministry of Education to finish the topics in the prescribed time. The other reason is the requirement of the University Entrance Examination which consists mainly of problem solving.

Around 80 percent of the students indicated that there are too many facts to learn in physics. This does not mean that these facts are not at their level of understanding, because the curriculum planning process is generally based on students' abilities. However, the time available for understanding the facts is limited. The findings of the teachers' questionnaires, as presented in section 7.1, also supported this argument, since teachers found the given lesson time less than adequate.

In summary, this picture shows that although the majority of students found physics to be a challenging subject, many were bored by physics lessons and only a minority of students found physics teaching interesting to them. This minority represents the category that would willingly enrol for physics. Therefore, optional physics courses seem to be inevitable for the Turkish context, because many students, as shown above, do not find physics teaching-learning interesting despite their teacher's attempts to adopt activities in line with the students' abilities.

Table 32

Students' Attitudes towards Physics Teaching-Learning

	Percentage of Positive Responses	*
I find physics challenging	83.7	
Physics is enjoyable	21.6	
I am bored most of the time in physics	72.1	18.6
There are many topics I do not like	46.5	34.9
I generally dislike my physics work	39.6	30.3
Physics is an enjoyable school subject	25.6	
Physics taught in our school is interesting	11.7	
Physics is a difficult subject	48.9	32.6
Physics is a difficult subject when it involves calculation	39.5	37.2
Physics is a difficult subject when it involves laboratory work	34.9	32.6
There are too many facts to learn in physics	79.0	12.9

* In the negative attitudes, the disagree responses, which are really the positive attitude responses, appear in the second column.

7.3.4 Teacher D's Class at School IV

This school was a provincial school. The school size was 750 and the class size was 35. The characteristics of the school and class are presented in section 7.2.4.0 of this chapter.

7.3.4.1 Students' Perception of Teaching-Learning Activities

The following picture can be drawn from Table 33 below. Regarding the activities which took place in Teacher D's class, students' responses indicated that supplementary materials were not very often used. About 40 percent of the students responded that 'sometimes' they used such materials. In fact, observation data shows that their teacher did use supplementary materials. Teacher D usually used these materials for problem solving purposes. Since this teacher had relatively less experience than others, it might be the reason that she chose these sources for problem solving.

There is some evidence that some students in this class found physics activities slightly interesting. While 12.1 percent of the students responded that 'often' their teacher made physics interesting for them, about 30 percent of them responded to the same item by 'sometimes'. This result indicates that even in a small class the less experienced teacher could not make the lesson interesting for the majority of students.

There is some evidence from the student responses that the teacher seemed to give more opportunity to the students to be involved in activities. These responses also show that a majority of students felt free to ask questions. However, observation data reveals that only ten percent of the total time (six lessons) was spent on student-dominated activities. This could be explained by the fact that the less experienced-teacher relied on the curriculum guideline and attempted to finish the topic in a prescribed time, with the result that she devoted less time to student-dominated activities.

Other evidence indicates that note-taking activities are used too often in this class. Students copied their teacher's notes from the blackboard. The observation and interview data also support these results. Even though the class size was fairly small, their teacher used teacher-dominated activities in order to control the class more easily.

One interesting finding from this class was that more than half of the students agreed that they 'often' conducted laboratory work. They similarly responded that the teacher followed lessons according to the textbook. However, during the period of this research there was no laboratory work. The teacher told the researcher that they had conducted laboratory work during the first term. In that respect, students' responses agreed with the teacher's response.

Table 33

Students' Perception of Teaching-Learning Activities

Items On the Questionnaire	Percentage of Students Responses		
	Often	Sometimes	Never
We use sources other than students textbooks	03	42.4	54.5
Teacher makes physics interesting for us	12.1	36.4	51.5
We feel free to ask questions	27.3	66.7	06.1
We copy teacher notes from blackboard	63.6	33.3	00.
Teacher does demonstrations	12.1	42.4	42.4
We do laboratory work as indicated in the textbook	54.4	39.4	06.1
Teacher follows lessons according to textbook	12.1	78.8	9.1
Teacher tests us on what he/she has taught	30.3	48.5	21.2

7.3.4.2 Students' Attitudes towards Physics Teaching-Learning

The following interpretation could be drawn from Table 34 below. There are some indications that physics to some extent was, in general, interesting for students in this classroom. However, only 18.2 percent of the students found physics interesting as taught in their classroom. This result suggests that some of the expectations of the students were not totally met by the teacher. In fact, observation data reveals that their teacher was less experienced and tried to finish the topics in the prescibed time, as explained above, which seemed to influence her choice of more teacher-dominated activities. Moreover, about 40 percent of the students responded that they were bored in physics lessons. Furthermore, about half of the students found physics a difficult subject. These findings reveal that some students attended physics lessons unwillingly and others expected a different quality of teaching from their teacher.

The findings also reveal that although one third of the students found physics enjoyable, about half of the students responded that there are too many topics to learn in physics. Again, this could be attributed to time shortage rather than the topics' complexity.

Table 34

Students' Attitudes towards Physics Teaching-Learning

	Percentage of Positive Responses	
I find physics challenging	66.6	
Physics is enjoyable	30.3	
I am bored most of the time in physics	39.4	24.3
There are many topics I do not like	45.4	43.4
I generally dislike my physics work	39.4	26.4
Physics is an enjoyable school subject	36.4	
Physics taught in our school is interesting	18.2	
Physics is a difficult subject	51.5	24.2
Physics is a difficult subject when it involves calculation	57.5	27.3
Physics is a difficult subject when it involves laboratory work	27.2	42.5
There are too many facts to learn in physics	62.7	22.2

* In the negative attitudes the disagree responses, which are really the positive attitude responses, appear in the second column.

7.3.5 Summary of the Students' Questionnaires Findings

Some important findings of the students' questionnaires can be presented as follows.

There is some evidence from the case 1 , case 3 and case 4 findings that their teachers do not make physics lessons interesting for the students (compared to case 2).

There are also similar findings in case 1 and case 3 that laboratory work is not carried out as part of the physics implementation process. Although there are some variations between student responses, it is clear that in all cases, the students copy notes from the blackboard as one of the main teaching activities. However, in case 2, the teacher does not ask the students to take notes, because at the end of each unit he them gives hand-outs.

There are also some consistent findings from all cases that, with slight variations from case to case, that most of the students found physics challenging. Findings from case 1 and 2 show that more than half of the students responded that physics was enjoyable. In the other cases this proportion was relatively low. There is also evidence that some students are bored in physics lessons, in all cases but especially in case 3 (around 70% ; in the other cases the range was around 30-40%).

From what has been said above, some general ideas emerge. First, although teachers try to adopt innovative teaching activities in order to balance the requirements of the Ministry on the one hand and students' characteristics on the other, they still face problems in making students participate actively in the teaching-learning process. Cultural effects seem to be a very influential factor on students in the classroom. Thus, students' characteristics as passive listeners dominate the teaching activities and, in turn, prevent the implementation of curricular-suggested activities by the Ministry.

Secondly, it was found that demonstrations are the most common laboratory work because of: large class sizes, lack of equipment and time limitation. Students' responses reveal that there are too many topics to learn in physics which implies that the time allocated to physics lessons is insufficient. Teachers' questionnaires support this argument.

Thirdly, teaching activities are sometimes used for both academic and disciplinary purposes. Taking notes is, for example, one of those activities used by teachers to control the class while the students copy either from the blackboard or write down teachers' explanations.

Fourthly, the number of students who indicated that physics, in general, is an interesting subject, is greater than the number of students who indicated that they enjoyed the subject as taught in their classroom. It seems that they like physics but not their teacher's style of teaching. In addition, students' responses proved that many of them took the subject unwillingly. Despite the fact that teachers modify the teaching activities, there is little improvement in the students' enthusiasm for physics. Therefore, it seems that optional physics courses, informal discussion sessions or practical work sessions would help to stimulate students' thinking and make them more active. For example, a fact observed and supported by the findings was that some teaching activities help to encourage students to become involved in the lesson more. Demonstrations, for instance, motivate the students to contribute to the discussion of ideas and concepts through asking questions.

7.4 Summary of the Results Emerging from the Findings and Answers to the Research Questions

The summary of the findings obtained from the teachers' questionnaires, observations and interviews with teachers and the students' questionnaires is presented in this section along with answers to the research questions.

1- Physics teachers interpretation of the new physics curriculum objectives

Teachers' responses and interview data reveal that physics teachers receive curricular information from a variety of sources. These are 'The Journal of Official Communication', students' textbooks, supplementary books, in-service programmes, and subject-colleagues' meetings. Furthermore, these instruments also indicate that teachers are aware of the intended objectives. However, as discussed in 7.2.5., teachers cannot implement these perceived objectives due to class realities and the influence of the University Entrance Examination. Evidence from students' responses show that some of the suggested activities do not match the students' characteristics, so that in spite of the Ministry requirement that the suggested activities be student-dominated, observation data proves that about 80 percent of the time is spent on teacher-dominated activities. By this, the first research question (i- How do physics teachers perceive and interpret the objectives of the new curriculum?) is answered.

2- Main physics teaching activities used and their influence on how students may reach intended objectives

As stated above, teacher-dominated activities are mostly used in the observed classes, whereas the suggested activities are student-dominated ones. The study sought to investigate teaching activities in relation to attainment of intended objectives. The data obtained from the teachers and students show that teacher-dominated activities were the main ones taking place in the observed classes. The quantitative findings of the observations proved that in most of the observed classes, teaching activities were similar. However, a qualitative analysis of the data shows that the activities were applied for different purposes. Observation and interview data (see 7.2.5) show that these differences depended mostly on class size and the teacher's personal style of teaching. For example, teacher A used the 'dictation activity' because he believed that students did not read their books so they could instead learn the subject by reading their notebooks. Teacher D used the same activity to handle the discipline problem in her classes. The teachers' unique styles of teaching were influenced by students' characteristics and the requirement of the Ministry that all topics should be covered regardless of whether students reached the intended objectives. Interview data shows that teachers believed that, under existing class conditions, it is not possible to apply the suggested activities and therefore it is very doubtful as to whether the intended objectives may be attained.

In terms of differences, the observation data show that there were different activities adopted by teachers. These are described in section 7.2. Students' questionnaires reveal that the teaching activities employed in their classes seemed to be suitable for their characteristics and/or attitudes, victims of up-living. However, the students responses also show that many students did not attend the physics courses willingly. Both unwillingness to attend and the adopted activities in the classes were not helpful to students in developing their processing skills as required by the Minstry of Education in the curriculum guide. This study also found other obstacles hindering the achievement of the intended objectives such as the influence of the University Entrance Examination on the implementation process. As explained in section 7.2, observation and interview data also show that problem solving activities adopted for University Entrance Examination purposes led to rote-learning.

From the findings presented in this part, it can be argued that the adapted activities are mostly unhelpful to students as regards attainment of intended objectives. Specifically, students cannot develop their science processing skills, since observation and teachers' questionnaires show that activities related to these skills are not adopted. This concludes the answers to the second and third research questions (namely: ii- To what extent are the intended objectives implemented?; iii- What are the main activities which physics teachers employ in the implementing the new physics curriculum?).

3- Main factors influencing the implementation process

Teachers' and students' questionnaires and observation data indicate the following factors as being influential on implementation:

1- The requirements of the Ministry: As stated in chapter 2, there is a national curriculum implemented in Turkey under central supervision by the Ministry of Education. This is imposed on teachers as a compulsory content with suggested activities. Teachers' interview data show that they feel under pressure to finish the topics in the prescribed time. However, they are not able to adapt suggested activities at the required level. Document reviews reveal that the philosophy of these activities is based on a student-dominated approach.

2- The University Entrance Examination: Both parents and students expect the teachers to help the students to enter university through passing the examination. Observation data show that teachers all more or less employ 'problem solving activities' based on examples from past examinations. Interview data with teachers supports this result. Teachers' questionnaires reveal that supplementary books are used for the same purpose. Document reviews show that the Ministry does not emphasise this approach to the same extent that it is used in the classroom.

3- Student characteristics and classroom reality: Students' questionnaires reveal that their cultural background and their previous education turns them into passive listeners. Observation data reveals that teachers try to motivate their students to become active by adapting some of the teaching activities. By these activities, they try simultaneously to get rid of their students' passiveness, while attempting to fulfil expectations of the Ministry. However, in some cases, large student numbers, lack of facilities, and compulsory attendance tend to adversely affect student-dominated activities. As can be seen from Table 26, the above factors led different teachers to adopt unique teaching styles in some respects. The above summary of the analysis answers the fourth research question (iv- What are the main factors which influence the implementation of the new physics curriculum?).

4- Physics teachers' views about remedial changes for effective physics curriculum implementation

The findings regarding remedial changes for effective curriculum implementation can be summarised as follows. The teachers' questionnaires reveal that the "Journal of Official Communication", "in-service programmes" and "subject-colleagues' meetings" are the main dissemination agencies. However, interviews with the teachers show that the "Journal of Official Communication" does not help teachers in a sufficient way. Moreover, some teachers do not find its explanations very helpful. Also the findings from the teachers' questionnaires reveal that although over the last ten years curriculum changes have been taking place in Turkey, there were not sufficient in-service programmes both qualitatively and quantitatively. The reasons for these inadequacies are discussed with regard to teacher participation in and organization of these programmes in section 7.1. Although teacher responses reveal the inadequacies of in-service programmes they do make recommendations as to necessary changes. However, some remedial initiatives emerge from the interviews. Teachers suggested that it would be more beneficial if the Ministry of Education organised these programmes in consultation with local authorities and teachers, so that the required content could be offered to participants.

Regarding subject-colleagues meetings, teacher responses showed that these do not function in the intended manner. Some teachers in the interviews suggested that if the minutes of meetings were circulated it would help to make the meetings more beneficial.

Another main suggestion was for an optional course. This idea of an optional course emerged from teachers' interviews and students' questionnaires. Observation findings relating to the small number of active students support the necessity for an optional course-attendance. These suggestions constitute the answer to the last of the research questions (v- What are the teachers' perceptions about remedial changes for the effective implementation of the new physics curriculum?).

CHAPTER 8

SUMMARY, DISCUSSIONS, SUGGESTIONS AND RECOMMENDATIONS FOR FUTURE RESEARCH

8.0 Introduction

This chapter begins with a summary of the steps undertaken throughout this study. The general discussion of the findings gives rise to a number of suggestions and also some personal opinions about from the study.

It is hoped that both the findings and the discussion will be a source of further ideas regarding the dissemination and implementation of the curriculum, which should help future curriculum changes to be made in the right direction.

It is recommended that the methods of implementing the findings of this study should form the basis for future investigations into curriculum change.

8.1 Summary

The Ministry of Education is planning to change the implementation of the physics curriculum in Turkey. This study is an attempt to describe the implementation process and compare the intended curriculum with the implemented one.

The literature relating to the study of curriculum change was reviewed as a basis for this investigation, and the study looks into the actual state of the implementation process of the physics curriculum.

A case study research methodology was employed for this investigation. Three main instruments were used to collect data.

Firstly, 50 physics teachers from several schools in the Black-Sea Region were asked to fill in a questionnaire. Later, four teachers who had filled in the questionnaire were observed and interviewed. Students' questionnaires were applied in those classes that had been observed. Informal interviews with teachers in the visited schools and with local educational authorities, inspectors and policy makers from the National Ministry of Education were also conducted.

8.2 General Discussion

The teachers' questionnaires showed that physics teachers working in the schools of the Black-Sea Region of Turkey are mostly male (76%) and that their age range is from 26 to 44. However, the number of younger physics teachers exceeds that of older ones. The highest proportion of teachers is between the ages of 28 and 30 years. It is well known from the related literature that teachers' teaching experience can affect the implementation process of the course. Lantz and Kass (1987) argue, for example, that experienced teachers, who know the educational context better, do not always rely on officially approved materials. However, the teachers' questionnaires show that most teachers had about three to five years of teaching experience which implies that the Turkish educational context, where the field work took place, has less experienced teachers. Moreover, more than half of the teachers in the study do not have more than three years experience in their present schools. The main reason behind these statistics is the socio-economic status of teachers in the state schools. State school teachers receive lower salaries than teachers on private courses. A substantial number of teachers with more than five years' teaching experience prefer to work on private courses.

Experience may be seen in two ways, firstly with respect to quality of teaching, and secondly as regards length of accumulated service. As was argued in 7.1.2, certain aspects should be targetted in order to improve the quality of teaching. Firstly, the study results suggest that pre-service education needs to develop teachers' science processing skills. Teachers' programmes at this stage should aim to prepare teachers in the use of basic, applicable and adaptable teaching activities for the classroom setting. Secondly, as discussed in 7.4, in-service programmes have some shortcomings that need to be improved in the future. To carry out these improvements, appropriate attention to the concept of the new curriculum should be given to these programmes, and their contents should meet teachers' requirements. Ideally, in-service programmes should be initiated by the teachers themselves and designed nationally in close cooperation with local authorities according to teachers' needs. In addition, these programmes should be timed during the academic year instead of in the summer holidays as in the past. Moreover, local authorities should make the regional programmes accessible to all teachers by providing them, for instance, with free transportation. Furthermore, incentives, specifically of a financial kind should be provided to encourage teachers to participate in such programmes. Above all, in order to lengthen teachers' service careers in terms of number of years in the state schools, the Ministry of Education has to target the financial problem of salaries, since teachers, especially the experienced ones, do not wish to continue teaching in the state schools when other institutions offer them more opportunities to promote their socio-economic status.

The overall situation is not bound to improve unless some changes are undertaken. To this end, the experience of other countries should be considered. For example, in England and Wales, the Schools Council held responsibility for initiating curriculum changes. The members of the Council were school teachers. It served the country for curricular matters for many years. It is suggested that the direct involvement of teachers in the curriculum change process could be considered by the Turkish Ministry of Education as a worthwhile idea based on the Schools Council experience.

The findings in the teachers' questionnaires and interviews showed that teachers are aware of the new curriculum objectives as stated by the Ministry of Education. This awareness is reflected in the way they ranked these objectives according to importance (see Table 11). However, class observation proved that the actual implementation of these objectives was not pursued in their daily teaching. It seems that the reason underlying this was that classroom realities hindered the implementation of intended objectives. This defect in the implementation procedure could be attributed to many reasons, of which the education system is the main. In a highly-centralised education system, the operation of teaching activities in the class is mostly shaped by the structure and the nature of the education system. Tobin and Gallagher (1987) found, in their study on academic work in science classes, that because of the influence of the education system and the students' characteristics, different teachers engaged in similar activities and academic work in the same school. The findings of this study match with Tobin and Gallaghers' (1987) in that the teaching activities were similar in the observed classes as a result of the influence of the education system. In addition, the duration of the total amount of teacher-dominated activities was also similar (about 80%) in the observed classes (see 7.2.5). However, the quality and the purposes of these activities were found to be slightly different for each teacher.

In the light of the findings, both from this study and the reviewed studies (Kimpston, 1985; Tobin and Gallagher, 1987), the following suggestions could be made in order to improve the quality of physics education in Turkey and in other countries where similar problems exist. While it is a long process to change the education system, which is such an important influence on class activities, as suggested in the studies mentioned above it is clear that there has not been an attempt to make changes as far as the structure of the Turkish education system is concerned. However, it has been argued in other parts of this thesis that changes may be initiated within the implementation process i.e. at classroom level rather than centrally. Firstly, course enrolment could be made optional for physics students. Students' questionnaires and teachers' interviews support the 'optional course' suggestion which would give more flexible opportunities for students. In that case, only interested students would take physics. Then, in these classes, the involvement of students in the class activities would increase in the way that the curriculum guideline suggests. Secondly, there is a need to encourage teachers through in-service and subject-colleagues' meetings in order to improve their teaching activities and to get students involved in these activities. The findings of this study shed some light on this need. The unique teaching styles revealed in this study (see Table 26, p.202) could be taught to other teachers during in-service training and subject-colleagues' meetings so that they too could adopt them in their classrooms. Beside these teaching styles, other activities could be suggested in order to encourage students to participate in extracurricular activities. In-service and subject-colleagues' meetings could be used for this purpose.

The interviews reveal that the teachers knew that the majority of students do not study outside the class except for those who attend private courses or take private tuition. Teachers believe that encouraging students to perform outside activities is time consuming, and would further limit the time available to cover all the prescribed topics. In addition, a common belief among most of the teachers that 'physics can only be learned in class' seems to be predominant. However, teachers should motivate students both with regard to class activities, despite students' attitudes towards compulsory physics classes and with regard to extracurricular activities, even though these may appear inconsistent with intended expectations. In fact, these extracurricular activities should help students to cover the prescribed topics, because if students start to study at home or in the library, the teachers would not need to spend more time than required to cover the topics in the class. In fact, the pedagogical need to apply these activities emerged from the teachers' questionnaires as well (see 7.1.1.3).

The observation and interview findings reveal that some of the suggested activities in the curriculum guide are not applicable in the existing class context. Students' questionnaire findings also support this conclusion. For example, laboratory work was not generally carried out in the observed classes as part of the curriculum, except for one lesson which was of a demonstration type. Therefore, objectives related to these activities cannot be achieved, as was indicated by most of the teachers interviewed. The activities which are not applicable mostly related to skills development as explained above. The question arises that if the activities do not take place, how are students going to develop related skills? Suggested skill development activities are based mostly on students' direct involvement in class activities.

Thus, it would obviously be beneficial for teachers and students to have the equipment to carry out the experiments. However, even in the existing classrooms, teachers could do much more than they are doing now. Demonstration activities do not require a laboratory; some can be done in the classroom. Therefore, another item of the in-service programme and agenda of the teachers' colleagues meetings should be how the activities related to demonstration can be conducted in the existing classroom.

The findings in the teachers' questionnaires reveal that the majority of teachers follow the 'student textbook'. This was confirmed from both observations and interviews with teachers. The related studies of Kelly and Monger (1973, 1974) found similar results. However, in the Turkish context, teachers find it useful to follow other sources as well. These are mostly supplementary books including examples encountered in the National University Entrance Examination.

As a suggestion deriving from these findings, teachers need a better curriculum guide with clear examples for teachers on how to exploit the suggested activities in the class. Therefore, it would be reasonable to provide more commonly applicable classroom activities in this curriculum guide. Teachers would not have to apply them to the letter, since they are only 'suggested' activities. They could instead adapt them to their own classes. Interview findings with teachers A and B seem to agree with this point of view, as they believed that each teacher should find his own way of implementing the suggested activities in his/her class.

The findings of the observations from all four classes showed that few students were active in the implementation processes. Similarly, quantitative observation findings showed that about 80 percent of the total time was spent on teacher initiated activities. The interviews with the teachers also confirmed this result. On the other hand, intended activities should mostly be student-dominated, according to the curriculum guide.

Thus, another suggestion might be made in order to increase student activity in the class, although considerable effort would be required to accomplish it.

There are many factors which prevent teachers from applying student-dominated teaching activities. There is evidence from the teachers' questionnaire, observations and interviews that the university entrance examination system is one of the main factors which shape the teaching activities in the classes. Furthermore, the students' questionnaire findings also show that the majority of students are bored with the existing format (see 7.3). Thus, in the light of the research findings, the following suggestions could be made: (1) course enrolment should be *optional* for students; (2) the teachers should be encouraged to apply laboratory or at least demonstration type activities, because the amount of student involvement was found to be much higher in the laboratory than in the classroom.

Another interesting finding was that although teachers generally applied similar types of activities, some different activities were also observed. For example, teacher A applied a unique style of implementation in his class in which one student should remain present at the blackboard during the whole implementation process. As was explained in section 7.2, the purpose of this activity was twofold: (1) it allowed easier control of class; (2) students found it easier to follow. Teacher B gave the students handouts at the end of each unit, so he did not require them to take notes. Teacher D used the "dictation activity" mostly to keep the class quiet. These different styles of teaching activities were found useful by these teachers. However, there is a need for further research in order to suggest ways in which these activities might be useful to other teachers in similar contexts. Therefore, research conducted in the future should be concerned with the positive effects of these activities on students' achievements. However, as far as this research is concerned, the findings related to unique teaching styles point to effective methods that could be set as an example for teaching activities generally in the existing educational system.

8.3 Conclusion

As discussed in the above section, among other issues, five main findings emerged from this study:

1- The majority of physics teachers surveyed have relatively little experience.

2- The students' textbook was found to be the main source followed by teachers.

3- Teaching activities in the observed classes were found to be quantitatively very similar and about 80 percent of the total time was spent on teacher-dominated activities.

4- Although teaching activities were found to be very similar, there were also some different teaching activities in different classes.

5- Some of the suggested student-dominated activities were not implemented in the observed classes and less than 20 percent of the total time was devoted to them.

As discussed above, among others, the following main suggestions may be made.

1- Teachers should be retained in schools for much longer periods of service.

2- Physics courses should be optional.

3- Teachers should be provided with better in-service training.

4- Subject-colleagues' meetings should be arranged in an effective way.

5- The curriculum guide needs to be revised.

6- More unique teaching styles should be investigated and evaluated in order to increase the level of students achievements and involvement with lessons.

8.4 Suggestions for Future Research

As was explained in detail in chapter 4, a case study research methodology was applied in this investigation. Four cases were examined with a research methodology that could be used in further research in order to gradually produce valid generalisations.

It would also be interesting to make some kind of longitudinal study to observe the same teachers in state schools and in private courses, then compare the quality differences between these two types of institutions. Common experience shows that private courses give better education, enabling students to succeed in the University Entrance Examination. Although some factors, such as the type of teachers, play a role in this process, it is known that class realities, in terms of large class size and laboratory work, for instance, are similar in both cases. However, teachers on these private courses, although they are controlled by the Ministry of Education, enjoy more autonomy than in the state schools. Teachers accordingly have more freedom to select their own teaching activities. Moreover, attendance on private courses is totally dependent on the willingness of the students. The Ministry of Education should take this factor into consideration. Since private course teachers try to offer better methods to implement their teaching, it is worthwhile investigating them. These methods can be introduced to other teachers in the state schools if they are found to be effective. The similarities and differences which are highlighted do not necessarily mean that private courses are perfect. Rather, it is obvious that they concentrate on their students' preparation for the University Entrance Examination. This implies that the problem solving activity might be the dominant activity there. An investigation into the above mentioned and other issues would help policy makers to make the necessary changes in the implementation process for both institutions.

8.5 The Researcher's Personal Opinions About The Study

8.5.1 Experience Gained in the course the Study

The researcher gained the following experience during the preparation of this thesis. Firstly, information was acquired concerning the curriculum change process, with reference to the British and Turkish contexts. When the instruments had been developed, observation and interviews were carried out. Then, the data was collected and analysed, using SPSS. Finally, the research writing process was completed.

8.5.2 Experience of Instruments Used

The researcher recommends to other researchers wishing to conduct research on curriculum issues in secondary schools to give their attention to the points mentioned below. As far as the questionnaires are concerned, they may need to arrange a prior meeting with the teacher if possible. In the construction of the questionnaires, they should not use more than four open-ended questions in order to ease the filling-in process. Also, they may need to limit the time for the questionnaire to not more than half an hour, to encourage the completion of the questionnaires. In order to gain the teachers' support for the research, researchers may need to try to find volunteer teachers. Turkish tradition does not allow researchers to discuss teachers' views about implementation in the presence of their colleagues. The researchers may have to convince teachers of the importance of the study, since the teachers, in many cases, do not appreciate research efforts. For example, many teachers told the researcher that they "believed that the recommendations of the study would not be taken into consideration by the authorities such as the Ministry of Education".

As far as the students' questionnaires are concerned, researchers may need to convince the students about the importance of the study. Like their teachers, the students also believed that their effort in filling out the questionnaire would not contribute to curriculum change. Moreover, researchers may need to convince the students about the confidentiality of the investigation. They will need to prepare a questionnaire that takes no more than 20 minutes.

As far as the interview with teachers is concerned, researchers should take great pains in selecting the sample of their interviewees, unless they are appointed to them by the Ministry. Interviews should not include specific questions in the first 20 minutes. The researchers should assure the confidentiality of data given.

As far as the observation process is concerned, researchers may need to find teachers who are willing to be observed. Sometimes, they need to allow much more time than expected for the necessary official permission process to conduct the study. As most schools are unfamiliar with this process of observation, the researcher recommends that other researchers should be prepared to explain their presence many times even to the same person. In addition, it is recommended that the same teacher should be observed in more detail rather than more teachers in less time to eliminate the effect of the researcher's presence during the implementation of lessons. This also gives researchers an opportunity to undertake in-depth studies.

BIBLIOGRAPHY

Adamu, Abdalla Uba (1989). 'An Intrinsic Analysis of the new Nigerian Science Curriculum', *Journal of Curriculum Studies, Vol. 21, No.1, P.37-51.*

Adamu, Abdalla Uba (1990). Science Educationas a Development Strategy in Nigeria: a Study of Kano State Science Secondary Schools, in Lewin, Keith M. & Stuart Janet S (Ed.), *Educational Innovation in Developing Countries,* Published in University of Sussex p.61-91.

Adelman, C., Jenkins, D. & Kemmis, S. (1980). 'Re-thinking case study: Notes From the Second Cambridge Conference', in Simons, H. (Ed.) *Towards a Science of Singular*, Norwich, Centre for Applied Research in Education, University of East Angila.

Akcay, M. (1990). Orta Ogretim Politika ve Uygulamalarinin Bugunku Durumu. In Istanbul Ticaret Odasi (Ed.), *Turkiye'nin Egitim Politikasi,* Istanbul Ticaret Odasi Yayini No. 1990-5, Istanbul, Turkey.

Akker van den, Jan J. (1988). 'The teacher as Learner in Curriculum Implementation', *Journal of Curriculum Studies, Vol.20, No.1, P.47-55.*

Alpaut, O. (1984). 'Fen Ogretiminin Verimli ve Islevsel hale getirilmesi'. Paper presented in Turk Egitim Dernegi (Ed.). *Orta Ogretim Kurumlarinda Fen Ogretimi ve Sorunlari.* TED toplantisi, 12-13 Haziran.

Atkin, M.J. (1984). 'Practitionar as Researcher: Some Techniques for Analysing Semi-Structured Data in Small-Scale Research', *British Journal of Educational Studies, Vol. 17, No.3, P.251-261.*

Ayas, A., Cepni, S. & Akdeniz, A. R. (1993). 'Development of the Turkish Secondary Science Curriculum', *Science Education, Vol. 77, No.4, P.433-440.*

Aydin, Yusuf (1989). 'Characteristics of Secondary Schools Mathematics Teachers: a Turkish study of practice teaching', *Journal of Education for Teaching, Vol.15, No.3, P.255-259.*

Bell, Judith (1989). *Doing Your Research Project: A Guide for first-time Researchers in Education and Social Science.* Open University Press.

Ben-Peretz, Miriam (1980). 'Teachers' Role in Curriculum Development: An alternatif Approach', *Canadian Journal of Education, Vol.2, No.2, P.52-61.*

Best, John W. (1986). *Research in Education*, Prentice-Hall, Englewood Cliffs, N.J.

Boardman, J.David (1980). 'Dissemination Strategies in Four Geography Curriculum Projects', *Journal of Curriculum Studies, Vol.12, No.2, p.109-121.*

Brekke, John S. (1987). 'The Model-Guided Method for Monitoring Program Implementation', *Evaluation Review, Vol.11, No.3, P.281-199.*

CEPUP. 'Science Observation Schedule' developed by University of California, Berkeley.

Cilenti, K. (1984). 'Fen Ogretiminde Arac ve Gerec kullanimi ve Laboratuvar Uygulamasi'. Paper presented in Turk Egitim Dernegi (Ed.), *Orta Ogretim Kurumlarinda Fen Ogretimi ve Sorunlari.* TED toplantisi, 12-13 Haziran.

Cohen, L. and Manion, L. (1992). *Research Methods in Education,* Routledge, London and New York.

Collette, A.T. & Chiappetta, E.L. (1989). *Science Intruction in the Middle and Secondary Schools,* Merrill Publishing Compony, Columbus, Ohio.

Crocker, R.K. (1983. 'The Functional Paradigms of Teachers. *Canadian Journal of Education, Vol.8, No.4, P.350-360.*

Crocker, K.Robert and Banfield, Helen (1986). 'Factors Influencing Teachers Decisions on School, Classroom, and Curriculum', *Journal of Research in Science Teaching, Vol.3, No.9, p.805-816.*

DES (1985). Department of Education and Science and the Welsh Office, *Science 5-16: A Statement of Policy,* HMSO.

Doyle, Walter (1991). 'Classroom Knowledge as a Foundation of Teaching', *Teachers College Record, Vol.91, No.3, P.347-360.*

Doyle, Walter (1983). 'Academic Work', *Review of Educational Research, Vo.53, No.2, P.159-199.*

Durusoy, M. (1984). 'Fen Ogretiminde Karsilasilan Baslica Sorunlar ve Nedenleri. Paper presented in Turk Egitim Dernegi (Ed.), *Orta Ogretim Ogretim Kurunlarinda Fen Ogretimi ve Sorunlari.* TED Toplantisi, 12-13 Haziran.

Ebenezer, V.Jazlin (1993). 'Grade 10 Students' Perceptions of and Attitudes toward Science Teaching and Scholl Science, *Journal of Reseach in Science Teaching, Vol.30, No.2, P.175-186.*

Eggleston, J.F,; Golton, M. & Jones, M.E. (1975). *A Science Teaching Observation Schedule,* School Council Research Series, MacMillan: London.

Emmer, T.Edmund (1986). 'Academic Activities and Task in first-year Teachers' Classes', *Teaching & Teacher Education, Vol.2, No.3, p.229-244.*

Esu, E.O. Akon (1991). 'Inservice Teacher Education in Nigeria', *Journal of Education for Teaching, Vo.17, No.2, P.189-199.*

Fischer, Abraham S. (1968). 'The Development of an Observational Instrument for Science Teaching', *Journal of Research in Science Teaching, Vol.5, P.127-137.*

Flanders, A. (1970). *Analysing Teacher Behaviour*, New York, Addison Wesley.

Fullan, Michael G. & Stiegelbauer, S. (1991). *The New Meaning of Educational Change*, Cassell Educational Limited, England.

Fullan, Michael G. (1992). *Successful School Improvement: the Implementation Perpective and Beyond,* Buckingham: Open University Press.

Fullan, M. & Pomfret, A. (1977). 'Research on Curriculum and Instruction Implementation', *Review of Educational Research. Vol.47, No.1, p.335-397.*

Galton, Maurice (1980). *Curriculum Change,* Lecester University Press.

Garnett, Patrick J. & Tobin, Kennth (1988). 'Teaching for Understanding: Exemplary Practice in High School Chemistry', *Journal of Research in Science Teaching, Vol.26, No.1, P.1-14.*

Greene, Jenifer & McClintock, Charles (1988). 'Triangulation in Evaluation: Design and Analysis Issues, *Evaluation Review, Vol.9, No.5, p.523-545.*

Guba, E. G. & Lincoln, Y.S. (1981). *Effective evaluation,* San Francisco: Jossry-Bass.

Gump, P. V. (1982). School Settings and Their Keeping. In D.L. Duke, (Ed), Helping Teachers Manage Classroom, P.98-114., Alexantria, V.A: Association for Supervisionand Curriculum Development.

Hall, Grene E. (1992). 'The Local Educational Change Process and Policy Implementation', *Journal of Research in Science Teaching, Vol.29, No.8, p.877-904.*

Harding, J.M., Kelly, P.J. & Nicodemus, R. B. (1976). 'The Study of Curriculum Change', *Studies in Science Education, Vol. 3, p.1-30.*

Hull, R. (1993). *ASE Secondary Science Teachers' Handbook*, Simon & Schuster Education, U.K.

Kelly, P. (1980). 'From innovation to Adaptability: the Changing Perspective of Curriculum Development', in Galton, M. (Ed.) *Curriculum Change, P.65-80.* Leicester University Press.

Kelly, A. V. (1989). *The Curriculum Theory and Practice, Paul Chapman Publishing Ltd,* 114 Liverpool Road, London N1 1LA.

Kelly, P.J and Monger, G. (1973). 'An evaluation of the Nuffield O-level biology course materials and their use Part I', *School Science and Mathematics Reviews, Vol.55, No.199, p.470-482.*

Kelly, P.J. (1971). 'The Process of Curriculum Innovation', *Paedogica Europaea, Vol.6, p.84-106.*

Kelly, P.J and Monger, G. (1974). 'An Evaluation of the Nuffield O-level biology and their use. Part II', *School Science and Mathemetics Review, Vo. No. P.705-715.*

Kelly, P.J (1979). 'Diffusion of Innovation in Science Education', in P. Tamir, at al (Ed,), *Curriculum Implementation and Its Relationships to Curriculum Development in Science.* Hebrew University, Jerusalem.

Kerry, Trevor (1985). 'Science Teachingin the Middle years: An approach through task analysis', *European Journal of Science Education, Vol.7, No.1, p.45-56.*

Keys, Wendy (1987). *Aspects of Science Education in English Schools*, The NFER-NESLON Publishing Company Ltd.

Kimpston, Richard D. (1985). 'Curriculum Fidelity and the Implementation Tasks Employed by Teachers: a Research Study', *Journal of Curriculum Studies, Vol.17, No.2, P.185-195.*

Koyuncu, I. (1984). *'Fen Ogretmeni Yetistirme ve Hizmetici Egitimi', Turk Egitim Kurumlarinda Fen Ogretimi ve Sorunlari Bilimsel Toplantisi*, Ankara, Turkey.

Lantz, Oliver & Kass, Heidi (1987). 'Chemisrtry Teachers' Fuctional Paradigms', *Science Education, Vol.71, No.1, P.117-134.*

Lawton, D. (1980). *The Politics of the School Curriculum*, Routledge & Kegan Paul, London.

Leithwood, Kenneth A. (1981). 'The Dimension of Curriculum Innovation', *Journal of Curriculum Studies, Vol.13, No.1, P.25-36.*

Leithwood, Kenneth A. & Montgomery, Deborah J. (1980). 'Evaluation Programme Implementation', *Evalaution Review, Vol.4, No.2*, P.193-214.

Lewy, A. (1977). *Handbook of Curriculum Evaluation*, UNESCO.

McCormick, R and James, M. (1983). *Curriculum Evaluation in Schools*, Croom Helm, London.

M.E.B. (1987). 'Lise Fizik, Kimya, Biyologi Programmalari', *Tebligler Dergisi, Sayi: 2197.*

M.E.B. (1986). *Fen Programlarini Degerlendirme Komisyonu Raporu.* Talim ve Terbiye Kurulu Baskanligi, Ankara, Turkey.

M.E.B. (1983). Tebligler Dergisi, Talim ve Terbiye Kurulu, Ankara.

M.E.B. (1985). Tebligler Dergisi, Talim ve Terbiye Kurulu, Ankara.

M.E.B. (1939). Tebligler Dergisi, Talim ve Terbiye Kurulu, Ankara.

MacDonald, Bary & Walker, Rod (1976). *Changing the Curriculum,* Open Books Publishing Limited.

Maclure, J.S (1967). *Curriculum Innovation in Practice*, Her Majesty's Stationary Office.

Menis, Joseph (1989). 'Attitudes towards School, Chemistry and Science among Upper Secondary Chemistry Students in the United States, *Research in Science and Technological Education, Vo.7, No.2, P.183-190.*

Merriam, S. B.(1988). *Case Study Research in Education: A Qualitative Approach.* San Francisco: Jossey-Bass.

Nasuhoglu, R. (1984). 'Fen Ogretiminde Durum Degerlendirilmesi', A Paper presented in *Orta Ogretim Kurumlarinda Fen Ogretimi ve Sorunlari*, Turk Egitim Dernegi (Ed.), 12-13 Haziran, Ankara, Turkey.

Neill, Sean R. St.J. (1983). 'Choosing an Appropriate Observation Method for Science Lessons', *Eroupean Journal of Science Education, Vol.5, No.3, P.327-331.*

Nisbet, J. & Watt, J. (1984). 'Case Study', in Judith Bell, Tony Bush, Alan Fox, Jane Goodey and Sandy Goulding (Ed.), *Conducting Small-Scale Investigations in Educational Management,* Open University Press.

OECD. (1989). *Reviews of National Policies for Education, Turkey.* Paris.

Oney, B. (1985). *Turkey: System of Education.* In Husen, T. & Neville, T. (Ed.), The International Encyclopedia of Education, Pargaman Press, P.5311-5313.

OSYM (1990). *Ogrenci Secme ve Yerlestirme Merkezi 1989 Ogrenci Imtihan Sonuclari,* Metasan, Ankara.

Ozinonu, A.K. (1976). *Innovation and Changes in Secondary Science Curriculum.* Faculty of Arts and Sciences Publication No: 30, Middle East Technical University, Ankara, Turkey.

Parlet, M. & Hamilton, D. (1975). *Evaluation as Illumination,* in Tawney, D. (Ed), Curriculum Evaluation Today: Trends and Implications, Schools Council Research Studies, Macmillan Education, London.

Plaskow, M. (1985). (Ed). *Life & Death of the Schools Council.* The Falmer Press.

Pritchard, A.J. (1981). *Pilot Studies.* (Unpublished Paper: School of Education, University of Southampton, SO9 5NH, Southampton, UK).

Roadrangka, Vantipa and Yeany, Russell H. (1982). 'A Study of Relationship Among Type and Quality of Implementation of Science Teaching Strategy, Student Formal Reasoning Ability, and Student Engagement', *ED 215 896 SE 037 101.*

Rogers, Everett M. (1983). *Diffusion of Innovations*, Collier Macmillan, Canada, Inc.

Rowntree, Derek (1981). *A Dictionary of Education*, Harper and Row Ltd.

Ruddock, Jean & Kelly, Peter J. (1976). *The Dissemination of Curriculum Development*, NFER Publishing Company.

Simons, H. (1987). Getting to Know Schools in a Democracy: The Politics and Process of Evaluation. Falmer Press.

Scheerens, Jaap (1991). 'Process Indicators of School Functioning: A Selection Based on the Research Literature on School Effectiveness, *Studies in Educational Evaluation, Vol.17, P.371-403.*

Scheirer, M. A. & Rezmovic, E.L. (1983). 'Measuring the Degree of Programme Implementation: A methodological Review', *Evaluation Review, Vol.7, No.5, P.599-633.*

Schools Council (1980). *Impact and Take-up Project. A First Interm Report*, Schools Council, London.

Schremer, Oded E. (1991). 'The Teacher-A Category in Curriculum Evaluation, *Studies in Educational Evaluation, Vol.17, P.23-39, P.23-39.*

Skilbeck, M. (1984). *School Based Curriculum Development*, Harper & Raw, London.

Skilbeck, Malcolm (1992). 'Curriculum Implementation: Conflict and Consensus?', *Education Research and Perspectives*, Vol.19, No.1, P.1-13.

Sonmez, Veysel (1990). *Program Gelistirmede Ogretmenin El Kitabi*, Safak Matbaaccilik, Ankara, Turkey.

SPSS Data Entry II Notes, Southampton University Computiing Services, User Guide 185.

Stake, R.E. (1976). *The Logic of the Case Study*, University of Illinois at Urbana. Champaigin. Mimeo.

Stake, R.E. (1980). 'The Case Study Methods in Social Inquiry', in Simons H. (Ed) *Towards a Science of the Singular: Essays about Case Study in Educational Research and Evaluation*, Norwich Centre for Applied Research in Education, University of East Anglia.

Stake, R.E. (1985). 'Case Study' in Nispet, J., Megarry, J. & Nispet, S. (Eds), *World Year of Education 1985. Research Policy and Practice*. London, Kagan Page: New York, Nichols Publishing. Company.

Stenhouse, L. (1978). 'Case Study and Case Records: Towards a Contemporary History of Education', *British Educational Journal, Vol.4, No.2, P.21-39.*

Stenhouse, L. (1975). *An Introduction to Curriculum Research and Develoment*, Heinemann, London.

Stufflebeam, D. & Shinkfield, A. (1985). *Systematic Evaluation*, Dordrecht, Netherlands: Kluwer-Nijoff.

Tamir, Pinchas (1990). *'Characteristics of Senior High School Science Teachers in Israel as Related to Their Educational Goals and Their Perception of the Implemented Curriculum', Science Education, Vo.74, No.1, P.53-67.*

Tamir, P., Blum, A., Hofstein, A. & Saban, N. (1979). *Curriculum Implementation and its Relationships to Curriculum Development in Science*, Hebrew University, Jerusalem.

Tobin, K. & Gallagher, J.J. (1987). 'What happens in high schools science classrooms?', *Journal of Curriculum Studies, Vol. 19, No.6, p549- 560.*

Turgut, M.F. & Pekgoz, M. (1976). Yeni Orta Ogretim Sisteminde Modern Matematik ve Fen Programlarinin denenmesi ve tesmili uzerine arastirmalar Projesi Kesin Degerlendirme Raporu, Fen Ogretimini Gelistirme Bilimsel Komisyonu, Ankara, Turkey.

Turgut, M.F. (1990). 'Turkiye'de Fen ve Matematik Programmalarini Yenileme Calismalari', *Hacettepe Universitesi Egitim Fakultesi Dergisi, Vol.5, P.1-4.*

Turkish Review (1989). *'The Educational Tradition of the Ottaman Empire and the Development of the Turkish Educational System of the Republican Era', Turkish Review Quarterly Digest, Vo.3, No.6, P.13-84.*

Ulug, F.B. & Topukcu, H. (1990). 'Orta Ogretim Sisteminin Yapi ve Isleyisi', in Istanbul Ticaret Odasi (Ed.), *Turkiye'nin Egitim Politikasi, Yayin No. 1990-5, Istanbul, Turkey.*

Ural, I. (1988). 'Turkey' in Kuricn, G.T (Ed.), *World Education Encyclopedia, Vol.3, P.1268-1281.*

Walker, R. & Adelman, C. (1975). *A Guide to Classroom Observation*, Methuen.

Waring, Mary (1979). 'The Implementation of Curriculum Change in School Science in England and Wales', European Journal of Science Education, Vol.1, No.3, P.257-275.

Whitehead, David J. (1980). *The Dissemination of Educational Innovations in Britain*, Hodder and Stoughton Educational, Great Britain.

Whitehead, David J. (1980). *The Dissemination of Educational Innovations in Britain.* Hodder and Stoughton.

Williams, I.W. & Buseri, J.C. (1988). 'Expository Teaching Styles of Nigerian Science Teachers. Part 1: The Science Teaching Schedule', *Research in Science and Teachnological Education, Vo.6, No.1, p.51-59.*

Wonnacott, T.H, & Wonnacott, J.R. (1984). *Introductory Statistics for Business and Economics.* Published by John Willey and Son.Inc.

Wragg, E.C. (1984. (Ed). *Classroom Teaching Skills*, Beckenham, Croom Helm.

Yeany, Russell (1977). 'The Effects of Model Viewing with Systematic Strategy Analysis on the Science Teaching Styles of Preservice Teachers', *Journal of Research in Science Teaching, Vol.14, No.3, P.209-222.*

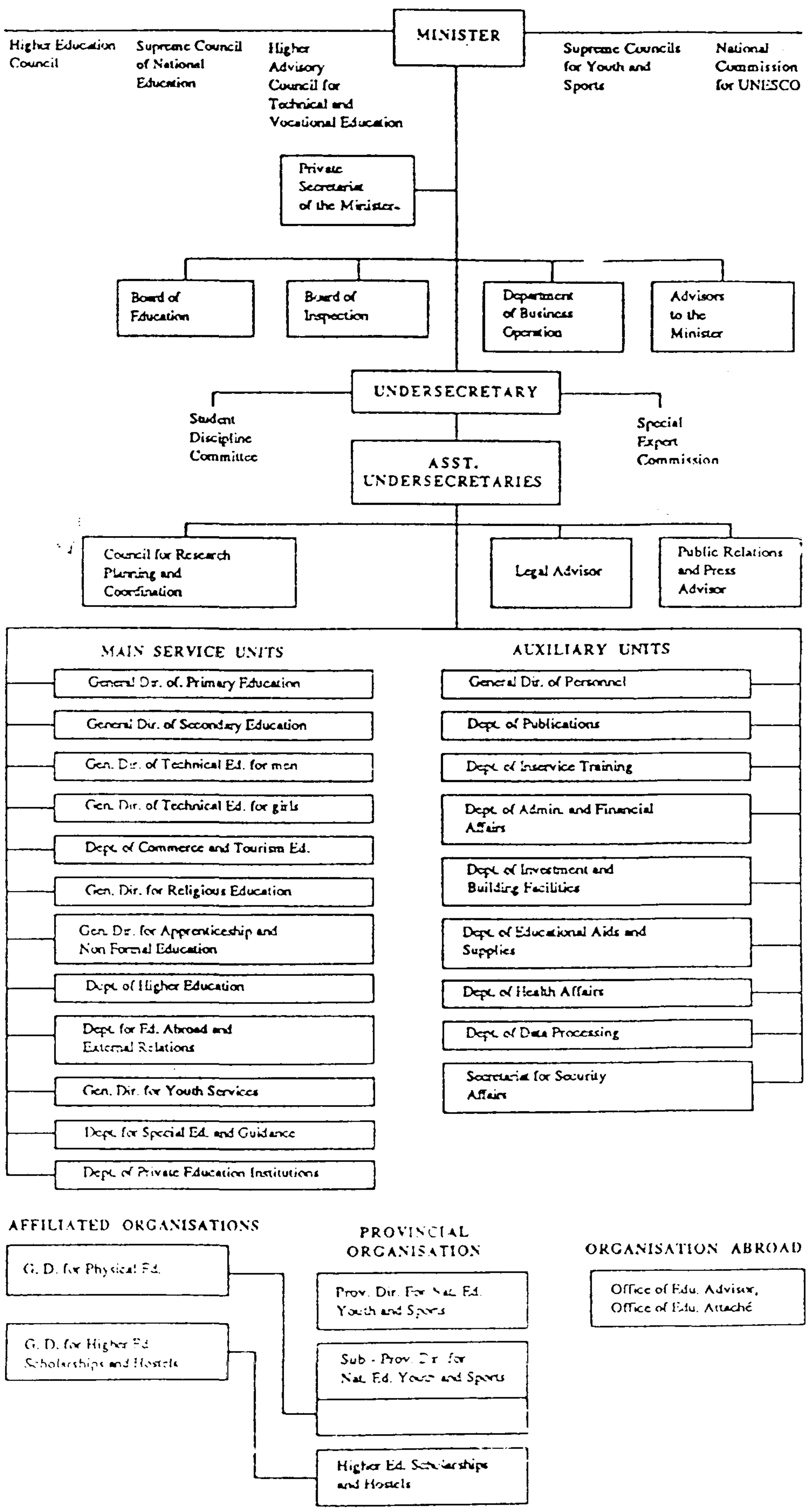
Yin, R. (1989). *Case study Research Design and Methodology.* Newbury Park, CA: Sage.

Yougman, M.B. (1984). *Analysing Questionnaires.* University of Nottingham School of Education.

APPENDICES

APPENDIX I STRUCTURE OF THE TURKISH EDUCATION SYSTEM

(From: OECD. 1989)



Development of the Turkish Secondary Science Curriculum

A. AYAS,[1] S. ÇEPNİ,[1] AND A. R. AKDENİZ[1]
K.T.Ü. Fatih Eğitim Fakültesi, Trabzon 61080, Turkey[2]

TURKEY AND ITS EDUCATIONAL SYSTEM

When the Ottoman Empire collapsed after the first world war, a new republic called Turkey was established in 1923. Soon after the proclamation, to change the poor and less developed appearance of the country many innovative attempts were undertaken in all areas, including education. Turkey is therefore one of the most powerful countries in the region.

Turkey has an area of 780,576 km^2 and is a bridge between Europe and Asia. The population is about 57 million, 99% of which is Muslim, and there are also ethnic minorities such as Jews and Christians, comprising about 1% of the total population. In 1982, the urban population was 52.5%. The nation's economy has an agricultural structure. According to 1985 statistics, 59.1% of the workforce belonged to the agricultural sector while 12.7% were employed in industry and 28.2% in the service sector, including construction. It is predicted that this picture will probably change gradually, with a decrease in the agricultural workforce and an increase in jobs in the industrial and service sectors.

According to World Bank sources, Turkey is a half-industrialized developing country. The Prime Minister of the 1980s, Mr. Özal, stated that the main aim of the country by the year 2000 is to be fully industrialized, with high economic growth and full integration into the European Community. To reach this target, the Turkish governments have been giving great emphasis both to improving and expanding education and training for economic adjustment to "the west" and to the nation's development (OECD, 1989). The key role of secondary education in this process

[1] The three authors have made equal contributions to this article.
[2] Current address: School of Education, University of Southhampton, Southhampton S09 5NH, UK

Science Education 77(4): 433–440 (1993)

CCC 0036-8326/93/040433-08

was outlined in the sixth 5-year plan from 1990–1994, which stated that the most valuable driving factors for the nation's development are to improve the quality of education in all secondary schools, to direct pupils in accordance with their abilities to vocational or technical schools, and to develop "diffused education" for people who were unable to continue for further education (Uluğ et al., 1990).

The Turkish Educational System was centralized by the Act of "Law of Unification of Instruction" in 1924. This act put all educational institutions under the control of the Ministry of Education, including the religious schools. However, the minorities—Armenians, Greeks, and Jews—are exempt from this implementation. The system consists of three main components: basic, secondary, and higher education. Basic education, which begins at the age of six, is eight years, compulsory, and free of charge in public schools. Every student who has completed his or her basic education, in accordance with classroom-based assessment done by the subject teachers during the academic years, is eligible for secondary education. Secondary education, which comprises general, vocational, and technical lycees, is 3 years and, like basic education, is free of charge in public schools. As the number of places at the higher institutions exceed the number of applicants, those who graduate from secondary schools have to take central entrance examinations to continue their higher education.

There is widespread agreement that science education is one of the major driving forces in the provision of the manpower needs of a nation's development. Therefore, heavy competition to provide a better education to their youths among the developed or technologically advanced countries has started, giving birth to the new curricular approaches in educational fields, especially science. This development has affected many developing countries, like Turkey. For example, a group of researchers was assigned to investigate the educational systems of a number of developed countries such as the United States, Britain, and Japan in 1959. Also, the well-known American curricula—PSSC, CHEM Study, and BSCS—were adapted.

This article discusses the problems encountered in the historic development of the Turkish secondary science curricula.

DEVELOPMENTS UP TO THE 1960s

To develop new and contemporary educational programs for the educational needs of the new Republic, several foreign educators—John Dewey, Kuhne, Omer Buyse, and the Kemerre Group, who have been well known in the educational milieu—have been invited to Turkey by the governments since 1924 (Basgöz and Wilson, 1968). The reports prepared by the foreign advisors on the Turkish Educational System have been discussed in detail by Turkish Educators (Turkish Review, 1989). A careful examination of the reports indicates that John Dewey's report is the soundest. He advised that Turkish educators should design and develop their own curriculum for all levels to meet national needs (Turkish Review, 1989).

In the 1950s, the aims and objectives of Turkish education were stated in the light of the suggestions from both Turkish educators and foreign advisors. However, whether these aims and objectives were being accomplished was not clear. John

Rufi, an American consultant who visited many secondary schools in different regions of Turkey, concluded that the objectives were not practically accomplished (Kazamias, 1966). During this period (1923–1960), the secondary science curricula were based upon textbooks. Theoretical rather than practical knowledge was dominant in the implementation process. This was concluded by a group of researchers who were appointed by the National Ministry of Education to examine the educational systems of a number of developed countries (the United States, Japan, Britain, Germany, Italy, and France) for the purpose of integrating new ideas into the educational system of Turkey in 1959 (The report, 1961).

The characteristics of educational reforms between 1923–1960 would be summarized as follows:

1. To a great extent, foreign advisers dominated the curriculum innovations.
2. The recommendations of foreign advisors were mainly theoretical rather than practical.
3. It was suggested that agricultural education be incorporated into school curricula for economic development of the modern country.

Although the foreign advisors' suggestions have dominated the educational system for 40 years, the outcomes of this implementation were not so successful (Kazamias, 1966). This may be due to the fact that the economic and social conditions of Turkey could not support the implementation of these theoretical suggestions in her school curricula.

DEVELOPMENT DURING THE POST-1960s

Adaptation of Foreign Curricula (1960–1984)

In parallel to developments in science education throughout the world, some initial attempts were also taking place in Turkey as early as the late 1950s. These were to organize in-service training for teachers, produce the curricular materials for schools, and establish moving laboratories for schools where there was no laboratory. In 1964, the establishment of a science lycee in Ankara, the capital city of Turkey, intensified the process of innovation in science education.

This lycee has been used as a pilot center for the implementation of the innovations. At first, the American curricula were implemented (PSSC and the CHEM study, which are only translated, and BSCS and SMSG, from which some topics were selected and adapted). In the later stages, the Commission of Development in Science and Mathematics Teaching, a body in the Board of Education, was established in 1967. The members of this commission were selected from teaching staff in the science departments of the universities in Ankara. The members of this commission have taken the following responsibilities: (1) translation and adaptation of the foreign curricula; (2) inservice training of teachers; (3) dissemination of the curricula; and (4) formative and summative evaluation of the curricula (Turgut, 1990). The commission, after the prepilot of curricula in the science lycee, decided to extend the pilot study to the nine general lycees. During the pilot studies, formative evaluations (incorporating teachers' and inspectors' reports and group discussions among evaluators and teachers, as well as students' achievements) have taken place for the purpose of extending the dissemination of the projects. As a result of the pilot studies, the projects were reorganized and implemented to about 200 lycees in Turkey (Turgut and Pekgöz, 1976). This wider implementation has revealed that many problems still exist in implementation. Moreover, an extended revision in all aspects of the curricula—from textbooks to in-service programs—was recommended (Turgut and Pekgöz, 1976). Hence, it was decided by the Council of Ministry of Education to disseminate the projects to other lycees by taking into account the above recommendations (MEB, 1983).

However, in terms of preservice teacher training the parallel innovations were not undertaken at the outset in the preservice curricula. Although at later stages some attempts were made to integrate the innovations to the preservice, it was not possible because of the widespread anarchy in teacher training institutions during 1976–1980 (Turgut, 1990).

The money for all these works had been provided by both the Turkish Scientific and Technical Research Institute (TÜBİTAK) and the National Ministry of Education between 1967 and 1980. When the funding ended by TÜBİTAK in 1980, the commission was also abolished (Turgut, 1990). The National Ministry of Education alone could not provide the needed funding. This was one of the reasons that caused the adapted science curricula to be abandoned in 1984.

Problems of Curriculum Adaptation and Implementation. As we indicated earlier, three well-known curricula, namely, PSSC, the CHEM Study, and BSCS, were adapted and implemented in Turkish schools. These curricula were developed in accordance with the economic and social context of the country of origin, which is an advanced one. The economic conditions in Turkey were not available to implement such advance curricula. Further, the social background is significantly different from that of the country of origin. These problems were not only encountered in Turkey. Recently, similar problems have been mentioned in the international milieu (Fensham, 1988; Tan, 1991).

In economic terms, first, although TÜBİTAK and the National Ministry of Education supported the projects financially at the outset, the physical requirements and materials could not be provided as needed. This has created a discrepancy between what was required and intended and what has been done. As a consequence, the dissemination process took a long time. In fact, the projects were never fully implemented all over the country. At later stages, one of the financial supporters, TÜBİTAK, decided to withdraw. Thus, it became more difficult to disseminate the projects to a broader extent. Therefore, some of the schools were implementing the traditional curriculum and others the adapted one. Because the educational system is centralized in Turkey, the policy makers decided to end this dichotomy among secondary schools. Therefore, the idea has emerged to develop a simple version of the adapted curricula that we name the new curricula to make the implementation process more economically viable and manageable in all secondary schools.

In addition, the majority of the teaching staff could not be equipped with the requirements of the adapted curricula because the available budget was insufficient to organize in-service courses for all teachers. Thus, many teaches who actually implemented the projects in their classrooms did not know much about the philosophy of the curricula. This lack of training and knowledge pushed teachers to integrate their traditional experiences into the adapted one. This was also another reason that influenced the policy makers in the Ministry of Education to develop a version of the curricula that would be understandable and recognizable to the teachers (Nasuhoğlu, 1984).

Apart from the economic conditions, the social context of the nation has affected the implementation process of the adapted curricula. First, the students and staff involved in the implementation process had significantly different cultural backgrounds from those in the origin country. By tradition, Turkish children believe that their elders know "everything" and do not make mistakes. They have grown up so that they depend highly upon "the way of their elders' supervision." They believe that knowledge is transferable directly from their parents' and teachers' head to theirs. There was therefore a cultural conflict in that the projects were developed on the basis that the students should actively be involved in the teaching–learning process. This is, in fact, a dichotomy between western culture and the Turkish one. Moreover, the western society in many ways is at an advanced level in terms of technical and economic aspects. Also, they are socially different. The majority of Turkish families are not familiar with much of the advanced technology and have little use for it in their daily life. The Turkish society is mainly agrarian and has close links to the rural way of life.

In addition, the philosophy of modern Turkey was to be westernized in all aspects. The intention was to adapt the western way of life both mentally and physically. To an extent, it was successful in the physical aspect, but the mentality has not changed much since then. However, there are some exceptions, such as a substantial number of policy makers who have been educated either abroad or in private schools such as Robert College or Saint Joseph, which implements a western style of education. In contrast, the teaching staff mainly come from rural families, share rural culture and values, and have low salaries in comparison to other professionals (Karagözoğlu, 1987). Because of the salary and low statute, the teaching profession is not attractive for children of wealthy families, the majority of which share and support the western life style.

At the translation stage, some further problems were encountered. This was due to the richness of vocabulary in the English language in comparison with the Turkish. It was not possible to find the exact word that gave the original meaning. In some cases, new words were invented to correspond to the English ones but these were not known by the students. In other cases, words coming from English origin and known by the students from their earlier education had changed, with newly invented words such as "vector" replaced with "yöngeç." Thus, the students' understanding was different from that intended in terms of concept building and understanding the basic principles and laws of science.

Finally, there were spiritual conflicts between the adapted curricula and the values of the society. The nation is a predominantly Muslim society. In the Islamic philosophy, "Man is created by the God as he is." Therefore, Darwinism is not acceptable at all. As teachers attempted to teach Darvinism in the schools, there was a dichotomy between the religious values and the school knowledge. Thus, students became skeptical about what they were taught at home and in schools.

All these points, both economic and social, and perhaps some others, have affected the implementation process of the adapted curricula. In contrast to the expectation of the policy makers in the National Ministry of Education, the process has not been successful. However, some of the content of the foreign curricula was used to develop a new textbook-based curricula that has been in action since the 1984–1985 academic year.

Current Secondary Science Education

After the abolishment of the implementation of the foreign curricula, a Council in the Board of Education was established to develop the new one. In contrast to the previous commission, the members of this council were mainly teachers and inspectors from the National Ministry of Education. The commission has written up the textbooks by making use of some of the content and objectives of the abandoned curricula. The syllabus for the new curricula was published in the official newspaper (*Tebliğler Dergisi*) of the Ministry of Education in 1985 (MEB, 1985). The syllabus has to be followed without any addition by the teachers, but the order of topics in teaching is not so rigid. The new curricula were not developed on the basis of field works in the Turkish context. Also, the commission did not use the practical experiences of the previous commission in the developmental stage of the new curriculum (Turgut, 1990). These two may be the most important missing points in the process. Further, apart from the student texts a teacher's guide and separate lab manual were also not prepared.

In addition, the teachers and public have been and are still mainly unaware of the philosophy of the new curricula. In fact, the philosophy is not clearly indicated in any official publication up to now. However, the textbooks, when they are examined, are content based and have given less priority to student-centered activities unlike the adapted one. Also, the INSET and Preservice Teacher education programs were not designed to prepare teachers to deal properly with the new curriculum and its instruction (Turgut, 1990).

Although the aims of the current science curricula are similar to that of developed countries, the fundamental implementation of it is in many cases still suffering because of inadequacies in the implementation process, such as poor teacher preparation, ineffective teaching methods, the lack of teaching aids, and crowded classrooms (Karagözoğlu, 1987; OECD, 1989). In fact, these are traditional problems in the Turkish context (Alpaut, 1984; Çilenti, 1984; Durusoy, 1984) and are also familiar to other nations, especially developing countries.

Although the new curricula is implemented all over the country to remove the aforementioned dichotomy, many schools still have inadequate physical facilities to implement it as intended. Therefore, it may be difficult to reach the curricular objectives. Actually, the evaluation of the new curricula has not been fully carried out so far. However, the coming years will hopefully provide more evidence of its success or failure. This evidence and experience could perhaps be used to redesign or develop a new curriculum according to the nation's needs and sources.

In conclusion, unless the social structure, economic conditions, and curricula are well matched it is skeptical to expect educational reforms to be successful. A curricular expert would be best for his or her own country but would not necessarily be of help to others. Developing education is not like transferring technology from one country to another. It is true that there are common methods of developing curricula that have obtained cross-cultural validation, like the importance of investigating the national needs. However, in practice application of techniques within methods are largely cultural-bound phenomena with individual differences within each culture. Therefore, while the process aspects of developments around the world in curricular fields may be of benefit the product may be inappropriate. The process should therefore be taken into account by home-grown planners and developers who are well aware of the needs and conditions of the nation. This approach would help developing countries like Turkey to reach their objectives in the 21st century.

REFERENCES

Alpaut, O. (1984). Fen öğretiminin verimli ve işlevsel hale getirilmesi. Paper presented in orta öğretim kurumlarında fen ögretimi ve sorunları, Türk Eğitim Derneği Bilimsel Toplantısı, Ankara, Turkey.

Başgöz, İ., & Wilson, H. E. (1968). *Educational problems in Turkey 1920–40.* Blomington, IN: Indiana University Press.

Çilenti, K. (1984). Fen öğretiminde araç, gereç kullanımı ve laboratuar uygulamasi. Paper presented in orta ögretim kurumlarında fen öğretimi ve sorunları, Türk Eğitim Derneği Bilimsel Toplantısı, Ankara, Turkey.

Durusoy, M. (1984). Fen öğretiminde karşılaşılan başıca sorunlar ve nedenleri. Paper presented in orta öğretim kurumlarında fen ögretimi ve sorunlari, panel I, Türk Egitim Dernegi Bilimsel Toplantisi, Ankara, Turkey.

Fensham, P. (1988). Familiar but different: Some dilemmas and new directions in science education. In P. Fensham (Ed.), *Developments and dilemmas in science education.* New York: Falmer Press.

Karagözoğlu, G. (1987). Yüksek öğretime geçişte öğretmenlik mesleğine yönelme (Preference for teaching profession among Turkish students sitting for the university entrance examination). *Hacettepe University Faculty of Education Journal, 2,* 34–46.

Kazamias, A. M. (1966). *Education and the quest for modernity in Turkey.* London: C. Tinling and Co. Ltd.

MEB. (1983). Fen programları durum değerlendirilmesi komisyonu raporu. Talim ve Terbiye Kurulu Başkanlığı, Ankara, Turkey.

MEB. (1985). Lise fizik, biyoloji ve kimya programlari. *Tebliğler Dergisi,* Sayi: 2197.

Nasuhoğlu, R. (1984). Fen (fizik, kimya, biyoloji) öğretiminde durum değerlendirmesi. Paper presented in orta öğretim kurumlarında fen öğretimi ve sorunları, panel I. Türk Eğitim Derneği Bilimsel Toplantisi, Ankara, Turkey.

OECD. (1989). *Reviews of national policies for education: Turkey.* Paris: Author.

Tan, S.-B. (1991). The development of secondary school science curriculum in Malaysia. *Science Education, 75,* 243–250.

The report of the Turkish national commission on education. (1961). Translated by M. Austin, American Board Publication Department, Istanbul, Turkey.

Turgut, M. F. (1990). Türkiye'de fen ve matematik programlarını yenileme çalişmalari. *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi, 5*, 1–14.

Turgut, M. F., & Pekgöz, M. (1976). *Yeni orta öğretim sisteminde modern matematik ve fen programlarının denenmesi ve teşmili üzerine araştırmalar projesi kesin değerlendirme raporu.* Ankara, Turkey: Fen Öğretimini Geliştirme Bilimsel Komisyonu.

Turkish Review. (1989). The educational tradition of the Ottoman Empire and the development of the Turkish educational system of republican era. *Turkish Review Quarterly Digest, 3*(16), 13–84.

Uluğ, F., Başdoğan, H. & Topukçu, H. (1990). Ortaöğretim sisteminde yapı ve işleyiş. In Istanbul Ticaret Odası, I. Ozaslan (Ed.), *Türkiye'nin eğitim politikası, 1990–5*. Istanbul: Hilal Matbaacılık, Bölüm 3, pp. 16–24.

Accepted for publication 10 December 1992

APPENDIX III DOCUMENTS

Document 1

CURRICULUM DEVELOPMENT MODEL

(From Official Publication, Ministry of National Education)

This document is related to curriculum innovation process for secondary schools.

The following important points mentioned in this document.

"1- Members of the Curriculum Development group are selected from the following institutions:

a) Teachers from related subjects working at schools

b) Teachers working one level down and up from related subject.

c) Curriculum Development Specialist from the National Ministry of Education.

d) If possible psychologist and sociologist from schools

e) Academics from universities.

2- Working process of curriculum development group are follows:

a) Curriculum Development Group is established and then trained by the cooperation of the related department and in-service division in the Ministry of Education.

b) This group determines tentative aims of the courses and objectives of the units and topics.

c) The related department from the Ministry of Education decides the final form of these curriculum aims, objectives and content of the courses.

d) The related textbooks are written by the commission of the writers who are selected from universities, schools and the Ministry.

3- The process of publication and dissemination of these programmes are as follows:

a) The last form of the programme is approved by the

Minister of Education.

b) The programmes are issued by the "Journal of Official Communication".

c) Programme and programme guide are published for teachers free of charge.

d) A group of monitor teachers chosen from each province are trained by the cooperation of the related education department, in-service and inspection division of the Ministry.

4- The evaluation of the programmes is carried out.

Document 2

CURRICULUM GUIDE AND CURRICULUM IMPLEMENTATION GUIDE

Curriculum Implementation Guide includes also what is written in Curriculum Guide. The following section 1 and 2 are taken from Curriculum Guide which are included also in Curriculum Implementation Guide.

I- The aims of the high school (lycee) physics course

1- To teach students basics concepts, principles and laws in order to enable them to understand the application of physics.

2- Get students to do investigation, observations and experiments, so that by doing these they can understand research methods in physics and have an opinion about scientific knowledge.

3- To help students to think physical event and develop basic, integrated science processing skills.

4- To help students to learn knowledge an acquire skills that are required for tertiary levels.

5-To help students to learn the learning methods for physics.

II- Explanation

1- To develop positive attitudes towards the learning of physical science.

2- To encourage students to read, think, make experiments and take part in discussion individually.

3- To encourage students to work individually, take part in discussion and investigate; research new methods and apply them.

4- To help students to learn ways of learning.

5- Students will be able to use the acquired knowledge and skills when they face the related problems in the future.

6- To develop positive attitudes to scientific endeavour by telling them the history of scientific people and their work conditions.

7- To encourage the students in a way that they can understand the meaning of scientific knowledge.

8- Teachers should give demonstration when appropriate for the purpose of showing and making them think about innovation in physical science.

9- Teacher has to emphasize the importance of knowledge and the role of physics in society in the lesson.

III- Subject-Colleagues' Meetings

At least two colleagues meetings take place in a year. The first one takes place at the beginning of the first term, the other at the beginning of the second term. If necessary it may be conducted more often than that.

A) First Meeting.

1- To read aims and objectives of the National Educational Objectives.

2- To evaluate curriculum activities in terms of previous year plan and achievement of the students.

3- To examine lesson programmes, objectives and remarks in relation to grade level to be taught, other lesson programmes and environmental conditions.

4- To discuss yearly plan concerning the following matter.

a) to arrange the time

b) to arrange the content in a yearly plan.

c) to decide objectives of the contents

d) to choose the teaching-learning methods

e) to decide the equipment and material

B) SECOND COLLEAGUE MEETING.

1- To evaluate the decisions taken in the previous meeting.

2- To take remedial action on some problems occurred during implementation process.

3- To examine the achievement of students, then take some decisions to promote student achievement.

4- To discuss other topics.

IV. Daily and Yearly Plans

Primary and Secondary teachers have to prepare daily and yearly plans. Some aims of preparing daily and yearly plans are given in the following sentences:

1- To make teachers aware of what and how this is going to be implemented .

2- To arrange the content in a schedule.

3- To make teachers think what materials and equipment are needed.

4- To make teachers work with their colleagues and in the same school to implement the same level of the lesson.

Yearly Plan

When the plan is prepared the following statements are to be taken into account.

1- To take ideas from previous plans.

2- To look at the calender and find out the working school days.

3- To consider the environmental conditions.

Teacher has to carry a copy of year plan with him/her, and take note of some problems occurred in implementation process.

Daily Plan

This plan includes the implemented content, experiment, discussion and problems and homework. Daily plan include the following subheading.

a) Name of the Lesson:
b) Class, Division:
c) Content:
d) Subheadings of the content:
e) Teaching Learning Strategies:
f) Sources and Equipment:
g) Outdoor-Experiment-Homework.
h) Implementation:
i) Evaluation:
j) Opinion about implementation:

h)Implementation

While teacher is implementing his plan, he may use one or more of the following strategies.

METHOD.	STRATEGIES.
1-Oral Explanation	Talking, Questions&Answers
2-Problem Solving	Analysis, Synthesis, Evaluation
3-Laboratory	Observation, Demonstration, Conduct experiment, Measurement, Evaluation.
4-Outdoor-Investigation.	Observation, Measurement, Evaluation.
5- Project.	According to content different

	strategies may be used.
6- Group Work.	Discussion, Panel, Seminar.

i) Evaluation:

In this section, 5-10 minutes are given for evaluation of student achievement. Teacher should write some question which will help him/her to understand whether students understand or not the implemented topic.

J) Opinion about implementation process:

Teacher should write his opinion about the implementation processes. And he/she should indicate the weakness part of the plan, and problems that occurred in the implementation processes.

In addition to the above procedure, while teacher is implementing his plan the following statements should also be taken into account.

1- The name of the content and subheading should be written on the blackboard so that every student can read them.

2- Dictation may be done such a way that student can write what they understand not directly what the teacher says.

3- While implementing the lesson the following way should be followed as much as possible.

a) Define the problem

b) To make observation, investigation about the problem

c) To make classification

d) To make necessary experiment

e) To make inferences from the experiment

f) To make hypotheses

V- Measurement and Evaluation

Written and oral assignments are indicated by the policies.

a) Written examination.

Questions should not be taken directly from the student textbook and sources. Many of the problems in the sources are low level, their purpose is to measure only knowledge level. Teachers' aim should be to make students understand the facts, principles and laws and apply them new situations etc. to develop basic and integrated science process skills. Therefore teachers should ask questions not only at knowledge level but also questions that required some interpretation, application of the facts, laws. Teachers should follow the curriculum guide as the basic source not the textbook. Textbook is only one of the sources.

1- Questions should be in the short form.

2- Questions should be made from both problem and content.

3- Questions should include implemented content and many of the question should be chosen from the new implemented part.

4- Questions should be asked at all levels like knowledge,understanding, application, synthesis and evaluation.

b)Oral examination.

Teachers should not give a specific time for oral examination, but evaluate the student on the basis of classroom activity.

Oral examination mark can be given before the end of term.

Oral examination mark should be announced to the students.

Document 4

THE MINUTES OF SUBJECT-COLLEAGUES MEETINGS

The following documents are taken from schools and are presented in order to reflect the process of these meetings.

From School I (School I is presented in chapter 7, section 7.2)

Physics Teachers Colleagues' Meeting:

Agenda:

1- Last year colleagues meetings reviewed.

2- The aims of the Ministry of Education read.

3- Aims and objectives of the physics lesson read.

4- Implementations process and strategies discussed.

5- Laboratory work discussed.

6- Yearly plan discussed.

7- Daily plan discussed.

8- The cooperation with other colleagues.

The reached decisions:

- The new topic should be announced to the students before the lesson.

- Question and answer methods should be used frequently in the implementation process.

- Example problem should be examined with the students.

- The teachers should follow their students progress.

- Some of the problem at the end the unit will be solved in the classroom and some of them will be given to the students as a homework.

- Teachers should use short questions and answer method especially past topics.

- The teachers should give opportunity to the students to take notes.

- The needed mathematics should be given as summary when it is appropriate.

- Laboratory should be used clean and appropriate.

From School II (This school presented in 7.2 section)

First Term Meeting:

Some of the agenda regarding teaching-learning strategies from meeting:

- To read and make awareness of the participant about aims and objectives of the science courses (physics, chemistry, biology) in high school.

a) These aims and related official document should be kept in teacher's file.

b) Objective of the each content should be determined by the teacher and indicated in the daily plan.

- To examine science curriculum (physics, chemistry, biology) year plan.

a) If there is some uncovered topic from previous year, this topic should be included in the year plan, this year and implemented in the classroom.

b) Optic content in physics should be implemented in at the beginning of the first term. (They have option to change the place of the topic).

c) Different teachers who taught the same courses in the different classes should meet each at least two weeks and discuss their daily plan so that they implement the programme according to year plan.

- To discuss student assessment method.

All grades have to take three examinations in one term and one of them should be multiple choice test items for the purpose of preparation of the University Entrance

Examination.

- To discuss and determine teaching-learning strategies

a) The following strategies will be used in the classroom.

Problem solving

Group working

Making Experiment

Making observation and outdoor activities

Questions and Answers

Oral explanation

Conducting experiment students by their own techniques

Student note taking techniques

Discussion techniques

Preparation of the experiment report by the student techniques

b) Experiment plans will be prepared by the teacher and attached to the year plan.

- Cooperation with other colleagues.

Science teachers should make cooperation with mathematics, arts and religion education teachers.

- To discuss some reasons about student failure

The following matters are the some reasons that cause students' failure.

They:

a) do not study enough at home rather they spent their time watching TV.

b) do not have parents.

c) do not have good enough accommodation to stay and study.

d) do not have self confidence

e) do not know how to study

f) have teachers who have different opinion on directing them to study.

e) have parents who are not interested in their children's work.

From School III (This school is presented in 7.2 section)

Some of the agenda and reached decision from the colleagues meeting:

- Curriculum guide for physics lesson was read and discussed.

Aims and objectives of the physics lesson are read and discussed.

- The physics teachers arranged the content according to available time.

- They specified the objectives of the each unit.

- They indicated the material which are available in use.

- They indicated the experiment that could be made in their school.

- Time arranged for daily and year plan.

At the beginning of the lesson teacher should give a summary of the previous lesson. This can be done by asking short answer questions to students.

Content should be explained by the teacher but questions and answer methods should be used frequently in order to keep students active in the classroom.

Experiment indicated in the meeting should arranged by the teacher prior to laboratory section.

- The teacher should determine the homework topic.

- Teaching-Learning strategies:

Teacher should know that he/she has responsibility to encourage students and make positive attitudes towards to science and scientific endeavour.

While teacher is implementing the lesson he should give daily life examples as much as possible. Teachers also keep their mind one of the objectives of the physics course is to help students to learn the way of learning.

Physics teaching-learning should based on the scientific methods. Frequently questions and answers should be used in implementation of the physics content. All experiments indicated in the year plan should be done. Laboratory work will be done as a group as much as possible.

-Development of students achievement:

Contents will be given to the students before the lesson so that when they come to the class they will be ready to discuss the topics.

Some research topic will be given to the students.

Students will be taught some way of studying physics.

Teacher should follow his/her students' progress.

- Physics teachers will cooperate with chemistry and mathematics teachers.

From one of the visited schools:

Some of the agenda and reached decision from the meeting:

- The aims of the physics lessons are read from the official publication.

- Physics teaching-learning strategies would be as follows:

Contents should be announced to the students before the implementation process so that students make preparation prior to lesson.

Teachers should try to make students active in the classroom.

Daily examples should be given in relation to the contents representation.

Some basic problems should be solved in the classroom and at the end of the unit problems will be given to the students as homework.

Students' homework should be followed by their teacher.

At the beginning of the lesson, the last topic should be summarised then the new topic will be started.

The teachers try to use model or figure as much as possible.

The physics teachers should cooperate with the mathematics and chemistry teachers.

The teachers should control the students whether they bring their textbooks and notebooks to class.

- The preparation of the daily and year plan:

All the contents in the year plan try to be covered on time.

Aims and objectives of the lessons, units and topics should be indicated on the year plan.

The summary of the topic will be written on the daily plan.

Daily plan may be written either notebooks or papers.

The teachers should carry the daily plan with him.

- Some of the social aspects of the science should be taken into account in the implementation process.(These contents arranged at the meeting).

- The laboratory experiments will be given to the students as a homework prior to laboratory time.The laboratory report will be controlled.

- The topics of the homework indicated in the meeting.

From one of the Visited schools:

Some of the agenda and decision from the meeting.

- As a teaching-learning strategies, oral teacher explanation, problem solving, note taking, etc. will be used in the implementation process.

- Contents implementation should be done according to the plan and try to cover all the topic indicated in the plan.

- Some of the social aspects of the science will be dealt with in the implementation process.
- The cooperation with other colleagues will be determined in another meeting.
- Teacher should encourage students and try to help them in the learning process.
- Students can use the school library.
- Students will be aware of the benefit of the group work.
- Question and answer method will be used in the implementation

APPENDIX IV TEACHER'S QUESTIONNAIRE

SECTION I. GENERAL INFORMATION.

1-What is your age? [ ] What is your sex?
Male 1
Female 2

2-Where did you obtain your teacher qualification?
3 years Teacher college 1
4 years Teacher college 2
Faculty of Education 3
Other............. 4

3- How many years teaching experience do you have?
One-three years 1
Three-five Years. 2
Five-Seven Years. 3
Eight-Ten Years. 4
Ten years or more. 5

4- How many years have you been in your present school? [ ]

5- How many different grades do you teach this year?
One 1
Two 2
Three 3
More than three(Specify) 4

6- How many different classes do you teach this year? [ ]

7-What is the average number of students in your classes? [ ]

8- How many physics teachers are there in your schools? [ ]

9- How many students are there in your schools? [ ]

SECTION II. AWARENESS

10-Teachers receive information from a variety of sources, Please indicate the usefulness of the following sources of information about new curriculum concerning aims, content and teaching learning strategies.

	never useful	rarely useful	sometimes useful	very useful
a) senior physics teacher in your school	1	2	3	4
b) physics books other than student textbook	1	2	3	4
c) science magazines, journals, et.	1	2	3	4
d) material from schools library	1	2	3	4
e) Teacher educators	1	2	3	4
f) student-teacher on teaching practice	1	2	3	4
g) Principal	1	2	3	4
h) Radio and TV programmes	1	2	3	4

others (Specify)......................

11-Indicate your opinion about the quality of the textbook and curriculum guide concerning the following statements in accordance with the given criteria.

	Completely inadequate	Fairly inadequate	Fairly adequate	completely adequate	I do not know
For textbook					
appropriateness of the content for the grade.	1	2	3	4	5
the relationships of the textbook's objectives with your own priorities	1	2	3	4	5
Illustration, graphs, et.	1	2	3	4	5
suggested activities	1	2	3	4	5
overall impression	1	2	3	4	5
other (specify)........................					
For Curriculum Guide					
comprehensibility of aims and contents	1	2	3	4	5
the relationships between aims and suggested implementation methods	1	2	3	4	5
Practicability of suggested activities in your school context.	1	2	3	4	5

12-Please indicate your assessment of the importance of each of the following objectives in physics teaching.

	No importance	of little importance	fairly importance	very important	I do not know
a) Understanding scientific facts, concepts laws,principles	1	2	3	4	5
b) Developing basic science process skills (formulating hypothesis, obtaining data)	1	2	3	4	5
c)Developing integrated science process skills.	1	2	3	4	5
d) Understanding the way that scientific knowledge develops	1	2	3	4	5
e) Understanding practical application of physics	1	2	3	4	5

SECTION III. TRAINING.

13-How helpful has your faculty or college education been to you as a physics teacher in regard to the following areas?

	No help	little help	some help	much help	I do not kno
a)Acquiring scientific facts, concepts, principles, laws	1	2	3	4	5
b)Acquiring basic science process skills.	1	2	3	4	5
c) Acquiring integrated science process skills.	1	2	3	4	5
d) Acquiring skills on lesson planning	1	2	3	4	5
e) Acquiring teaching skills.	1	2	3	4	5

14-Please, rate the value of each of the following experience with regard to the contribution to your work as a physics teacher.

	Completely useless	Fairly useless	Fairly useful	Very useful
a) Formal meeting with other physics teachers.	1	2	3	4
b) Informal meeting with colleagues	1	2	3	4
c) Workshops presented by regional in-service organisation	1	2	3	4

15-Has an In-Service programme for physics teaching-learning taken place in your region?

Yes 1
No 2

16-Have you attended an In-Service Programme for physics teaching-learning either regional or national level.

Yes 1
No 2

17-How effective was the In-Service programme
(Answer this question if you attended)

Completely ineffective 1
Fairly ineffective 2
Fairly effective 3
Very effective 4

18-How much In-Service programme per year do you feel you require in order to cope with the new physics programme.

None 1
3-5 Hours 2
15-20 Hours 3
An intensive one term refresher course 4

19-If you feel you require to take an In-Service course indicate the possible content of the course which you need.

....
....
....

SECTION IV. IMPLEMENTATION.

20-In preparing your daily and year plan to what extent do you consider the following sources in regard to the objectives, content and teaching-learning methods.

	none	little	much	very much
a)Curriculum guide	1	2	3	4
b)Student textbook	1	2	3	4
c)Other sources..(specify).				

21-This question is related to the physics teaching-learning strategies you are using in your classroom. How often do you use the following strategies in your classroom. Indicate your answer in accordance with the given criteria.

	Never Used	Seldom Used	Often Used	Very often Used
a) Teacher Oral Explanation.	1	2	3	4
b) Practical teacher explanation	1	2	3	4
Written teacher explanation.	1	2	3	4
d) Question & answer type teacher-led discussion.	1	2	3	4
e) Question & Answer type student-led discussion.	1	2	3	4
f) Individual practical work.	1	2	3	4
g) Group practical work	1	2	3	4
h) Student written work in the in the classroom.	1	2	3	4

22-In preparing your class test to what extent do you consider the following sources.

	none	little	much	very much
a) objectives in the curriculum guide	1	2	3	4
b) questions in the student textbook	1	2	3	4
c) question asked in the university entrance examination.	1	2	3	4
d) Other (Specify)..........				

23-Please choose the statement that most likely applies to your situation.
In general I implement my physics courses-

in a laboratory or special designed physics room	1
in a classroom with occasional access to a laboratory	2
in a classroom with facilities for demonstration only	3
in a classroom with no special facilities for physics	4

24-Which statement most likely apply to your situation regarding equipment and supplies for physics teaching.

There are ample equipment for student use	1
There is outdated equipment for students use	2
There is adequate equipment for student use	3
There is virtually no physics equipment	4
There is adequate audio-visual equipment	5

25-Overall, how do you rate the quality of the facilities and equipment available to you for physics teaching-learning.

very poor	1
poor	2
Satisfactory	3
Good	4
Excellent	5

SECTION V. EVALUATION.

26-How effective do you feel your teaching is in enabling students to achieve each of the following objectives?

	Very ineffective	Fairly ineffective	Fairly effective	Very effective	Not an objective
a) Understanding scientific facts, laws, principles.	1	2	3	4	5
b) Understanding practical application of physics	1	2	3	4	5
c) Developing basic science process skills	1	2	3	4	5
d) Developing integrated science process skills	1	2	3	4	5
e) Understanding the way that scientific knowledge is develop	1	2	3	4	5

27-Please rate the importance of the following areas as representing obstacles to the achievement of intended objectives.

	No importance	of little importance	fairly important	very important	I do not know
Curriculum Guidelines	1	2	3	4	5
Textbook	1	2	3	4	5
Physical facilities and equipment	1	2	3	4	5
Class size	1	2	3	4	5
Time allocation for the lesson	1	2	3	4	5
Communication with colleagues	1	2	3	4	5
Students' interests and abilities	1	2	3	4	5
My Pre-Service education	1	2	3	4	5
My In-Service education	1	2	3	4	5
Other (specify)..................					

APPENDIX V STUDENTS' QUESTIONNAIRES

STUDENTS' PERCEPTION OF PHYSICS TEACHING-LEARNING ACTIVITIES

1 Often used

2 Sometimes Used

3 Never used

1- We use sources other than student textbooks	1	2	3
2- Teacher makes physics interesting for us	1	2	3
3- We feel free to ask questions	1	2	3
4- We copy teacher's notes from blackboard	1	2	3
5- Teacher does demonstration	1	2	3
6- We do laboratory work as indicated in the textbook	1	2	3
7- Teacher follows lesson according to textbook	1	2	3
8- Teacher tests us on what he/she taught	1	2	3

STUDENTS' ATTITUDES TOWARDS PHYSICS TEACHING-LEARNING

Scales: 1- Strongly agree
2- Agree
3- Uncertain
4- Disagree
5- Strongly disagree.

1- I find physics challenging	1	2	3	4	5
2- Physics is enjoyable	1	2	3	4	5
3- I am bored most of the time in physics	1	2	3	4	5
4- There are many facts I do not like	1	2	3	4	5
5- I generally dislike my physics work	1	2	3	4	5
6- Physics is an enjoyable school subject	1	2	3	4	5
7- Physics taught in school is interesting	1	2	3	4	5
8- Physics is a difficult subject	1	2	3	4	5
9- Physics is a difficult subject when it involves calculations	1	2	3	4	5
10- Physics is a difficult subject when it involves laboratory work	1	2	3	4	5
11- There are too many facts to learn in physics	1	2	3	4	5

APPENDIX VI OBSERVATION SCHEDULE

TEACHER'S NAME:
NAME OF SCHOOL:
DATE:
GRADE LEVEL:
TITLE OF LESSON:

A C T I V I T I E S									COMMENTARY	
Teacher Explanation			Questions		Problem Solving		Other		level of organization; number of active students; quality of discussion; unusual teaching methods	
written	oral	dictation	student	teacher	student	teacher				Time (Min)
										3
										6
										9
										12
										15
										18

✓✓ A Major Activity in Period (>50 of Time)
✓ A Minor Activity in Period (<50 of Time)

Appendix VII

ITEMS RELATED TO INTERVIEWS

1- How do you view the curriculum innovation process regarding dissemination aspects?

2- To what extent do pre- and in-service education prepare you for teaching physics in the your classroom?

3- What are your views about the practicality of the teaching activities suggested by the Ministry of Education?

4- What are the main difficulties that as a physics teacher you encounter in the implementation of the physics curriculum?

5- What is your rationale for choosing teaching activities?

6- Do you use innovative and unique teaching activities?
Can you tell me the factors that underline your choice?

7- Do you think that the type of activities you use in your classroom are consistent with the intentions of the Ministry of Education?

8- What are your suggestions for remedial changes in the teaching-learning process of the physics subject?

APPPENDIX VIII OFFICIAL PERMISION TO CARRY OUT THE RESEARCH IN THE SCHOOLS OF BLACK-SEA REGION OF TURKEY

T.C.
MİLLİ EĞİTİM BAKANLIĞI
Yurtdışı Eğitimi ve Dışilişkileri
Genel Müdürlüğü

SAYI : 360/İngiltere 92. Egt. Ögr.-36 16.01.92* 450

KONU : Alipaşa Ayaş, Salih Çepni,
Ali Rıza Akdeniz'in
Araştırma İsteği.

ANKARA

T.C. LONDRA BÜYÜKELÇİLİĞİ
EĞİTİM MÜŞAVİRLİĞİNE

İLGİ: 5.12.1991 tarih ve 22.91.4094 sayılı yazınız.

Karadeniz Teknik Üniversitesi Fatih Eğitim Fakültesi Fen Bilimleri Eğitimi Bölümünden mezun olan ve Yüksek Öğretim Kurulu tarafından Yüksek Lisans-Doktora öğrenimi görmek üzere yurtdışına gönderilen Alipaşa AYAS, Ali Rıza AKDENİZ ve Salih ÇEPNİ'nin 1991-1992 öğretim yılı içerisinde Samsun veya Trabzon illerinde Fen Bilgisi, Kimya ve Fizik derslerini izlemek istediklerine dair Ortaöğretim Genel Müdürlüğüne hitaben yazmış olduğunuz ilgi'de kayıtlı yazı incelenmiştir.

Konuyla ilgili olarak; Alipaşa AYAS ve Ali Rıza AKDENİZ'in Trabzon İli ile istedikleri tarihlerde, Salih CEPNİ'nin ise 1991-1992 öğretim yılının 2.döneminde ve birinde veya bu liselerin hepsinde araştırma yapmaları Bakanlığımızca uygun görülmüştür.

Bilgilerini ve gereğini rica ederim.

BAKAN ADINA

Ülkü BİLGEN
Genel Müdür

NOT: Verilecek karşılıklara desimal dosya numarası ile yazınızın şube, gün ve sayısının bildirilmesi.
TEL:

T. C.
KARADENİZ TEKNİK ÜNİVERSİTESİ
FATİH EĞİTİM FAKÜLTESİ DEKANLIĞI

Sayı : Per.işl.B.30.2.KTÜ.0.36.00.00.200.1/379

Konu : Arş.Gör.A.Rıza AKDENİZ

Trabzon

17.02.1992

MİLLİ EĞİTİM MÜDÜRLÜĞÜNE
(TRABZON-RİZE-GİRESUN-ORDU-ARTVİN)

Fakültemiz Fen Bilimleri Eğitimi Bölümü Fizik Anabilim Dalı Araştırma Görevlisi Ali Rıza AKDENİZ, doktora çalışmasını sürdürdüğü İngiltere Southampton dan Dekanlığımıza gönderdiği 04.02.1992 tarihli dilekçesi ile doktora konusu ile ilgili Türkiye'deki 1991-1992 öğretim yılı içinde orta dereceli okullarda Fizik derslerinin eğitim ve öğretim uygulamaları hakkında araştırma yapma, bilgi toplama olduğu ve bu çalışması için de Doğu Karadeniz Bölgesi'ni seçtiği, konu hakkında Müdürlüğünüzden izin alınması gerektiğini bildirmiştir.

Makamınızca uygun görülmesi halinde adı geçen araştırma görevlimize yardım ve kolaylık gösterilmesini saygılarımla rica ederim.

S. Özden

Prof.Dr.Seçkin ÖZDEN
DEKAN

DAĞITIM :

1-Milli Eğitim Müdürlüğüne/TRABZON
2-Milli Eğitim Müdürlüğüne/RİZE
3-Milli Eğitim Müdürlüğüne/GİRESUN
4-Milli Eğitim Müdürlüğüne/ORDU
5-Milli Eğitim Müdürlüğüne/ARTVİN

Telefon : (Santral) - 81000 Telefax 82550