UNIVERSITY OF SOUTHAMPTON

FACULTY OF PHYSICAL SCIENCES AND ENGINEERING

Electronics and Computer Science

The Impact of Integrating MOOCs into Campus Courses on Student Engagement

By

Fadiyah Muwaffaq Almutairi

Thesis for the degree of Doctor of Philosophy in Computer Science

February 2018

Dedicated To

My parents

My husband,

My three children

WITHOUT WHOM THIS WORK WOULD NOT HAVE BEEN POSSIBLE

UNIVERSITY OF SOUTHAMPTON

ABSTRACT

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This thesis examines the impact of integrating elements of Massive Open Online Courses (MOOCs) into the on-campus learning of Saudi women's higher educational institutions. It also explores and identifies patterns of student engagement in a blended MOOC design.

MOOCs are courses which are delivered, usually by leading universities, with the promise of providing free, high-quality education to a limitless number of learners. In a 'blended' course design, instructors can integrate MOOC content with face-to-face educational activities and components. Thus enabling them to use lecture time to conduct meaningful discussions, to identify and clarify misconceptions, or to mentor students in group projects. The current study seeks to improve the general understanding of the impact of blending MOOC systems into Saudi women's higher education, with emphasis on student engagement.

A preliminary study was conducted to develop a model that could help measure student engagement in the context of a blended-MOOC. Three well-established existing frameworks — the National Survey of Student Engagement (NSSE), the UK Engagement Survey (UKES), and the Student Engagement Questionnaire (SEQ)— were combined into a single model. The model has nine indicators which provide information about distinct aspects of student engagement. This model was confirmed by a panel of thirty-five expert practitioners. A trial evaluation using the model was carried out on thirteen students who had participated in a course that had adopted a blended-MOOC format.

Subsequently, a counterbalanced, within-subjects experimental design was used to identify any statistically significant differences in the impact on student

engagement between the face-to- face learning and blended-MOOC approaches. A fourteen-week experiment took place at three different Saudi women's universities' "Intro to Artificial Intelligence" courses. A total of one hundred and eight participants were divided into two groups; both groups being administered the same treatments, albeit in a different order.

The confirmed model, interviews with lecturers, as well as the researcher's reflections and notes were all used in order to assess the change in student engagement. The results of the study reveal that students who were exposed to the blended-MOOC design became more engaged with relation to some of the NSSE's indicators, including: reflective & integrative learning, higher-order learning, collaborative learning, and learning strategies. No statistically significant evidence of a positive effect was found in student engagement in terms of student-faculty interactions. The study also shows that there is a positive correlation between time spent using the MOOC system and the model's engagement indicators. In other words, the more the students used the MOOC system for educational activities, the more they engaged in their learning process.

This research contributes to the literature by developing a model for measuring student engagement within a blended-MOOC context and conducting an experimental study for the purpose of examining the impact of integrating elements of MOOCs into campus-based study.

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Declaration of authorship

I, Fadiyah Almutairi declare that this thesis entitled 'The Impact of Integrating MOOCs into Campus Courses on Student Engagement' and the work presented in it are my own and have been generated by me as the result of my own original research. I confirm that:

1. This work was done wholly or mainly while a candidature for a research degree at this University;
2. Where any part of this thesis has previously been submitted for a degree or any other qualification at this University or any other institution, this has been clearly stated;
3. Where I have consulted the published work of others, this is always clearly attributed;
4. Where I have quoted from the work of others, the source is always given. With the exception of such quotations, this thesis is entirely my own work;
5. I have acknowledged all main sources of help;
6. Where the thesis is based on work done by myself jointly with others, I have made clear exactly what was done by others and what I have contributed myself;
7. Parts of this work have been published as:

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Glossary of terms

AI	Artificial Intelligence
ANOVA	Analysis Of Variance
BM	Blended MOOC
BMSE	Blended-MOOC Student Engagement
CCTV	Closed Circuit Television
CLASSE	Classroom Survey of Student Engagement
CSEQ	College Student Experiences Questionnaire
F2F	Face to Face
GPA	Grade Point Average
KKU	King Khalid University
LMS	Learning Management System
MOOC	Massive Open Online Course
NCeDL	National Centre for E-Learning and Distance Learning
NSSE	National Survey of Student Engagement
SCEQ	Student Course Engagement Questionnaire
SE	Student Engagement
SEI	Student Engagement Index
SEQ	Student Engagement Questionnaire
SPSS	Statistical Package for Social Sciences
TU	Taif University
UKES	UK Engagement Survey

Chapter 1. Introduction

The development of MOOC (Massive Open Online Course) has gained a considerable amount of public attention since the Stanford MOOC first launched in the autumn of 2011. MOOCs are online courses predominantly produced by elite universities with the promise of providing free, high-quality education to an unlimited number of learners (Johnson et al., 2013; UK Universities, 2013; Zhang, 2013).

They offer an opportunity for a blended course design, where MOOC content and materials integrated into on-campus courses (Bruff et al., 2013; Martin, 2012). This enables instructors use lecture time for activities, such as having meaningful discussions, identifying and clarifying misconceptions, or mentoring students whilst they are conducting a group project (Chen, 2013).

This kind of blended learning has been given different names by various academicians, including the "distributed flip" (Caulfield et al., 2013), the blended/hybrid model (Bruff et al., 2013; Griffiths et al., 2014; Holotescu et al., 2014), and the blended MOOCs (LaMartina, 2013; Israel, 2015). MOOCs themselves have also evolved to blend the use of social networking tools in order to further stimulate engagement and interactions between learners.

The use of MOOC systems in blended contexts has the potential of influencing higher education in a variety of ways:

1. For students, the systems can influence and shape or structure their approaches to learning and may stimulate communication amongst the members of the class;
2. For educators, MOOCs may assist the development and selection of online resources and change traditional teaching practices;
3. For institutions and researchers, MOOCs can provide large data sets which can be analysed and used to investigate the processes of learning and learner behaviour more deeply.

If MOOC systems are changing teaching practices and campus learning environments, it is reasonable to assume that they are also affecting the way students engage with their courses. In spite of this possibility, very little is known about how blending MOOCs with campus courses influences student engagement.

This study responds to the need to investigate the impact of MOOC systems on student engagement in higher education by exploring patterns of student engagement in blended MOOC contexts.

This study was undertaken by an academic from Saudi Arabia. Therefore, a further motivation for undertaking this research was that of exploring how such interventions may impact and potentially improve learning experiences within Saudi women's higher education.

Saudi women's higher education was selected as a context study for a number of reasons. The Saudi higher education system is gender-segregated. Because of this separation, female students may not necessarily receive the same quality of education as their male counterparts seeing as there is, at the time of writing, a current shortage of well-qualified female instructors for such students (Al-Rasheed, 2014; Alhareth et al., 2015).

Furthermore, there has been a statistically significant increase in the number of Saudi women graduating from secondary school every year (Alhareth et al., 2015). The growth in the number of students, along with the lack of female instructors, has led to an excess in demand. This may, in turn, compromise and negatively affect the quality of student learning at Saudi women's universities (Betts et al., 2003; Ferguson and Womack, 1993; Wayne and Youngs, 2003; Klitgaard and Hall, 1975; Murnane and Phillips, 1981).

A number of studies have evidenced the potential gains which can arise from blending MOOCs into the classroom (Griffiths et al., 2014; Bruff et al., 2013; Caulfield et al., 2013; Holotescu et al., 2014; Freihat and Zamil, 2014; Firmin et al., 2014). These studies, situated in a variety of different educational contexts, indicate that blending MOOCs can enhance learning experiences and improve learning outcomes.

Participation in MOOCs may have the potential to:

1. Enrich learning and provide a greater level of participation to students which may, in turn, enhance the overall learning experience since it has the potential of broadening the number of contributory lectures and resources.
2. Offer the opportunity of effectively bringing in visiting lecturers at no additional cost while also preserving the local social norms of how once should approach education. In this case, not only may students become more engaged because of it, but also academics may find that it contributes to their continuing professional development.

3. Provide a great opportunity for campus students to meet and communicate with a heterogeneous mix of learners with different backgrounds and different levels of prior knowledge.

This study investigates whether it is possible to emulate such gains by integrating MOOCs into the different campuses and cultural contexts of courses run by education faculties in Saudi Arabian women' s universities. The current study examines how integrating MOOC materials into campus courses may affect student engagement in Saudi women' s higher education. It also identifies the engagement patterns of Saudi students studying in blended-MOOC settings.

1.1 Statement of the Problem

Previous studies investigate how integrating MOOC resources into campus courses affects a variety of different learning outcomes, including grades (Pérez-Sanagustín et al., 2016; Griffiths et al., 2014; Najafi et al., 2014; Freihat and Zamil, 2014), student satisfaction (Griffiths et al., 2014; Bruff et al., 2013), and skills improvement (Freihat and Zamil, 2014; Griffiths et al., 2014; Pérez-Sanagustín et al., 2016; Cornelius et al., 2017). So far, very little attention has been paid to what impact the blended-MOOC course design may have on student engagement.

The calibration of student engagement has been considered to 'be one of the better predictors of learning and personal development' (Carini et al., 2006, p.2). The internationally recognised National Survey of Student Engagement (NSSE)[1] defines student engagement as 'the time and energy students devote to educationally sound activities inside and outside of the classroom, and the policies and practices that institutions use to induce students to take part in these activities' (Kuh 2003, p. 25).

The concept has been positively associated to a variety of positive and desirable learning outcomes, including:

- critical thinking and personal development (Endo and Harpel, 1982; Kuh and Vesper, 1997; Pike, 1999, 2000; Pascarella, 1983; Pascarella et al., 1996);
- cognitive development (Kuh, 1995, 1993; Anaya, 1999; Astin, 1993; Pascarella and Terenzini, 2005);

[1] The NSSE survey, launched in 2000 and updated in 2013, assesses the extent to which students engage in educational practices associated with high levels of learning and development.

- psychosocial development (Badura et al., 2000; Chickering and Reisser, 1993; Harper, 2004; Evans et al., 1998);
- improved grades (Astin, 1977, 1993; National Survey of Student Engagement, 2002);
- student satisfaction (Kuh and Vesper, 1997; Kuh et al., 2008, 2005, 2011)
- and student persistence (Astin, 1975, 1984, 1993; Bean, 2005; Berger and Milem, 1999; Pascarella and Terenzini, 2005).

Student engagement is a reliable proxy for student learning, as it 'comes close to providing necessary and sufficient information about student learning' (Coates 2005, p. 32).

The NSSE instrument has been used directly or modified and customised in many different contexts and settings (Buckley, 2013). This study used most of the NSSE[2] indicators, along with some indicators from the UK Engagement Survey (UKES) and Coates's (2006) Student Engagement Questionnaire (SEQ)[3] for the purpose of addressing the following research questions:

> RQ1) How does integrating MOOCs into campus courses affect student engagement in Saudi women's higher education?
>
> RQ2) What indicators can be used to measure student engagement in a blended-MOOC course design?
>
> RQ3) What are the relationships between student engagement indicators and time spent in MOOC systems?
>
> RQ4) Are particular patterns (e.g. similarities or differences) in engagement evident when the behaviours of students in blended-MOOCs are classified based on institution?

1.2 Procedure

This study has two main phases: the preliminary study and the experimental study. The aim of the preliminary study was that of developing a model for assessing student engagement in the blended MOOC context. The model has nine indicators for measuring student engagement. Those indicators were drawn from the well-established NSSE, the UKES, and the SEQ.

The use of this model was confirmed quantitatively by a panel of thirty-five expert practitioners. Subsequently, a trial evaluation using the model was

[2] http://nsse.indiana.edu - explained more in Chapter 3.
[3] Coates, Hamish. Student engagement in campus-based and online education: University connections. Routledge, 2006. – explained more in Chapter 3.

conducted with thirteen students from the University of Southampton who had taken a course based on the blended-MOOC format during the 2015/16 academic year.

After confirming the validity of the model, an experimental study, using a counterbalanced, within-subjects design, was carried out in order to examine whether there was a statistically significant difference between how the face-to-face and blended-MOOC learning approaches affect student engagement.

The fourteen-week study took place during the 2016/17 academic year at three different Saudi women's universities' blended-MOOC "*Intro to Artificial Intelligence*" courses[4]. There were one hundred and eight participants who were divided into two groups, with both groups being administered the same treatments, albeit in a different order (during the first seven weeks of the course, group one was taught in a face-to-face fashion, whereas they were taught via the blended-MOOC method during the last seven weeks; the second group, on the other hand, received the same treatments, but in the reverse order, with the blended-MOOC method being administered to them during the first seven-week period and the face-to-face method being administered during the second). The confirmed model, the interviews with lecturers, as well as the researcher's reflections and notes were all used in order to assess the change in student engagement.

1.3 Organisation of the Thesis

This thesis is split into nine chapters. These chapters are broken down as follows:

Chapter 1 Introduction: The current chapter provides a general introduction to the topic of this research which briefly describes (a) the problem which the thesis will focus on, (b) the methodology adopted for the study, and (c) the organisation of the thesis.

Chapter 2 The Study Context: The chapter presents general information regarding the context of the study, including the state of Saudi women's higher education, as well as the educational technologies they use for their courses.

Chapter 3 Literature Review: The chapter provides an overview of the relevant literature regarding the concept of MOOCs, blended MOOCs, and student engagement. It reviews the different measurement methodologies used to gauge

[4] These courses were offered over the UDACITY platform by two well-qualified instructors and involved 113,380 registered learners.

student engagement, as well as studies which had examined student engagement in blended learning contexts, particularly on blended-MOOCs.

Chapter 4 A Model of Student Engagement in the Context of the Blended-MOOC: The chapter relates the designing of a model for measuring student engagement in the blended-MOOC context.

Chapter 5 A Preliminary Study: The chapter discusses the preliminary study which was conducted in order to confirm the proposed model.

Chapter 6 Methodology: The chapter describes the research methodology and methods used in the experimental study.

Chapter 7 Results and Findings: The chapter presents the results and findings which were drawn from the quantitative and qualitative methods used in the experimental study.

Chapter 8 Discussion: The chapter provides an in-depth discussion regarding this study's findings and results.

Chapter 9 Conclusion: The chapter summarises the research's findings and proposes ideas for further research.

Chapter 2. The Context of the Research

Most existing studies of MOOCs have been conducted in English-speaking nations which have rather different educational and cultural systems to the context of the current study. Therefore, this chapter attempts to provide readers with information about the context of this study. It first presents a general background and then goes on to discuss Saudi higher education, with a particular focus on women's higher education. Gender-segregation and women's positions at such institutions are primarily examined in this chapter because this research focuses on Saudi women's higher education.

The chapter also describes the projects which have already been implemented in Saudi Arabia, including e-learning, blended learning, and MOOCs (though, when discussing MOOCs, other Arab countries are also examined). Finally, it examines some challenges which face women's higher education.

2.1 Background

Saudi Arabia is the birthplace of Islam and the home of the two holy sites for Muslims, Makkah and Medina. The official language of the country is Arabic; English is also widely spoken throughout the country. Indeed, it is often used in business and is even a compulsory second language taught at schools. The kingdom has thirteen administrative regions, with each region having a number of governorates. Riyadh City is the capital of Saudi Arabia. The area of Saudi Arabia is around 2,250,000 square kilometres (868,730 square miles) and it has a population of 32,817,435[5] (2017 August).

Saudi Arabian culture has been greatly influenced by being the home of Islam. Cultural and social norms, such as sex segregation, influence every aspect of life, including education. Schools and universities are gender-segregated — namely, women are taught in segregated spheres where men cannot come into contact with them. There is no direct interaction between female and male students; women are served and taught by female staff. In some cases, though, women are taught by male lecturers, albeit through closed-circuit TV.

[5] http://www.worldometers.info/world-population/saudi-arabia-population/ (accessed in 18th August 2017).

The next section provides an overview of the Saudi higher education system, with an emphasis on women's status in that system.

2.2 Higher Education in Saudi Arabia

A real interest in education in Saudi Arabia began after the discovery of oil in the country in 1938.

- In 1954, the Ministry of Education was founded, though schools were only open to boys.
- In 1957, the first Saudi university was established.
- In 1960, important steps were taken to expand the educational opportunities of all Saudi citizens, including females, with the first schools for girls being opened in the same year (Alamri, 2011).
- By the mid-1970s, approximately half of all Saudi girls were educated in schools. Five years later, education and higher education were available to all Saudi girls (AlMunajjed, 2009).
- In 2005, the *Afaq* project (*Afaq* is an Arabic term which means "horizons") was launched to establish a future plan for higher education in the Kingdom of Saudi Arabia, increase educational opportunities for women, and boost scientific research (Minisrty of Higher Education, 2010).

Education continues to receive the largest share of the Saudi budget. In 2014, for example, the government allocated fifty-six billion US dollars to education and training[6] (i.e. twenty-five per cent of their total spending). The Saudi government has made substantial efforts to ensure that women have full and equal access to basic education for the purposes of achieving gender equality. The Saudi government also provides Saudi students allowances during their years of study as an incentive for them to enrol in tertiary educational institutions. Furthermore, on 7 September, 2000, Saudi Arabia signed and ratified the Convention on the Elimination of All Forms of Discrimination against Women (CEDAW) with some reservations to promote gender equality, and to ensure women's equal access to education (Blanchfield, 2012; Islam, 2014).

The kingdom of Saudi Arabia has twenty-six government-run universities and ten private universities distributed all over the country (see Table 2-1[7]). All the

[6] http://www.us-sabc.org/custom/news/details.cfm?id=1541#.VDg9tPldXK0 (accessed in January 2015).
[7] https://www.moe.gov.sa/en/HigherEducation/governmenthighereducation/StateUniversities/Pages/Introduction.aspx (accessed in January 2015).

universities are connected to the Ministry of Education but, nevertheless, are given a considerable degree of administrative and academic independence.[8]

Table 2-1: Saudi Universities

Region	University	Year	City	Type
Riyadh	King Saud University	1957	Riyadh	Public
	Al-Imam Mohammad bin Saud Islamic University	1974	Riyadh	Public
	Arab Open University	2002	Riyadh, Jeddah, Dammam, AlAhsaa, AlMadinah, Hail	Private
	Prince Sultan University	2000	Riyadh	Private
	Dar Al-Uloom University	2005	Riyadh	Private
	Al-Faisal University	2007	Riyadh	Private
	King Saud bin Abdul-Aziz University for Health Sciences	2005	Riyadh	Public
	Al-Ymamah University	2004	Riyadh	Private
	Princess Nora Bint Abdul-Rahman University	2007	Riyadh	Public (Female only)
	Saudi Electronic University	2011	Riyadh	Public
	Shaqra University	2010	Shaqra	Public
	Sattam Bin Abdul-Aziz	2010	AlKharj	Public
	Al-Majma'ah University	2010	AlMajma'ah	Public
Makkah	King Abdul-Aziz University	1967	Jeddah	Public
	Effat University	1999	Jeddah	Private (Female only)
	Dar Al-Hekma University	1999	Jeddah	Private
	University of Business and Technology	1996	Jeddah	Private
	University of Jeddah	2014	Jeddah	Public
	Umm Al-Qura University	1967	Makkah	Public

[8] http://www.mohe.gov.sa/en/studyinside/Government-Universities/Pages/default.aspx (accessed in January 2015).

	Taif University	2003	Taif	Public
	King Abdullah University of Science and Technology	2009	Thwal	Public
Eastern	University of Dammam	2010	Dammam	Public
	King Faisal University	1975	Al-Ahsa	Public
	King Fahad University for Petroleum and Minerals	1963	AlDahran	Public (Male only)
	Prince Mohammad University	2006	AlKhobar	Private
Almadina	Islamic University	1961	AlMadina	Public (Male only)
	Taibah University	2003	AlMadina	Public
Asir	King Khalid University	1999	Abha	Public
AlQassim	Qassim University	2004	Burydah	Public
AlJouf	AlJouf University	2005	AlJouf	Public
Jazan	Jazan University	2006	Jazan	Public
Hail	University of Hail	2005	Hail	Public
AlBaha	AlBaha University	2006	AlBaha	Public
Tabuk	Tabuk University	2006	Tabuk	Public
	Fahad Bin Sultan University	2003	Tabuk	Private
Najran	Najran University	2006	Najran	Public
Northern Border	Northern Border University	2007	Arar	Public

2.2.1 Women's Higher Education in Saudi Arabia

Saudi women's higher education was first introduced in 1962 in Riyadh by means of a special programme called ENTSAB, with education being provided off-campus, with the sole exception being when they had to take exams. In 1967, not only did King Abdul-Aziz University begin permitting women to attend courses on-campus but also the Girls Education College was established in Makkah. Since that time, more institutions have been established by the Ministry of Education (Alaugab, 2007).

Nowadays, all Saudi universities accept women — with the two only exceptions being the University of Petroleum and Minerals and the Islamic University. One of the universities which accepts women to attend their courses is the Princess Nora Bint Abdul Rahman University. That university is a large governmental university which admits only women. It can now accept up to 40,000 female students, though it plans to accept more in the future (Alhareth et al., 2015).

Furthermore, it offers a number of science courses which were previously limited only to male students.

The Saudi government has continued to make investments in higher educational programmes, and women's higher educational opportunities have continued to increase. Today, Saudi women can study both at home and abroad. During the 2011/12 academic year, for example, there were 35,700 female students who studied abroad, compared to only 3,879 during the 2004/2005 academic year (Alhareth et al., 2015).

Having proffered this brief overview of the state of higher education in Saudi Arabia, the next section shall examine the state of e-learning in the country.

2.3 E-Learning in Saudi Arabia

Saudi Arabia has developed the National Centre for E-Learning and Distance Learning (NCeDL) Project with the aim of becoming more competitive with international leaders in the area of e-learning research, development and implementation (Al-Asmari and Rabb Khan, 2014). The centre has initiated a number of projects, including:

- **TAJSEER:** The TAJSEER is an NCeDL project under the supervision of the Ministry of Education. The initiative is considered to be *'the educational portal for e-learning and distance learning'* in Saudi Arabia (Al-Fahad 2009, p. 112). It aims at supporting tertiary institutions and assists them in deploying the most recent e-learning technologies and applications.
- **JUSUR,** which is a Learning Management System (LMS), has been designed by the centre to manage the processes and activities of e-learning in Saudi Arabia.
- **Award of Excellence:** An award given by the NCeDL to creative projects in the field of e-Learning and distance learning.
- **MAKNAZ** (Learning Objects Repository), The MAKNAZ is a digital repository system that can be used for storing, managing, and sharing learning resources (learning objects). Those learning resources can be files, images, presentations, videos, etc.
- **TAISEER:** A collection of services provided by the NCeDL for the purpose of fostering higher educational institutions and staff to use JUSUR and other e-learning technologies in their teaching practices and in their interactions with students. (Al-Fahad, 2009) [9]

[9] http://www.elc.edu.sa/portal/?q=en/node/339 (accessed in January 2015)

2.4 Blended Learning in Saudi Arabia

The first use of blended learning in Saudi Arabia was implemented in October 2007 by King Saud University when it developed a "transitory programme" for its College of Applied Studies and Community Services (CASCS). This programme aimed to provide an opportunity to enhance students' GPA up to the point where they could pursue higher education. Another aim of the programme was to address the swift growth of student applicants. The transitory programme offered five introductory courses accredited by their relevant departments. Those five blended courses were: two Islamic studies courses (101 IS and 102 IS), two Arabic language courses (101 AL and 103 AL), and one introductory English course (101 ENG). 70% of these courses' contents were offered online, while the rest (30%) were offered on-campus. Their online instruction was composed of five elements: announcements, assignment submission, online quizzes, lecture notes, and online discussions (Alebaikan, 2010). Later, in 2009, King Khalid University adopted a Five-Year Strategic Plan for developing more blended courses in order to enhance its quality of education.

The NCeDL made great efforts to provide rich multimedia materials which would allow lecturers to incorporate e-learning in their lectures. The Ministry of Education has also shown a great interest in adopting blended course designs as, more recently, a conference was held on 21 November, 2017, in Riyadh to discuss the ways with which to expand the use of blended learning formats within Saudi higher education. The conference involved a set of sixty experts from different backgrounds. It is, therefore, expected that, in the foreseeable future, more colleges will adopt the blended model[10].

Blended learning provides a more flexible learning environment, especially for female students, who usually experience greater stress from family responsibilities, as well as for workers (both male and female), seeing as they would not have to be present at every face-to-face session.

[10] http://www.spa.gov.sa/1690459 (accessed in 18th December 2017)

2.5 MOOCs in Saudi Arabia and Arab countries

In September 2013, Saudi entrepreneur Fouad Alfarhan with his colleagues launched an Arabic MOOC platform, called "Rwaq" that offers courses in various subjects and fields. The platform has attracted tens of thousands of learners since its launch. They worked with professors and lecturers who would donate their time to develop a free course, while the platform covered the cost of video production and publication.

One of those professors is Dr. Maha bint Abdullah AlSinan, who commended the Prize and Grant of Prince Salman bin Abdulaziz for the Arabian Peninsula Studies and Research. She offered a MOOC on "Modernism in the Visual Arts". Having a woman teacher in MOOCs is simply normal, Alfarhan says. He also notes MOOCs make no differentiation between a female and male as an educator (Curely, 2014).

On July 15, Saudi Ministry of Labour has partnered with edX, to launch an Arabic MOOC platform portal aimed to bridge the gap between educational and employment in the kingdom and throughout the Arab countries. The platform will include courses from edx's partners translated into Arabic along with courses offered by Saudi institutions. The first set of these online courses have begun in September 2014 as a pilot program, aimed at rural communities, women, youth and persons with disabilities (Edx, 2014).

MOOCs are not so new to the Arab world. There are a number of projects in Arab world such as:

- In November 2013, the Queen Rania Foundation has launched an Arabic MOOC platform portal with a partnership with edX, called Edraak. This Jordan platform will offer a selection of edx's courses with Arabic translation for free. Moreover, it will also develop its own Arabic courses by Arab professionals in various fields (Hazett, 2014).
- In Egypt, MOOCs aggregator (SkillAcademy) has been developed by Bassem Fayek and Zaid Marji. This aggregator worked as a MOOCs playlist with feedback.
- A new Arabic start-up "MenaVersity" has been developed in Lebanon, with the aim to offer online courses ranging from social media to Arabic cooking.

2.6 The Challenges of Saudi Women's Higher Education System

Despite the efforts of the Saudi higher education system, there are still some challenges facing women's higher education in the country:

- Recent data show the lack of female enrolment in scientific and technological fields (AlMunajjed, 2009; Islam, 2014) (see Figure 2-1). Not only is the enrolment of female students in these fields low, but some other fields, such as engineering and agriculture, remain predominantly male domains because they have only recently offered women the choice of attending those courses. For example, the first female engineering faculty at government universities opened in late 2012 with only two disciplines; viz., Electrical Engineering and Industrial Engineering. Other fields of study are restricted, depending on the university.

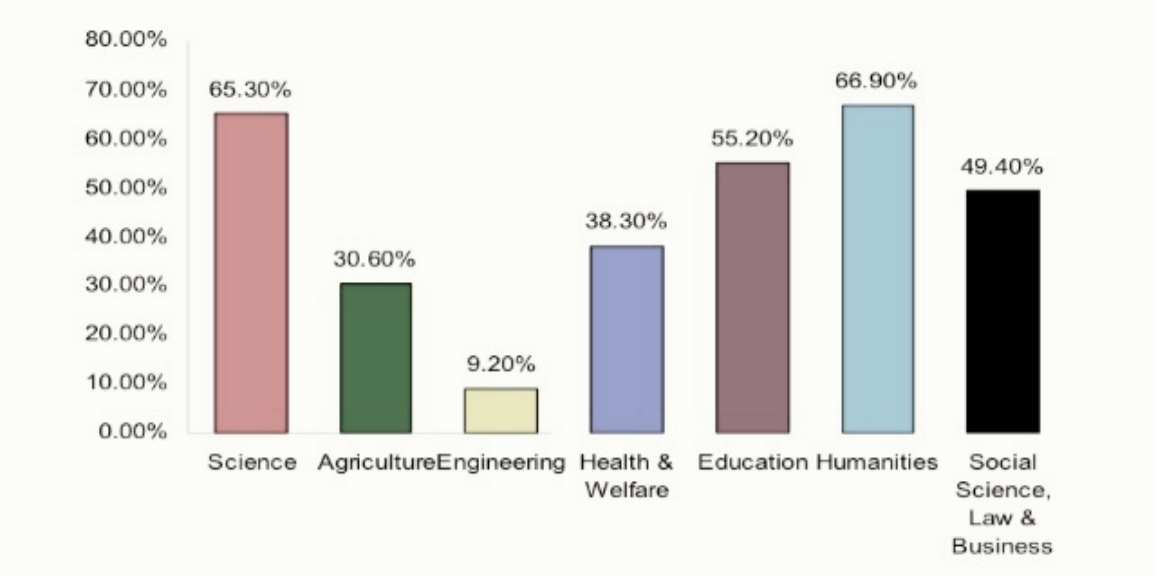

Figure 2-1: Women's share of enrolees in tertiary education in Saudi Arabia during the year 2011 by field of study (source: (Islam, 2014))

- Most universities use traditional methods of teaching in which students never play an active role. This kind of teaching requires much memorising without critical thinking or discussion (Alhareth et al., 2015). Furthermore, university students do not carry out research, usually relying on lectures for their learning (Alshubaily, 2008).
- The distribution of universities between regions, as well as the barriers of traditional culture, have limited the access to higher education for women

who live in the Southern and Northern Regions of Saudi Arabia (see Table 2-1). Alhareth et al. (2015) showed the regional disparities in opportunities to access higher education for female secondary school graduates. For instance, in 2008, seventy-three per cent of female graduates were offered places at Saudi universities, whereas only 1.4 per cent were offered places at universities in the Northern and Najran Regions of the country. This implies that some regions offer less opportunities to women for accessing higher educations than the others (e.g. Riyadh, Jeddah and Dammam).

- The proliferation of female graduates has led to a pressing demand for higher education by women. Recent data published by the Ministry of Education shows the numbers of Saudi freshmen has soared from 43,113 in 1990/91 to 293,750 in 2015/16. It should be noted that the increase in the total of female freshmen surpasses their male counterparts as the number of male students is 138,936 and the female students is 154,814[11].
  Correspondingly, the number of female lecturers teaching at Saudi universities has increased from around 4,700 in 2003/2004 to 30,893 by 2015/16 whereas the number of male lecturers has risen from about 7,200 to around 46,092 in the same period[12] (Alhareth et al., 2015).
  There is an evident lack of female lecturers, however, since the number of female students has increased and, indeed, has outnumbered the number of male students.
- Women's universities suffer from a lack of well-qualified female instructors (Al-Rasheed, 2014). Female students may not receive the same quality of education as their male counterparts because the educators for men are usually better trained. For example, in 2014, more than 20,730 men teaching at government universities held doctorates, compared to only 8,952 women[13].
  In response to this disparity, the Ministry of Education has recognised the need to formulate new programmes for teaching at the women's sections of universities. As a result, some women's universities tend to hire male instructors to lecture various courses over either TV monitors or Closed-Circuit Televisions CCTV (Hamdan, 2005; Al-Rasheed, 2014; AlMunajjed, 2009). Lecturing through a TV monitor, however, can be a distraction instead of being useful seeing as it has many drawbacks, including:
  - Technical problems: This kind of communication technology is not always trustworthy. There might be an inability to connect with students and/or a lack of clarity about the lesson; moreover, the quality of the video/audio might be below par;

[11] https://www.stats.gov.sa/ar/3218 (accessed in February 2018)
[12] https://www.stats.gov.sa/ar/413-0 (accessed in February 2018)
[13] http://www.mohe.gov.sa/ar/Ministry/Deputy-Ministry-for-Planning-and-Information-affairs/HESC/Ehsaat/Pages/default.aspx (accessed in January 2015)

- Connection stability: In the middle of an important part of a discussion or a lecture, students may be disconnected and may have to wait to be reconnected;
- A certain delay in sound/video that leads to difficulties in interacting promptly and efficiently with a lecturer;
- No video camera can capture all parts of a room at the same time. So, students might not be able to see both the board and the lecturer simultaneously.

Ultimately, strong teaching and scientific research is inevitably needed in the arena of Saudi women's higher education. Furthermore, a CCTV, TV monitor, or an online learning platform can provide remote access to the lectures yet fail to provide the richer learning experiences which female students desire (Hannah, 2014).

Next chapter provides an overview of previous research on the concept of MOOCs, blended MOOCs, and student engagement.

Chapter 3. MOOCs and student engagement

This chapter aims to examine the nature of MOOCs, as well as different types of MOOC, including blended-MOOCs. It also discusses the term "student engagement", its value to student learning, and methods of measuring student engagement in the context of higher education. The chapter also reviews some measures of engagement and studies which are concerned about student engagement within MOOCs and blended courses.

3.1 What Is A MOOC?

MOOC is considered to be a form of distance education. Distance education has been defined as 'a planned teaching/learning experience that uses a wide spectrum of technologies to reach learners at a distance and is designed to encourage learner interaction and certification of learning' (Greenberg 1998, p. 36). The term "distance education" is eponymous with its primary characteristic — that of learning whilst the student and teacher are separated by physical distance. This differentiates this type of learning from face-to-face education (Keegan, 1990).

The key benefit of this type of education (i.e. learning from a distance) could be interpreted using three different perspectives:

- **From the learner's perspective,** distance education frees students from the constraints of time, place, and pace with access to more opportunities for further learning and development;
- **From the educator's perspective,** distance education provides opportunities for teachers to enable them to acquire new skills and build their professional identities with relatively low costs without disrupting their careers;
- **From the institution's perspective,** distance education accepts a large number of students by providing learning opportunities for students who are far away from normal educational institutions at minimum costs by not requiring them to recruit more teachers or to establish new buildings and campuses.

With the widespread use of computers and the internet, as well as further advancements in technology, it has become easier to offer distance education via the internet. It was in this way that the concept of Massive Open Online Courses (MOOCs) emerged.

MOOCs is a term which was coined in 2008 by Dave Cormier and Bryan Alexander when they were trying to describe an online course (CCK08) taught by George Siemens and Stephen Downes which had succeeded a number of earlier successful Open Online Courses (OOCs) (Fini et al., 2009). This course was freely available worldwide and, at the same time, was aimed at a group of twenty-four fee-paying students. At the end of the course, there had been around 2,200 registered participants of the course, all of whom had varying levels of participation and involvement in the course (Fini, 2009; Downes, 2010).

In 2011, Sebastian Thrun and his colleagues at Stanford University offered the "*Introduction to Artificial Intelligence*" free online course. It attracted 160,000 people from one hundred and ninety countries. Since then, a wide range of both topics and platforms have been developed (Rodriguez, 2012; Yuan and Powell, 2013). The phenomena was eventually described as "*the educational buzzword of 2012*" by Daniel (2012), thus reflecting the widespread interest in this concept.

According to Bates (2014), MOOCs have four key characteristics:

> **"Massive"** refers to the number of participants. MOOCs can easily accept hundreds to thousands of learners, all of whom may be simultaneously engaged in the course.
>
> **"Open"** refers to the fact that 'anyone is free to register... [and that] [t]here are no prerequisites, other than Internet access, and [that] no fees are required' (Bond 2013, p. 29). It may also refer to many other related concepts, such as: open source; open registration; open curricula; open syllabi; open assessment; and the open learning environment (Rodriguez, 2012).
>
> **"Online"** refers to the use of the Internet and the World Wide Web for the purpose of delivering course components.
>
> **"Course"** refers to a series of lectures, readings, or other course materials with schedules and facilitators, all of which are structured and organised around a particular topic (Billington and Fronmueller, 2013; Bond, 2013; Bates, 2014).

MOOCs have been classified into two main types (Rodriguez, 2012; Daniel, 2012):

1. cMOOCs: This term was defined by Mcauley, Stewart, Siemens, & Cormier (2010, p. 4) as 'an online phenomenon ... [that] integrates the connectivity of social networking, the facilitation of an acknowledged expert in a field of study, and a collection of freely accessible online resources'. cMOOCs are based on connected and collaborative learning where learners use a public open platform to explore new pedagogies outside the classroom (Yuan and Powell, 2013). The learners in cMOOCs take on a fuller role in shaping their learning experiences than in normal online courses (Milligan et al., 2013).
2. xMOOCs) are online courses conducted in a traditional lecture format (lectures, instruction, quizzes, discussions, etc.) and delivered through proprietary Learning Management Systems (LMSs) to a massive number of learners. xMOOCs are associated generally with the four largest platform providers: edX; UDACITY; Coursera; and FuturLearn. These providers have contracted a number of prestigious educational institutions and/or individual academics to provide course content (UK Universities, 2013; Haggard, 2013).

A recent development in MOOCs has been the integration of MOOCs into campus courses in the form of blended learning (Houston, 2013; Chen, 2013; Kolowich, 2013; Sandeen, 2013). Blended-MOOCs do incorporate some face-to-face sessions, but part of the course content and activities are offered via a MOOC platform. This type of course design is discussed in the next section.

3.1.1 Blended-MOOCs as a Form of Blended Learning

Blended learning is still an evolving field and has no commonly agreed-upon definition; below are some different working definitions of blended learning:

- 'A pedagogical approach that combines the effectiveness and socialization opportunities of the classroom with the technologically enhanced active learning possibilities of the online environment, rather than a ratio of delivery modalities.' (Dziuban et al., 2004)
- 'A hybrid of classroom and online learning that includes some of the conveniences of online courses without the complete loss of face-to-face contact' (Rovai & Jordan 2004, p. 1)

Blended learning combines several different delivery modalities for the purpose of harnessing the strengths of each whilst also promoting learning. The US Department of Education published a meta-analysis of experimental and quasi-

experimental research, indicating that the blended learning approach has been shown to be more effective than both pure e-learning and traditional face-to-face learning (Means et al., 2009).

Blended learning programmes can take different forms and models. For example, in the "flipped" classroom, the typical cycle of course content acquisition is reversed so that students may acquire their first exposure to the instructional content either online or outside the classroom and then use actual class time for group projects, discussion and problem-solving.

Recently, a number of scholars have used an adapted flipped classroom model where, during outside class time, students participate in a MOOC offered by lecturers at another institution — usually from well-known and prestigious universities — and then meet in class with local instructors for the purpose of engaging in meaningful discussions, identifying and clarifying a misconception, or mentoring students in a group project. This form of blended learning has been termed as the *distributed flip* (Caulfield et al., 2013), the *blended / hybrid* model (Bruff et al., 2013; Griffiths et al., 2014; Holotescu et al., 2014), or simply as the *blended-MOOCs* (LaMartina, 2013; Israel, 2015). The last term, however, was the one which was utilised in this thesis.

Blended-MOOCs incorporate some face-to-face sessions, but part of the course content and activities are offered via a MOOC platform. MOOC materials must be relevant to the work being done in the classroom, and vice versa — i.e. face-to-face discussions and activities must draw upon online materials (Bruff et al., 2013). Not only does this form of teaching give students more on-campus and peer support, but it also helps in solving some of the authenticity, certification and assessment issues facing MOOCs, as well as enhancing the completion rate of MOOC takers.

A body of literature suggests that blended approaches to learning may offer an optimal environment for augmenting student engagement and success (Picciano et al., 2013; Elmaadaway, 2017; Gilboy et al., 2015; James et al., 2014; Jamaludin and Osman, 2014). A review of student engagement is presented in the following section.

3.2 Defining Student Engagement

A critical review of the literature on student engagement in higher education makes it clear that this concept means different things to different people (Barkley, 2009). As Bowen (2005) explains, there is a lack of consensus on what exactly student engagement is.

For example, in 1930, Ralph Tyler defined engagement as *"time on task"* (Merwin, 1969). Pace (1984) extended Tyler's concept to create the College Student Experiences Questionnaire (CSEQ) to measure *"quality of effort."* Pace's research over three decades (1960 to 1990) found that the more effort students invest in using the institutional resources and opportunities provided for their learning, the greater they will benefit (Gonyea et al., 2003; Pace, 1984, 1990).

In 1984, Astin (1984, p. 297) augmented the concept of *"quality of effort"* with his theory of student involvement. This refers to *'the amount of physical and psychological energy that the student devotes to the academic experience.'* Drawing upon his longitudinal studies about the impact of college on students, Astin empirically demonstrated the relationship between involvement and both developmental and attitudinal outcomes.

Astin's theory supports Pace's findings: the more students are involved in their academic activities, the more student learning and personal development transpires (Astin, 1993, 1977). Astin was one of the most significant contributors to the widely cited report entitled *"Involvement in Learning"* (National Inst. of Education, 1984). That report underlines the importance that involvement has on student persistence, achievement, and other valued outcomes (Astin, 1984).

In 1987, Chickering and Gamson published *"The Seven Principles for Good Practice in Undergraduate Education"*. Their book was conceptually linked to CSEQ items. In sum, Chickering and Gamson found that effective educational practice includes: student-faculty contact; cooperation among students; active learning; prompt feedback; time on task; high expectations; and respect for diverse talents and ways of learning. The response to these published principles was immediate and overwhelming, seeing as they are usually used in order to help improve undergraduate education.

In the spring of 2000, the National Survey of Student Engagement (NSSE) was launched as a means for examining the quality of the student learning experience (National Survey of Student Engagement, 2007). The NSSE defines student engagement as *'the time and energy students devote to educationally sound activities inside and outside of the classroom, and the policies and practices that institutions use to induce students to take part in these activities'* (Kuh 2003, p. 25). This definition of student engagement is grounded on four key researches: the *"quality of effort"* concept developed by Pace (1984); the *"theory of involvement"* propounded by Astin (1984); the *"seven principles of good practice in undergraduate education"* proposed by Chickering & Gamson (1987); and the *"causal model of learning and cognitive development"* put forward by Pascarella et al. (2005).

From these four studies, the NSSE proffers five benchmarks of effective educational practice; namely:

- **Active and collaborative learning:** Items on this scale are designed to assess the extent to which students interact with other students, and the frequency of student participation in academic activities inside and outside of the classroom.
- **Student interactions with faculty members:** This benchmark is designed to evaluate student and faculty interaction. This includes participation with faculty members inside and outside the classroom, and the level of engagement with them with regard to grades, coursework and career planning.
- **Level of academic challenge:** Questions in this scale focus on measuring students' academic effort and the institutional expectations of students.
- **Enriching educational experiences:** Items in this dimension are designed to report on the number of complementary learning activities available to students. This can be joining demonstrated in their participating in community service and internships and their engaging in curricular and co-curricular activities with students of different backgrounds.
- **Supportive campus environment:** Questions in this section deal with the extent to which students perceive the institution as being dedicated to student success and the cultivation of positive relationships amongst students, faculty, staff and community on campus.

In 2004, Fredricks et al. (2004) further recognised three main dimensions of student engagement. These are detailed as follows:

- **Behavioural engagement:** students who are behaviourally engaged would be involved in activities, such as completing homework, asking questions in class, attending course-related events, complying with school rules, etc.
- **Cognitive engagement:** students who are cognitively engaged would invest in their personal learning and development, strive to go beyond the basic requirements, and enjoy academic challenges, such as assignments which emphasise higher order thinking skills, time spent on coursework which requires reflection, the integration and synthesis of concepts, etc.
- **Emotional (affective) engagement**: students who are emotionally engaged would experience a range of emotional reactions with respect to their attitudes, values, interests, satisfaction, belonging, enjoyment, etc.

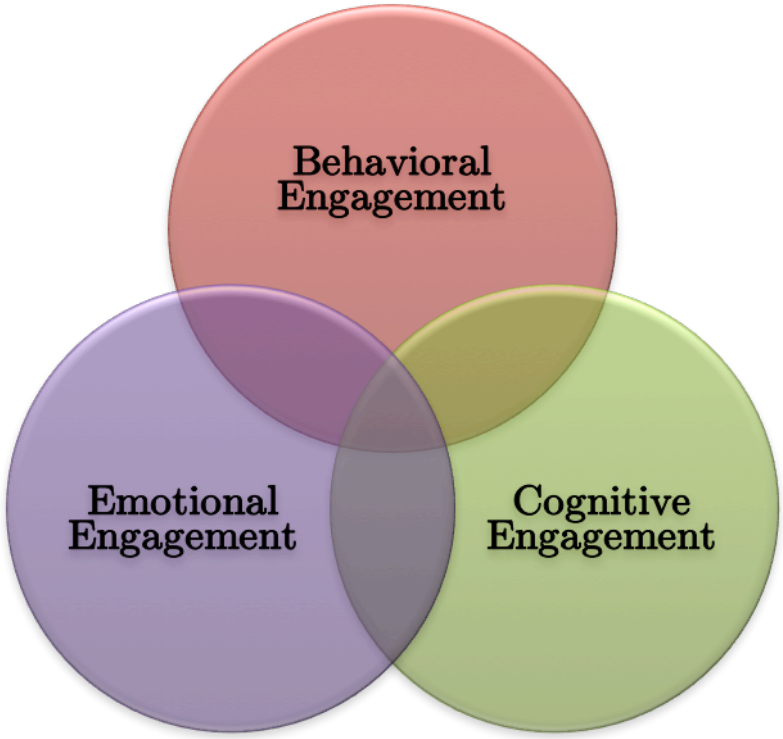

Figure 3-1: Student Engagement Dimensions (Fredricks et al., 2004)

3.2.1 The Value of Student Engagement Data

The calibration of student engagement has been considered to 'be among the better predictors of learning and personal development' (Carini et al., 2006, p. 2). Studies have demonstrated a consistent positive correlation between specific aspects of engagement and a range of favourable outcomes, including:

- critical thinking and personal development (Endo and Harpel, 1982; Kuh and Vesper, 1997; Pike, 1999, 2000; Pascarella, 1983; Pascarella et al., 1996);
- cognitive development (Kuh, 1995, 1993; Anaya, 1999; Astin, 1993; Pascarella and Terenzini, 2005);
- psychosocial development (Badura et al., 2000; Chickering and Reisser, 1993; Harper, 2004; Evans et al., 1998);
- the improvement of grades (Astin, 1977, 1993; National Survey of Student Engagement, 2002);
- student satisfaction (Kuh and Vesper, 1997; Kuh et al., 2008, 2005, 2011)
- and student persistence (Astin, 1975, 1984, 1993; Bean, 2005; Berger and Milem, 1999; Pascarella and Terenzini, 2005).

3.2.2 Methods of Measuring Student Engagement

The wide range of engagement definitions and the complexity surrounding student engagement have resulted in a diversity of measurement methods and techniques. There is a number of methods for collecting student engagement data (Fredricks and McColskey, 2012; Chapman, 2003; Jennings and Angelo, 2006), such as: student self-report, interview, observation, and experience sampling. Table 3-1 provides an overview of each method.

Table 3-1: A comparison of methods used to measure student engagement

Data collection methods	Pros	Cons
Student self-report: A method where students are asked about various aspects of engagement and select the response which best indicates their personal experience and/or opinion.	• Practical and easy to administer. • Able to be administered to a large and heterogeneous sample at low cost. • Participants have the option of remaining anonymous, which may promote honest responses. • As they are usually used with a large sample, the findings can be generalisable.	• Usually used to measure two types of engagement, emotional and cognitive, because collecting data on these types of engagement by other methods, such as observations, teacher's interview, or teacher's rating scales, is highly inferential. • A number of concerns with this method include honesty, accuracy of responses, and return rate.
Interview: A method where participants are asked to describe their experiences in more open-ended ways. The questions of the interview have three different types: structured, semi-structured, and unstructured.	• Provides a more detailed, individualised and contextualised understanding of student engagement.	• The knowledge, skills, and biases of the interviewer can affect the quality, accuracy, and depth of the responses obtained. • Concerns regarding social desirability, reliability (stability and consistency), and the validity of the interview findings. • Usually involve a small sample size and limited contexts. This reduces its generalisability to other settings.

Observation: A method where a researcher observes student behaviours in a systematic manner without affecting or interfering with their behaviours.	• Provides contextual information about student engagement. This information could improve our understanding of unfolding processes within different contexts. • Can be used to verify findings collected from engagement survey or interview techniques.	• Can be time consuming to use, and observers may need to observe student behaviours in different learning settings (i.e., classroom, group work, lab) in order to obtain an accurate and full picture of student engagement. • Requires proper training since observational methods strongly rely upon the abilities and skills of the observer in capturing and making sense of what is observed. • Gives limited information on the quality of students' efforts, behaviours, or participation. • Usually involves a small sample size within limited contexts. This reduces its generalisability to other settings.

Experience Sampling: a systematic way of collecting data from participants who provide samples of their ongoing behaviours. With this methodology, students are given alarm watches for a set time period. In response to the device's signals, students answer a number of questions concerning their current location and activities, as well as questions regarding their cognitive and emotional states.	• Allows one to collect detailed information about student engagement in the current moment. This might help to minimise problems with recall and retrospectivity (as with student self-report). • Enables one to gather information about engagement at different times and for different situations.	• Can be time consuming for participants, • The success of the method relies on students' willingness to participate and comply. • Engagement is a complex latent variable which could be inappropriately measured by the small number of questions included in this method.

3.2.3 Review of Student Engagement Self-Reports

Based on the aforementioned comparison of methods used to collect student engagement data, student self-report and interview with lecturers along with the researcher's observation and notes were selected for use in this study.

The student self-reports are the most common method for measuring student engagement. Most of these self-reports are general and not related to specific disciplines, although there are some examples of measures that are used to assess student engagement in a specific discipline like math (Kong et al., 2003)) or reading (Wigfield et al., 2008).

Some of these reports can be used to measure student engagement at the institutional level, while others are designed for a single course experience. Seeing as the aim of this study is to measure student engagement in blended-MOOC courses within Saudi women's higher education, the researcher has only reviewed self-reports which could be used at course level within higher educational institutions.

Measuring student engagement within a particular course experience provides valuable feedback for assessing and improving students' investment in the learning process. The feedback obtained from such an experience could be used

as a way of evaluating a particular course's structure, pedagogy and design. Barkley (2009, p. 44) asserts that, 'whatever means [a] teacher [uses] to [assess] engagement in their classes, gathering appropriate feedback can help close the gap between what teachers think is happening in their classes and what students are actually experiencing.'

Below is a review of the models used to measure student engagement within a particular course experience. Each model consists of a number of indicators/scales and within each indicator a set of items/questions. The review will provide some useful insights about how to design a model of assessing student engagement within the blended-MOOC course design.

- **The National Survey of Student Engagement (NSSE)** is a well-used model for studying undergraduate student engagement at an institutional level. It was also used by a number of scholars (Robinson and Hullinger, 2008; Delialioğlu, 2012; Neumann and Hood, 2009) to study student engagement at the course-level. The model has ten engagement indicators which may be grouped into four major themes (see Table 3-2).

  Despite the fact that the NSSE is designed to measure student engagement within the face-to-face course design, it has been used directly or modified and customised in many different contexts and settings (Buckley, 2013), including online (Robinson and Hullinger 2008; Wintrup et al. 2015), and blended courses (Delialioğlu, 2012; Cornelius et al., 2017; Chen et al., 2010; Laird and Kuh, 2005; Owston et al., 2013).

Table 3-2: NSSE engagement indicators

Theme	Engagement indicators	Description
Academic challenge	Higher-order learning	This indicator reflects mental activities, such as memorising, applying, analysing, evaluating and creating new ideas/ways of viewing things.
	Reflective & integrative learning	This indicator evaluates the level of making connections among concepts and between new ideas and previous learning, as well as viewing issues from new viewpoints.
	Learning strategies	This indicator assesses the extent to which students use some effective learning strategies, such as identifying key information in readings, reviewing notes after class, and summarising course materials.
	Quantitative reasoning	This indicator measures the ability of student in using and understanding numerical and statistical information in their daily life.
Learning with peers	Collaborative learning	This indicator collects information on how often students engage in collaborative work and discussions with peers.
	Discussions with diverse others	This indicator examines the extent to which students interact and communicate with other students with different backgrounds and life experiences.
Experiences with faculty	Student-faculty interaction	This indicator explores how often students work/discuss/interact with their faculty.
	Effective teaching practices	This indicator captures students' perceptions of how teaching staff uses organised instruction, how they give clear explanations, and how they provide effective feedback.
Campus environment	Quality of interactions	This indicator asks students to rate the quality of their interactions with other students, academic advisors, faculty, student services staff, and other administrative staff.
	Supportive environment	This Indicator explores students' perceptions of how much their institution emphasises services and activities which support their learning and development.

- **The Student Course Engagement Questionnaire (SCEQ)** was developed by Handelsman et al. (2005) to measure four types of engagement:
    1. **Skill engagement** includes levels of practicing some learning strategies and skills which promote academic success, such as note-taking. This type corresponds to the NSSE category of "level of academic challenge."
    2. **Emotional engagement** refers to the level of affective involvement that students have with course materials.
    3. **Participation/interaction engagement** includes levels of interaction with both the instructor and other students. This type corresponds to the NSSE category of "active and collaborative learning."
    4. **Performance engagement** refers students' levels of performance in-class, such as grades.
- **The Classroom Survey of Student Engagement (CLASSE)** is an adaptation of the NSSE which was developed by Ouimet & Smallwood (2005) in order to assess student perceptions of engagement in a course. CLASSE is composed of two instruments:
    1. The student version of CLASSE, which asks students how frequently they engage in various educational activities within a particular course.
    2. The faculty version of CLASSE, which asks the faculty delivering that course how important the various educational activities are in facilitating student success.

    Both instruments have six indicators. They are as follows:

    1) Engagement Activities; 2) Cognitive Skills; 3) Other Educational Practices; 4) Class Atmosphere Impressions; 5) Optional Course-specific; and 6) Demographic Items.

    The two versions of CLASSE can be contrasted and examined 'to identify important and valued educational practices that are occurring less frequently than desired or expected.'[14].
- **Student Engagement (SE)** is a 14-item assessment which was adapted from the NSSE model for use at the course-level (Ahlfeldt et al., 2005). The questions examine three aspects of student engagement: 1) Collaborative Learning; 2) Cognitive Development; and 3) Personal Skills Development.

[14] http://nsse.indiana.edu/html/classroom_survey_of_student_engagement.cfm

- **The UK Engagement Survey (UKES)** is an adaptation of the NSSE for the purpose of better understanding UK students' experience of the following nine key areas:
  1) Critical Thinking, which uses the same items of the NSSE Higher-order learning indicator;
  2) Learning with Others, which asks the same questions of the NSSE collaborative learning indicator.
  3) Interacting with Staff, which has six questions, some of which were taken from the NSSE student-staff interaction indicator.
  4) Reflecting and Connecting, which has the same questions of the NSSE reflective & integrative learning indicator.
  5) Course Challenge; includes two items which focus on students' responsibility for their own learning, as well as the sense that they have of being challenged by the course.
  6) Engagement with Research, which asks four questions about the emphasis in the course on students' learning about the methods and results of one or more researches.
  7) Staff-Student Partnership has three questions about the extent to which students contribute to a joint community of staff and students, and work with teaching staff in improving their course and evaluating teaching and assessment practices.
  8) Skills Development (Hard and Soft Skills); involves twelve questions which ask about students' development of a number of skills and abilities.
  9) How Students Spend Time asks seven questions about the number of hours that students spend on different activities.

  The UKES can be used at two levels; an institutional level and a course level (Cornelius et al., 2017; Wintrup et al., 2015).

- **The Student Engagement Index (SEI)** adapted NSSE to identify specific measures of classroom engagement (Langley, 2006). For each NSSE benchmark, a number of engagement indicators are identified, along with relevant questions/items. Below is a sample of the indicators and items:

  Benchmark 1: The Level of Academic Challenge:

  1. Effort

  I was challenged by the overall amount of material to be learned.

  2. Time

  I needed to spend a significant amount of time on class materials to be successful.

3. Student/Instructor Expectations

I set high expectations for my achievement.

Benchmark 2: Student/Faculty Interactions:

1. Access to Contact with an Instructor

My questions about course assignments were answered in a timely manner by the instructor.

2. Quality of Teacher Feedback

I received useful feedback from the instructor on tests and class assignments.

3. Teacher/Student Relationships

I felt that the instructor was approachable to discuss class-related issues.

4. Encouragement/Commitment/Interest

I developed enthusiasm and interest to learn more about class content.

5. Supportive Class Environment

My performance in this course was directly related to the positive learning environment which had been created by the instructor.

6. Clarity/Organisation

I was able to understand class material because it was presented clearly and in a well-organised fashion.

Benchmark 3: Active and Collaborative Learning:

1. Active Learning

I participated actively in most class learning experiences.

2. Collaborative/Independent Learning

I frequently worked with other students to solve problems in class.

Benchmark 4: Enriching Educational Experiences:

1. Diversity Issues

I was challenged to reconsider my point-of-view on some course topics.

2. Integration/Synthesis/Application of Knowledge

I developed the ability to solve real problems in my future profession.

3. Enriching Personal/Professional Experiences

I developed stronger analytical skills for examining issues presented in class.

4. General Technology Issue

Appropriate technology tools were effectively used to communicate the content.

- **The Student Engagement Questionnaire (SEQ)** was developed by Coates (2006) to study student engagement in blended course designs and the influence of online learning management systems (LMSs) on students' involvement with their study. The model consists of two main parts: general engagement and online engagement. Each part has a number of indicators/scales, and within each scale, a set of items/questions. The two parts are discussed below in more details.
    a. **General Engagement:** General engagement includes nine scales to measure more general forms of campus-based student engagement:
        1. The Constructive Teaching (CT) scale was developed to capture students' perceptions about whether their teachers support their active learning and construction of knowledge.
        2. The Supportive Learning Environment (SLE) scale was developed to address students' perceptions of whether they feel like they are members of a supportive community of learners at university.
        3. The Teacher Approachability (TA) scale was developed in order to ask students about their perceptions of teachers' interest in them as students.
        4. The Academic Challenge (AC) scale was developed in order to measure students' perceptions of whether they felt that the feedback that they receive and the homework that they have to complete challenges them to learn.
        5. The Active Learning (AL) scale was developed to assess the extent to which students use practices which are likely to produce learning.
        6. The Student and Staff Interaction (SSI) scale is designed to measure the level of interaction that students have with their teachers.
        7. The Complementary Activities (CA) scale is used to measure students' involvement in activities around the university campus.
        8. The Collaborative Work (CW) scale was developed to capture students' participation in a range of collaborative works and activities.
        9. The Beyond-Class Collaboration (BCC) scale is designed to assess the extent to which students are required to, and do, work together with others outside of the classroom.
    b. **Online Engagement:** Coates (2006) believes that online learning, which is a part of blended learning, requires its own engagement scales. These include:

1. The Online Engagement (OE) scale, which examines how often students incorporate the use of online learning systems into their studies.
2. The Online Active Learning (OAL) scale measures how often students actively use online learning systems to improve their learning.
3. The Online Academic Relevance (OAR) scale measures the extent to which students use online learning systems to contextualise and enhance the relevance of their studies.
4. The Online Teaching (OT) scale captures students' perceptions of whether their teachers use online learning systems in pedagogically effective ways.
5. The Online Collaboration (OC) scale measures how often students use online learning systems to do academic activities and collaborative work with peers.
6. The Online Social Interaction (OSI) scale reports how often students use online learning systems to interact with others.
7. The Online Contact with Staff (OCS) scale measures the extent to which students contact their teachers online.

To conclude this section, the reviewed models indicate that no self-report aimed to study student engagement within the blended-MOOC context. Furthermore, most of them were designed to measure student engagement in the face-to-face course design.

The review also suggests that there is an agreement on the importance of the following engagement indicators: (see table below)

Table 3-3: Common indicators of student engagement

Engagement indicators	Literature review
1. Academic challenge	NSSE, UKES, SE, SEI, SEQ, SCEQ (labelled as skill engagement)
2. Collaborative learning	NSSE, UKES, SE, SEI, SEQ, SCEQ (termed as participation engagement)
3. Student-faculty interaction	NSSE, UKES, SEI, SEQ, SCEQ (named as participation dimension)

3.3 Review of Studies of Student Engagement in MOOCs

Having MOOCs as an essential part in the blended-MOOC design, this section attempts to review some studies that are concerned with student engagement within MOOCs. A number of individuals have made different categorisations and classifications of MOOC learners' engagement patterns. For example:

- Phil Hill (2013), in the e-literate blog, classified MOOC participants as follows
  - "Lurkers"- who enrol in the course just to observe or sample a few learning materials at most. Some of them may not even get beyond the registration, so they are basically behind the scenes.
  - "Passive participants"- who typically watch videos, perhaps take exams, but tend not to participate in the course's activities or discussions.
  - " Drop-in participants" - who actively participate in specific topics within the course, but do not attempt to finish the course.
  - " Active participants" - who fully engage in the course and actively participate in course discussions and social tools, and complete the course tasks and activities.

  This classification (apart from drop-in participants) has also been used by Milligan, Littlejohn, & Margaryan (2013) in their study to describe engagement patterns in cMOOCs.

  Milligan et al. (2013, p. 149) identified 'a number of key factors that mediated engagement including confidence, prior experience, and motivation'.

- Stanford University has classified MOOC learners into four classes: Auditing, Completing, Disengaging, and Sampling (Kizilcec et al., 2013). These classifications and archetypes, however, are dynamic, and participants may change over time from one to the other over the duration of a course (Joseph and Nath, 2013).
- Hew (2014) selected three top-rated MOOCs in the disciplines of programming languages, literature, and art and design to investigate the factors necessary to promote student engagement in the MOOC context. He found that there were five factors behind the popularity of these MOOCs. These include: '(1) problem-centric learning with clear expositions; (2)

instructor accessibility and passion; (3) active learning; (4) peer interaction; and (5) using helpful course resources' (p. 1).

- Wintrup et al. (2015) explored student engagement in two MOOCs developed by the University of Southampton and delivered through the FuturLearn platform. Wintrup et al. (2015) adapted the UK Engagement Survey (UKES), which is largely derived from NSSE items. The results of the study indicate that 'both MOOCs succeeded in enabling significant proportions of participants to feel engaged in intellectual endeavours such as forming new understandings, making connections with previous knowledge and experience, and exploring knowledge actively, creatively and critically' (p. 41).
- Robinson and Hullinger (2008) modified the NSSE survey to assess student engagement within the online learning context. They found that 'online students were modestly engaged in selected NSSE dimensions and had a pattern of engagement that differed from on-campus students' (p. 101).

3.3 Review of Studies of Student Engagement within the Blended-MOOC context

Several studies have investigated the effect of using MOOCs within campus teaching. For example:

1. Martin (2012) and sixteen of his students (from the Computer Science Department at the University of Massachusetts, Lowell) used the massive open artificial intelligence (AI) course offered by Stanford University's Sebastian Thrun and Peter Norvig. This MOOC course attracts wide publicity, and there have been around 160,000 participants since its launch in October 2011. Martin and his students were among the 23,000 students who completed the ten-week course. Martin met his students once weekly for a 75-minute session. He used classroom time for hands-on activities and conversations about what they had learned and what they had found confusing or had disagreed upon. They described the MOOC's format to be relaxing and engaging. They rated Thrun and Norvig as strong teachers. Nevertheless, this study seemed to be a small study and did not have data about student learning.
2. Fisher (2013), a lecturer at Vanderbilt University, integrated a Stanford Machine Learning MOOC into his on-campus course in Machine Learning during the Autumn of 2012. The MOOC was delivered through the Coursera platform and taught by Professor Andrew Ng, a director of the Stanford Artificial Intelligence Lab and co-founder of Coursera.

Only ten students enrolled in this "*wrapped*" course. They were asked to register in the MOOC and participate in all activities involved in the machine-learning MOOC. Those activities include watching video lectures and discussion forums, and completing quizzes and programming assignments. Students were also asked to take screenshots of their works and hand them to the on-campus lecturer, allowing that work to contribute to their grades the campus course.

Students were assigned additional reading assignments on topics which were not covered in the MOOC. After the ten-week machine learning MOOC finished, students worked during the final four weeks on projects of their own design. Although students reported that they were satisfied by their end-of-semester evaluations, they articulated concerns about wrapping MOOCs into class. Students did not contribute actively in the Coursera discussion forum, preferring to engage with the local learning community provided in the on-campus component of the course. Despite the low participation in the discussion forum, they found it helpful for problem solving and getting help from other online students. Students also found the misalignment of MOOC content with face-to-face class problematic. They perceived the role of the on-campus instructor as a facilitator.

It is worth mentioning that this study had just ten students, thereby making it hard to define an emerging trend in blended-MOOCs. Furthermore, the study did not provide data on learning outcomes.

3. In Spring 2013, San Jose State University (SJSU) launched three college remedial MOOCs on the UDACITY platform (Firmin et al., 2014). The MOOC courses were 1) a remedial-algebra survey course (MATH 6L), 2) an introduction to college-level algebra (MATH 8), and 3) an introduction to college-level statistics (STAT 95). Over 15,000 students enrolled for the three courses. Retention, success, and online support were all tested by using an augmented online learning environment (ALOE) on a subgroup of two hundred and thirteen students. The two hundred and thirteen participants were comprised of ninety-eight matriculated students with an age range between eighteen and twenty-four and one hundred and fifteen non-matriculated students with age range between fifteen and eighty-six.

   AOLE enrolment was limited to a group of one hundred students per course, with a breakdown of fifty SJSU students and fifty non-SJSU students per class. Researchers found that:

   - The strongest success indicator was student effort in terms of solving and submitting problem sets and viewing lecture videos.
   - A strong correlation between the amount of time students viewed course videos and pass rates, particularly with regards to the STAT 95 course.

- The matriculated students passed at higher success rate than non-matriculated students in all courses.
- The study found no statistically significant relationships with students' demographic characteristics, use of online support, and success rate. Those characteristics include ethnicity, age, gender, and matriculation status.
- The study found a number of factors which contributed to hindering students to use support services. Those factors include: lack of online experience, lack of computer access outside of school, lack of awareness about service availability with regards to online support, as well as difficulties with interacting with some aspects of the platform.
- The researchers concluded that the low pass rates which were discovered in all courses should be attributed to the fact that the courses target at-risk students.

Though this research was similar to other previous studies, it mostly focused on at-risk students and the ones who need remedial classes in particular subjects.

4. Caulfield et al. (2013), in their article *"Rethinking Online Community in MOOCs Used for Blended Learning,"* reported a research conducted by Patti Ordonez-Rozo at the University of Puerto Rico Rio Perdras.

   Patti Ordonez-Rozo used Stanford's introduction of MOOC databases into a campus course in the Spring of 2012 for a group of twenty-six. The MOOC coincided with an on-campus computer sciences class. The study adopted flipped classroom design, where students watch MOOC videos and lectures at home and then come to class for in-class activities, projects, and assessments using the sequenced content of the MOOC.

   The researchers used Stanford's backend data, student surveys, and faculty reports for analysis. They examined students' use of videos, participation in discussion forums, completion of assignments and quizzes. They stated that the face-to-face instructor valued the affordances of the readily available materials provided by the MOOCs, such as appropriate video lectures, quizzes and assignments. All these materials were open for the public, thereby allowing the instructor to focus more on class-time activities, discussion, feedback, and class projects. Nevertheless, similar to Bruff et al.'s (2013) observation, the researchers observed that students did not make much use of the online discussion forums. They also found that 62% of the students participated in the discussion forums for one session or less, and 25% of students did not visit the forums at all. Instead, students engaged

with the interactive elements which were available to them, such as the video lectures and quizzes offered by the MOOC.
This study focused on student engagement in terms of viewing videos, visiting discussion forums, and completing assignments. Moreover, it is difficult to draw a conclusion about this study because it had a small sample size of only twenty-six students.

5. Najafi, Evans, & Federico (2014) conducted a study in order to investigate how high school students, who had been enrolled in a university preparatory economics course, engaged with a Behavioural Economics MOOC. The MOOC components were integrated into a school-based course. A group of twenty-nine students were divided into two groups; namely: MOOC-only, who had no teacher support; and blended-mode, who had weekly tutorials. They found that:
    - The MOOC-only group scored slightly lower on a test provided by the teacher but scored slightly higher in a test provided by the MOOC.
    - Although the MOOC-only group watched more videos, the blended-mode group stayed more on-track with the MOOC.
    - The blended-mode group was more persistent in retaking quizzes, although they scored lower than the MOOC-only group.
6. Griffiths et al. (2014) carried out a two-year study from 2012 to 2013 at seven campuses under the purview of the University Systems of Maryland (USM). The study used MOOCs and other online technologies with their campus teaching experiences. Four campuses used MOOCs developed by Coursera, while the other three campuses used courses from the Open Learning Initiative (OLI) at Carnegie Mellon University. Seventeen online courses were used in a variety of blended formats at the campuses. Of these seventeen courses, three courses were from the OLI, while fourteen were MOOCs of which seven were offered by USM faculty participants. One of the blended formats, however, was given entirely online. Within this blended format, students had to register and complete all activities and assignments online. They conducted seven side-by-side comparison tests to compare the hybrid systems' students' results with the results of those students who had been taught in traditional, face-to-face courses. The study covered a different number of subjects with different focuses of study, including computer sciences, biology, communications, statistics, and pre-calculus. It also gathered feedback from both students and the faculty who had participated in the study.

There was a total of 1598 students who participated in the study. The average age of the group was twenty. They were diverse in terms of ethnic backgrounds and income groups. These students were divided into two groups. Whereas eight hundred and twenty were placed in the control group, seven hundred and seventy-eight were assigned to the experiment group. The average section size for the control group was seventy-six, whereas it was seventy-seven for the experiment group. Furthermore, the experiment group had on average of seventy-two minutes of class time per week when compared to the one hundred and twenty-six minutes that the control group received.

The study concluded the following from its results:

- Students from the experiment group fared as well or slightly better than the students from the control group in terms of pass rates, grades and scores on common assessments.
- There was no consistent evidence to show that the blended format had any negative effects on any of the subgroups. This is consistent with Firmin et al.'s (2014) results.
- Students had statistically significantly lower levels of satisfaction with their blended-format experience because they had less face-to-face interaction with teachers.
- The qualitative data revealed an improvement in students' critical thinking skills.

7. Freihat & Zamil (2014) investigated the impact of using MOOC elements on developing listening skills amongst Saudi female students. A group of forty such students were divided into two groups, twenty for the control group and twenty for the experimental group. The research's findings were as follows:
    - The MOOC helped students to improve their listening skills.
    - They found statistically significant differences between the face-to-face group and the blended-MOOC group with relation to their post-test mean scores. These differences were evidenced for all listening skills — namely, intensive, selective, and extensive — the results demonstrated that the experimental group was favoured.

    This study involved a small number of students (i.e. there were only forty students).
8. Holotescu et al. (2014) reported upon a new approach with which they had integrated students who were participating in different MOOCs into a single blended course. The topics of the MOOCs were connected to a Web Programming course at University Politehnica Timisoara, Romania, and

delivered on a microblogging platform named Cirip which was designed for education.

A group of seventy students were able to enrol in a MOOC of their choice and which matched their on-campus course. They furthermore were able to participate in at least ten per cent of MOOC materials and activities. The findings of this study can be summarised as follows:

- The study showed that, though students were asked to participate in ten per cent of MOOC activities, twenty-four per cent of students completed all the MOOC materials and activities, while sixty-six per cent completed at least half of the MOOC materials offered to them. The remaining students completed more than the average value of ten per cent for most of the MOOCs.
- The researchers noted that *'students had a high autonomy in assessing their own learning needs for choosing the MOOCs in which to participate in order to deepen the course topics, but also to find useful information for group project development.'* (p. 248)
- Students' opinions about the courses were positive, though no further feedback was offered, although they did express the opinion that more direct communication and feedback from MOOC instructors was needed.

9. Pérez-Sanagustín et al. (2016) conducted a pilot study at the School of Engineering in Pontificia Universidad Católica de Chile (UC-Engineering). They used four MOOCs to complement or substitute traditional remedial courses on calculus. The four MOOCs were developed by three teaching assistants and were delivered via the Open edX platform as part of the UC-Engineering online initiative. They were all open to anyone interested. The students at UC-Engineering, however, were informed that their participation in the MOOCs was voluntary.

   The MOOCs' effects on five hundred and eighty-nine freshmen students were investigated. Students' scores in the diagnostic and final exams, MOOC log files, and students' prior knowledge (obtained by the students' admission scores) were all analysed. The study found that around sixteen per cent of these students actually became active in the MOOCs, particularly during the time before they took the diagnostic exam. Indeed, those students showed statistically higher scores on the diagnostic exam. Nevertheless, no statistically significant effect was discerned from their final exam scores.

The researchers affirmed that MOOCs are a good mechanism for helping students strengthen their skills and update their previous knowledge on a particular topic. They asserted, though, that MOOCs need to be carefully integrated into a campus course in order to actually make an impact on the students' learning.

10. Cornelius et al. (2017) carried out a mixed-method study at the University of Aberdeen for the purpose of better understanding on-campus learners' experiences and engagement in a blended-MOOC course. The study used the *"Africa: Sustainable Development for All"* course as the basis of their study. That course was developed by the University of Aberdeen on the FutureLearn platform. The researchers made use of the UK Engagement Survey (UKES) to compare the engagement of a group of forty-five students who took the MOOC as part of their studies with a wider cohort of on-campus learners (viz., five hundred seventy-seven other students). The data analysis showed that student engagement differed statistically significant significantly between MOOC- and campus-based courses in a number of areas.
    - They found that students in blended-MOOCs reported higher engagement in terms of the following indicators: learning with others; reflecting and connecting; research and enquiry; staff-student partnership; and four items of the skills development indicator.
    - Students who took part in face-to-face courses were more engaged in critical thinking, course challenges, and one item of the skills development indicator.
    - No statistically significant differences were found between the two groups in terms of the following indicators: interaction with staff and the teaching offered by the course.

The preliminary findings of the blended-MOOC studies which were reviewed above may be summarised as follows:

1. In terms of student scores, students in blended-MOOC courses performed slightly better than, or almost equally to, the students who had been taught using the face-to-face course design.
2. There was no consistent evidence of negative effects on any of the blended-MOOC subgroups.
3. Students in the blended-MOOC courses showed an improvement in reflective and integrative learning and some skills including critical thinking.
4. Positive attitudes towards the blended-MOOC course design.

5. Low levels of participation in the discussion forums which were provided by the MOOC platforms.

There are only a few of these studies due to there being a lack of experiments in integrating MOOCs into campus teaching experiences. Most of these studies have focused on the impact that using MOOCs has on student experiences in terms of student scores (Pérez-Sanagustín et al., 2016; Griffiths et al., 2014; Najafi et al., 2014; Freihat and Zamil, 2014), student satisfaction (Griffiths et al., 2014; Bruff et al., 2013), skills improvement (Freihat and Zamil, 2014; Griffiths et al., 2014; Pérez-Sanagustín et al., 2016), student persistence (Najafi et al., 2014), and student participation (Holotescu et al., 2014).

The literature found only one study which was concerned with the impact of MOOCs on on-campus student engagement (Cornelius et al., 2017). The study is more recent and was conducted at the University of Aberdeen which is different from the current study's context. It used only UKES indicators for the purpose of studying student engagement on blended-MOOC course design. Therefore, further research of this nature needs to be carried out with a large group of subjects in order to obtain more data so as to reach a consensus on the success of using MOOCs in on-campus teaching. They should also be conducted in different contexts where students have less access to high quality higher education.

Forms of blended learning in general have the potential of increasing student engagement. For example, both Osguthorpe & Graham (2003) and Herreid & Schiller (2013) argue that combining face-to-face and online learning approaches has the potential of offering a learning environment in which there are more student engagement opportunities than those offered by simply applying only one approach of learning. Studies on blended learning have identified that that method of learning may offer some potential gains for higher education institutions, such as:

1. Enabling collaborative learning and interactions with peers and teachers. For example, Aycock et al. (2002), Garnham & Kaleta (2002), and Elmaadaway (2017) all found that general forms of the blended-course design increase student engagement and facilitate interaction among students, as well as between students and their instructors.
2. Promoting active learning and higher-order thinking skills (Ritchhart et al., 2011; James et al., 2014; Murphy et al., 2016; Elmaadaway, 2017). Jamaludin & Osman (2014), for example, confirmed that, by using the flipped classroom format, *"students are cognitively engaged by trying to make connections with their own experiences, relate the ideas to what*

they already know, trying to fit different ideas together and make sense of them, and generating their own examples to understand the concepts" (p. 129). Furthermore, Ravenscroft & Luhanga (2014) found an improvement in students' collaborative learning and higher-order thinking skills after replacing the face-to-face teaching method with the flipped classroom method.

Studies (Chen et al., 2010; Hu and Kuh, 2001; Laird and Kuh, 2005; Kuh and Hu, 2001b) have also found that, the more students engage with educational technology, the more they engage with effective educational practices, such as active and collaborative learning and student–faculty interaction.

3.4 Summary

This chapter discussed the definitions of MOOCs, the blended-MOOC, and student engagement. It reviewed some methods of measuring student engagement in the context of higher education. These methods of measuring student engagement are summarised below in Table 3-4.

Table 3-4: A summary of the models that can be used to measure student engagement within single-course experiences

Models	Indicators/Measures/Scales
The Student Course Engagement Questionnaire (SCEQ)	1. Skill Engagement 2. Emotional Engagement 3. Participation/Interaction Engagement 4. Performance Engagement
The National Survey of Student Engagement (NSSE)	1. Higher-order Learning 2. Reflective & Integrative Learning 3. Learning Strategies 4. Quantitative Reasoning 5. Collaborative Learning 6. Discussions with Diverse Others 7. Supportive Environment 8. Student-faculty Interactions 9. Effective Teaching Practices 10. Quality of Interactions
The Classroom Survey of Student Engagement (CLASSE)	1. Engagement Activities 2. Cognitive Skills 3. Other Educational Practices 4. Class Atmosphere Impressions 5. Optional Course-specific 6. Demographic Items

The Student Engagement Index (SEI)	1. Level of Academic Challenge 2. Quality of Student Interactions 3. Active and Collaborative Learning 4. Enriching Educational Experiences	
The Student Engagement (SE)	1. Collaborative Learning 2. Cognitive Development 3. Personal Skills Development	
The UK Engagement Survey (UKES)	1. Critical Thinking 2. Learning with Others 3. Interacting with Staff 4. Reflecting and Connecting 5. Course Challenge	6. Engagement with Research 7. Staff-Student Partnership 8. Skills Development (Hard and Soft Skills) 9. How Students Spend Time
The Student Engagement Questionnaire (SEQ)	1. Online Engagement 2. Online Active Learning 3. Online Social Interaction 4. Online Collaboration 5. Online Teaching 6. Online Academic Relevance 7. Online Contact with Staff	8. Constructive Teaching 9. Collaborative Work 10. Teacher Approachability 11. Supportive Learning Environment 12. Student and Staff Interaction 13. Active Learning 14. Academic Challenge 15. Complementary Activities 16. Beyond Class Collaboration

The literature showed that there was a lack of studies concerning studying the impact that integrating MOOC elements into campus courses has on student engagement. As the context of blended-MOOCs has characteristics which differ from other contexts, there is a need to develop a model which can be used in order to measure student engagement. For this reason, in the next chapter, the researcher proposes a model for measuring student engagement in the blended-MOOC context.

Chapter 4. A Proposed Model of Student Engagement in the Blended MOOC Context

The previous chapter demonstrated student engagement to be a complex and multifaceted concept which cannot be observed or measured directly. Keeping all of the problems and benefits of the other models in mind, the main goal of this chapter is that of developing a more suitable model for measuring the engagement of students in the blended-MOOC course design.

4.1 The Process of Developing The Blended-MOOC Student Engagement (BMSE) Model

Step one: analysing and reviewing the models of student engagement

Extensive research has been carried out on student engagement in face-to-face courses and online courses (see Section 3.2.3). But no single study exists with the aim of developing a model of measuring student engagement in the blended-MOOC context. Most blended learning researches have adapted the NSSE to examine student engagement (Delialioğlu, 2012; Cornelius et al., 2017; Chen et al., 2010; Laird and Kuh, 2005; Owston et al., 2013). The NSSE instrument is a tool for evaluating general forms of engagement.

The literature review found only one model which was designed for being used in the blended course design. The model was developed by Coates (2006) and has nineteen scales for evaluating student engagement when LMSs have been incorporated into on-campus learning (Coates, 2007).

Coates's (2006) model is not applicable for being used in the blended-MOOC context because it is designed to measure the engagement of students in a context where LMSs have been integrated into on-campus study. It asks questions such as *how often have you experienced the following:*

1. *I used an online learning system to contact academic staff.*
2. *Using learning systems has made me feel like a part of the university.*
3. *I had individual contact with academic staff online.*

Step two: identifying the main elements of the blended-MOOC course design

Due to the lack of models that concerned on student engagement in the blended-MOOC, the researcher attended *'WEBS6201: Foundations of Web Science'* course which was delivered in the blended-MOOC format and run by University of Southampton. The reasons of attending this course were to better understand the context of blended MOOC and to identify elements that students would more likely engage with in that context.

The researcher observed that the blended-MOOC courses have characteristics that differ to other course designs, such as, using materials from other institutions, collaborating with global communities, communicating with other lecturers, interacting and reflecting in social networking.

She also observed that learning in the blended-MOOC can occur in three main settings: on-campus; on the MOOC platform; or via a social network (see Figure 4-1).

1. **Campus learning:** In the blended-MOOC design, students are expected to come to class for more detailed lectures and group discussions. Therefore, they are supposed to engage with their teacher, their peers, and the contents.
2. **MOOC Learning:** It is assumed that students will watch MOOC videos, take part in some interactive quizzes, read lesson notes, discuss with others, and participate in discussion forums.
3. **Social Networking:** Students are presumed to reflect and share their learning with other learners via social media.

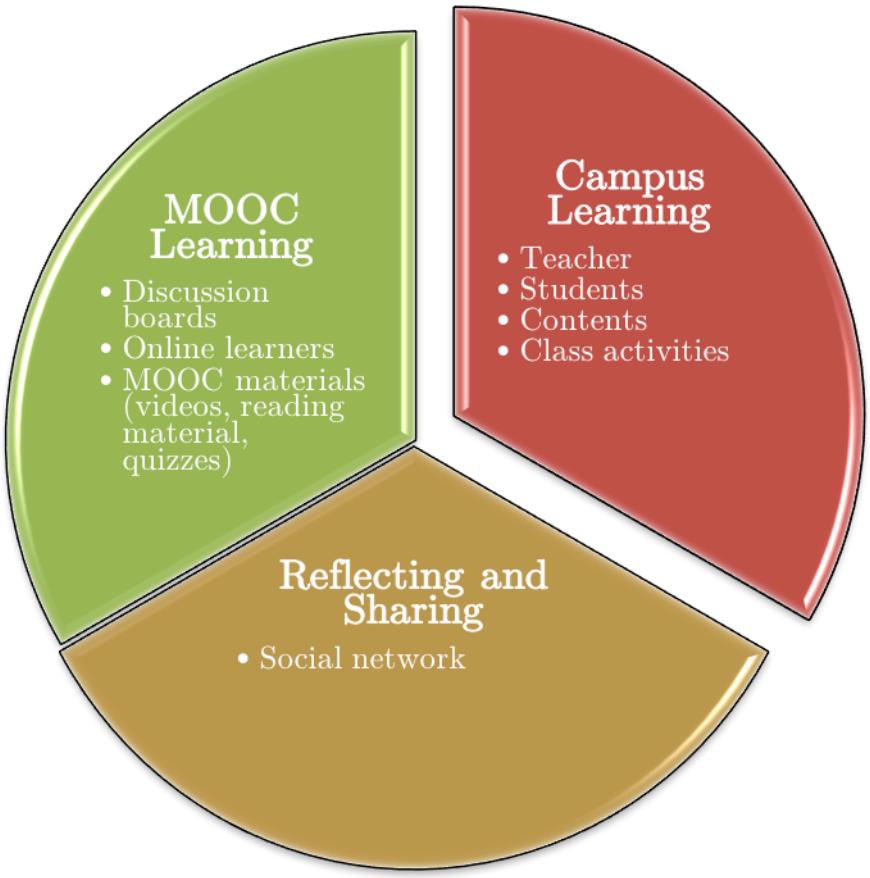

Figure 4-1: Learning in the blended-MOOC course design

Step three: choosing theoretical frameworks

After identifying the key elements of the blended-MOOC course design, NSSE was selected as this model's theoretical framework along with UKES and SEQ to measure those elements. There is a number of reasons behind the researcher's choosing NSSE:

- NSSE is a large-scale project administered by the University of Indiana that seeks to 'assess the extent to which students engage in educational practices associated with high levels of learning and development.'[15] It is grounded on four main antecedents: "quality of effort" (Pace, 1984); the "theory of involvement" (Astin, 1984); the "seven principles of good practice in undergraduate education" (Chickering and Gamson, 1987) and Pascarella et al.'s (2005) "causal model of learning and cognitive development."
- The NSSE instrument has been used both directly and in a modified form for many different contexts, such as face-to-face, online (Robinson and Hullinger 2008; Wintrup et al. 2015), and blended courses (Delialioğlu, 2012; Cornelius et al., 2017; Chen et al., 2010; Laird and Kuh, 2005; Owston et al., 2013).
- The NSSE's items have been adapted internationally with different names, such as: (UKES) in United Kingdom; (AUSSE) in Australia; (SASSE) in South Africa; (ISSE) in Ireland; and (NSSE-China) in China.
- The NSSE publishes engagement data annually, allowing for a comparison with the benchmark score.

The NSSE has ten engagement indicators organised under four major themes (see Table 4-1).

Table 4-1: NSSE engagement indicators

Theme	Engagement indicators
Academic challenge	Higher-order learning Reflective & integrative learning Learning strategies Quantitative reasoning
Learning with peers	Collaborative learning Discussions with diverse others

[15] http://nsse.indiana.edu/html/survey_instruments.cfm

Experiences with faculty	Student-faculty interaction Effective teaching practices
Campus environment	Quality of interactions Supportive environment

The current research used only four of the NSSE's indicators; viz.:

1. **Higher-order Learning:** This indicator captures the extent to which course materials and assessments emphasise challenging mental tasks, such as application, analysis, judgment, and synthesis.
2. **Reflective and Integrative Learning:** This indicator examines the level of integration of ideas and concepts in the course.
3. **Learning Strategies:** This indicator asks students how often they applied some effective learning strategies in the course.
4. **Collaborative Learning:** This indicator gathers information about how often students are involved in collaborative work.

These four indicators are most relevant to the blended-MOOC course design, while the others relate to how students perceive their entire institution, not their experiences with a single course. For example:

- **The quality of interactions indicator** asks students to rate the quality of their interactions with their academic advisors and/or administrative staff;
- **The quantitative reasoning indicator** asks students questions, such as:

  How often have you used numerical information to examine a real-world problem or issue (unemployment, climate change, public health, etc.);

- **The supportive environment indicator** captures students' perceptions on how much their institution emphasises the provision of support for their overall well-being, as well as their assisting them to manage their non-academic responsibilities

The current study did not use the student-faculty interaction indicator because the NSSE's items for this indicator overlook the interactions between students and staff which take place inside of the classroom (see Table 4-2). Nevertheless, this kind of interaction was appreciated by UKES. For example, UKES asked questions such as:

> *how often have you asked questions in taught sessions or contributed to discussions about course material in other ways?*

For this reason, this study has made use of the UKES for the purpose of measuring the interaction between students and faculty.

Table 4-2: A comparison of the NSSE and UKES's student-staff interaction indicator

Student-Staff Interaction	
NSSE 2015	**UKES 2015**
How often have you: Talked about career plans with a faculty member? Worked with a faculty member on activities other than coursework? Discussed course topics, ideas, or concepts with a faculty member outside of class? Discussed your academic performance with a faculty member?	*About how often have you done each of the following* Asked questions in taught sessions or contributed to discussions about course material in other ways? Discussed your academic performance and/or feedback with teaching staff; Talked about your career plans with teaching staff or advisors? Discussed ideas from your course with teaching staff outside taught sessions, including by email/online? Worked with teaching staff on activities other than coursework? Made significant changes to your work based on feedback?

As MOOCs and social media are essential elements of the blended-MOOC design, four online indicators were added to the model to measure the engagement of students with these two components; MOOC and social media. These four indicators were adapted from the SEQ and the NSSE in order to fit into the blended-MOOC teaching method. These indicators are as follows:

- **MOOC (online) active learning:** Collects information about the degree to which students actively use MOOC systems for enhancing their learning;
- **MOOC (online) collaborative learning;** Measures the degree to which students use MOOC systems for doing academic work with other online learners;
- **MOOC social interaction:** Asks about how students use MOOC systems or social networks for the purpose of experiencing a range of interactions and communications with others;
- **Teaching with MOOCs:** Captures students' perceptions of whether instructors used MOOC elements and materials in pedagogically effective ways.

Thus, as a whole, the proposed model has nine indicators for tracking campus students' engagement with online-related indicators. The details of each indicator are presented in depth Table 4-3.

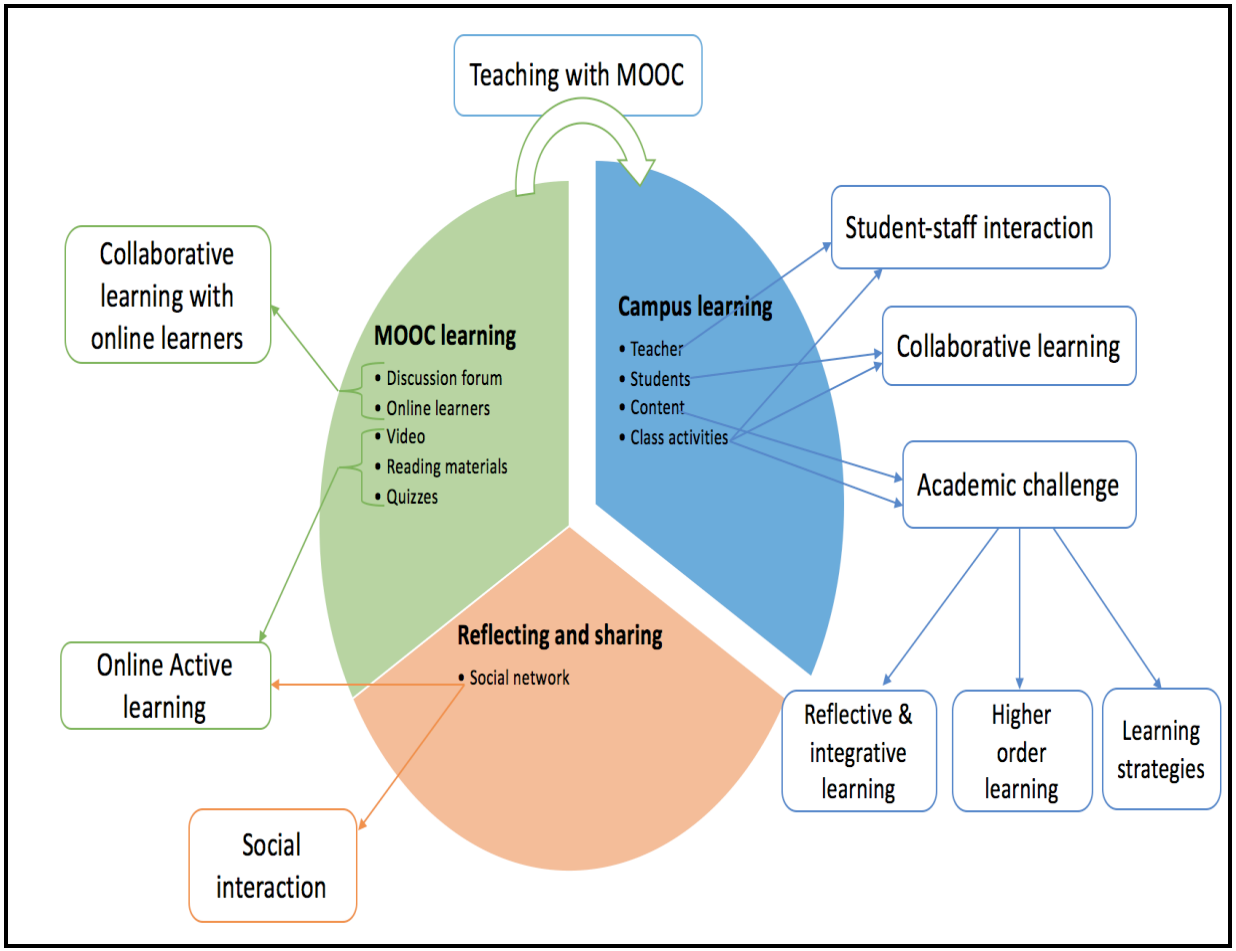

Figure 4-2: Proposed BMSE model

Table 4-3: The BMSE model's items and their corresponding descriptions

	Engagement Indicators	Items/Metrics
General Engagement Indicators	**Reflective and Integrative Learning** (source: NSSE): Six items designed for studying the level of integration and connection of ideas and concepts.	*During the module, how often have you:* 1. Combined ideas from different courses when completing assignments? 2. Connected your learning to societal problems or issues? 3. Examined the strengths and weaknesses of your own views on a topic or issue? 4. Tried to better understand someone else's views by imagining how an issue looks from his or her perspective? 5. Learned something that changed the way you understand an issue or concept? 6. Connected ideas from your courses to your prior experiences and knowledge?
	Higher-Order Learning (source: NSSE): Five items capture the extent to which course materials and assessments emphasise challenging mental tasks, such as application, analysis, judgment, and synthesis.	*During the module, how much has your coursework emphasised the following?* 1. Memorising course materials; 2. Applying facts, theories, or methods to practical problems or new situations; 3. Analysing an idea, experience, or line of reasoning in depth by examining its parts; 4. Evaluating a point-of-view, decision, or information source; 5. Forming a new idea or understanding from various pieces of information.
	Learning strategies (source: NSSE): Three items designed to assess the extent to which students performed some effective learning strategies.	*During the module, how often have you:* 1. Identified key information from reading assignments? 2. Reviewed your notes after class? 3. Summarised what you learned in class or from course materials?
	Collaborative Learning (source: NSSE): This indicator includes four questions which examine the extent to which two or more students work together in educationally purposeful activities.	*During the module, how often have you:* 1. Asked another student to help you understand course materials? 2. Explained course materials to one or more students? 3. Prepared for exams by discussing or working through course materials with other students? 4. Worked with other students on course projects or assignments?

	Student/Staff Interactions (source: UKES): Six items explore the degree to which students contact and interact with their teachers.	*About how often have you done each of the following?* 1. Asked questions in taught sessions or contributed to discussions about course material in other ways; 2. Discussed your academic performance and/or feedback with teaching staff; 3. Talked about your career plans with teaching staff or advisors; 4. Discussed ideas from your course with teaching staff outside taught sessions, including by email/online; 5. Worked with teaching staff on activities other than coursework; 6. Made significant changes to your work based on feedback;
MOOC Engagement Indicators	MOOC Active Learning (adapted from SEQ): Five items designed to collect information about the degree to which students actively use MOOCs for the purpose of enhancing their learning.	*During the course, to what extent have you experienced the following?* 1. Found that MOOC materials challenged you to learn. 2. Used MOOC resources to improve your learning. 3. Used MOOC materials to make lectures more meaningful. 4. Used MOOC quizzes to improve your understanding of a topic. 5. Shared and reflected on what you learned in the MOOC course through blogs, micro-blogging, discussion spaces, etc.] – from the researcher
	MOOC Collaborative Learning (adapted from NSSE): Three items designed to capture the degree to which students use MOOCs for the purpose of doing academic work with other online learners.	*During the module, how often have you:* 1. Asked another online learner to help you understand course materials? 2. Explained course materials to one or more other online learners? 3. Posted a question on the MOOC discussion forum? – from the researcher
	MOOC Social Interaction (adapted from SEQ): Two questions ask about how students experience a range of interactions and communications with others when using MOOCs.	*During the course, about how often have you done the following?* 1. Had helpful online conversations with others; 2. Used MOOC tools (discussion spaces, social media, and emails) to communicate with others – from researcher

	Teaching with MOOCs (adapted from SEQ): Three items used for capturing students' perceptions of whether instructors use MOOC in pedagogically effective ways.	*During the course, to what extent have you experienced the following?* 1. Teaching staff used MOOC materials to discuss interesting issues; 2. Staff used MOOCs in ways that improved the overall teaching experience; 3. Staff used MOOCs to provide students with extra assistance.

4.2 Summary

This chapter aimed to propose a model for measuring student engagement in the blended-MOOC context (BMSE). The proposed BMSE model has nine indicators with which to capture student engagement both on-campus and online. Those indicators are listed as follows:

1. Reflective and integrative learning (source: NSSE);
2. High-order learning (source: NSSE);
3. Learning strategies (source: NSSE);
4. Collaborative learning (source: NSSE);
5. Student-staff interaction (source: UKES);
6. MOOC Active Learning (adapted from: SEQ);
7. MOOC collaborative learning (adapted from: NSSE);
8. MOOC Social Interaction (adapted from: SEQ);
9. Teaching with MOOCs (adapted from: SEQ);

Each indicator has a set of items which were drawn from the NSSE, the UKES, and the SEQ. The next chapter aims to validate the proposed model for use in the experimental study.

Chapter 5. Preliminary Study

In the previous chapter, the Blended-MOOC Student Engagement (BMSE) model was proposed based on the literature review. The model has nine indicators to measure student engagement in the blended-MOOC context. The majority of the indicators' items were drawn from three well-established frameworks: the National Survey of Student Engagement NSSE, the UK Engagement Survey UKES and the Student Engagement Questionnaire SEQ.

This chapter regards the preliminary study which was conducted for this research. The preliminary study was designed in order to validate the proposed model for use in the full-scale study. The preliminary study itself had two main phases:

- The first phase involved enlisting the help of thirty-five expert practitioners to confirm that the indicators would be efficient at measuring student engagement in the blended-MOOC context.
- The second phase involved a trial evaluation of the use of the model and involved thirteen students who participated in a blended-MOOC course.

The chapter discusses the methods used for conducting the preliminary study, including details regarding the sample, sample size and analysis test. Finally, the chapter presents the preliminary study's results and the final model which was calibrated using those results.

5.1 Research Methodology of the Preliminary Study

Because the key aim of the preliminary study was that of capturing and quantifying experts' attitudes towards the proposed engagement indicators, the quantitative research design was used for the preliminary study. The study used two online questionnaires were used on practitioners and students, respectively, for confirming and evaluating the model.

1. The expert practitioner questionnaire was used to confirm whether all of the proposed indicators were sufficient at measuring student engagement in the blended-MOOC context.
2. The student survey was designed and evaluated after the expert' s confirmation in order to test and " try out" the BMSE model.

5.1.1 Expert Practitioner Questionnaire Design

The expert survey was designed to capture experts' opinions on each of the proposed indicators identified in the literature review. Because this model is new, efforts were made to recruit expert practitioners from a wide range of backgrounds. The communication medium for data collection was a self-administered online questionnaire using the survey software called *SurveyGizmo*. The questionnaire (see Appendix A) was divided into three sections:

1. The first section was used to collect general information about the participants (role played in the MOOC, years of experience);
2. The second section asked nine 5-Likert scale questions, ranging from (Very important =5) to (Not at all important=1);
3. The last section consisted of two open-ended questions for the purpose of checking whether there was ambiguity in any indicator and whether any further indicators needed to be incorporated.

5.1.1.1 Sample and Sample Size

The population of interest for the expert questionnaire were MOOC educators who were academics with experience in teaching both on-campus and via MOOCs.

Moreover, MOOC facilitators were also targeted seeing as facilitators are academics who have experience in teaching in conventional settings and helping MOOC educators provide individual and group support through course discussions, emails and regular contact with classes.

The expert practitioners were asked to participate in the online questionnaire and rate the importance of each indicator (see Appendix A).

Statistical power analysis (such as G*Power, which was the software adopted in this study) assisted the researcher in calculating the minimum sample size. We needed to consider two types of errors:

Type I errors (α), which occur when the null hypothesis is true, but wrongly rejected;

Type II errors (β), which occur when the null hypothesis is false, but not rejected.

Table 5-1 shows the sample size which was required for this study.

Table 5-1: Minimum sample size of experts - the preliminary study

Tail(s)	Two
Effect size d	.65
α err prob	0.05
Power (1-β err prob)	0.95
Minimum sample size	**33**

5.1.1.2 The Method of Analysing Data

The one-sample t-test was used to analyse the expert practitioner questionnaire in order to confirm the proposed indicators. This kind of test was used to determine whether the mean rating for a representative question of each proposed indicator was statistically significant higher than 3.5. The rationale behind choosing 3.5 was that this number falls between "neutral" and "important" on the five-point Likert scale.

Establishing hypotheses:

To test the hypotheses, we set a confidence level of 95% and the alpha α at 0.05. The null and alternative hypotheses were as follows:

Null hypothesis: the mean value of an indicator is equal to or lower than 3.5.

Alternative hypothesis: the mean value of an indicator is higher than 3.5.

In this study, the indicator is accepted when the null hypothesis is rejected ($p < .05$).

5.1.2 A Trial Evaluation of the Confirmed Model: Student Questionnaire

After the confirmation of the indicators, a student questionnaire was designed as a method for evaluating the confirmed model. Students were asked to complete an online self-administered questionnaire relating to their experiences as students on a blended-MOOC course.

The questionnaire had thirty-eight closed-ended questions which were mainly derived from well-established surveys such as the NSSE, the UKES and the SEQ). These questions were organised into three main sections: general information; student engagement (general engagement, MOOC engagement); and open questions (see Appendix B).

1. **General Information**

   This part seeks to gather general information about the course by means of two questions in particular: what was the module's name and how much study time was spent using MOOCs?

2. **Student Engagement**

   The majority of student engagement questions were taken from the NSSE. The questionnaire used a four-point Likert scale as designed in the NSSE instrument, ranging from *very often* (4) to *never (1)*. The rationale behind choosing a 4-point Likert scale was because, when using published scales, it is not a good idea to deviate from the original presentation (including response options) seeing as this might throw some doubt upon the psychometric properties of the questions. Moreover, the same scale was adopted in order to allow a comparison between the results obtained from the users of our model and the others obtained from the original questionnaires (e.g. the NSSE and the UKES).

   Questions in this section are classified into two main themes: viz., general engagement and MOOC engagement:

   - General engagement has five indicators: reflective and integrative learning; higher-order learning; learning strategies; collaborative learning; and student-staff interactions;
   - MOOC engagement has four MOOC-related indicators: MOOC active learning; MOOC collaborative learning; MOOC social interaction; and teaching with MOOCs.

3. **The Open-ended Question**

   We ended the questionnaire with an open-ended question to let participants express themselves and provide comments about the questionnaire and/or the course so as to provide the researcher with better insights as to how to design the main study.

5.1.2.1 Sample

The population of interest consisted of students who had taken a course with MOOC elements (blended-MOOCs). The University of Southampton has offered a number of MOOCs through the FuturLearn platform. Some of these were embedded and used in taught courses. For example, in the 2015/16 academic year, the " WEBS6201: Foundations of Web Science" course and the " MANG3052: Digital Marketing: Engaging with the Customer" course adopted the blended-MOOC methodology. These two courses were selected for

examination for the evaluation, with students from both courses being invited to participate in the questionnaire.

5.1.3 Ethical Approval

The questionnaires used in the preliminary study were reviewed and approved by the Ethical Committee of Electronic and Computer Science at the University of Southampton. This study meets their ethical standards. Its ethics was approved under reference numbers 15021 and 18889 (see Appendix C and Appendix D).

The NSSE items were used with the permission of the College Student Report, National Survey of Student Engagement, Copyright 2001-13 by the Trustees of Indiana University (see Appendix E).

5.2 Results of the Preliminary Study

5.2.1 Results of the Expert Questionnaire

The expert questionnaire survey was carried out over two months (from 10 January, 2015 till 15 March, 2015) with an involvement of thirty-five expert academics and educators/facilitators in the MOOC system.

As shown in Figure 5-1, the participants were from different backgrounds, with:

- 31.43% from Saudi Arabia;
- 28.57% from the UK;
- 17.14% from Malaysia;
- 5.71% from Australia; and
- 2.86% each from Algeria, France, Mexico, Palestine, Sweden, and the United States.

As displayed in Figure 5-2, the MOOC educators involved in this survey constituted 65.7% of the respondents, while 31.4% of respondents were facilitators, with "others" constituting 2.9%. We only accepted academics who taught in the MOOC system. The 2.9% mentioned earlier were respondents who described themselves as both educators and facilitators.

31.4% of the sample had more than two years of teaching experience in the MOOC system, 31.4% had between one to two years of experience in the system, and 37.1% had six months or less (see Figure 5-3).

If one examines Figure 5-4 and Table 5-2, one can discern the fact that they all were in agreement about the importance of all of the indicators. Interestingly,

no participants registered an objection to the importance of any of the following student engagement indicators: reflective and Integrative learning; higher-order learning; student-staff interaction; and MOOC social interaction.

57.1% believed the reflective and integrative learning indicator to be a very important aspect of student engagement in the blended-MOOC context. 8.6%, however, believed the MOOC collaborative learning indicator not to be important.

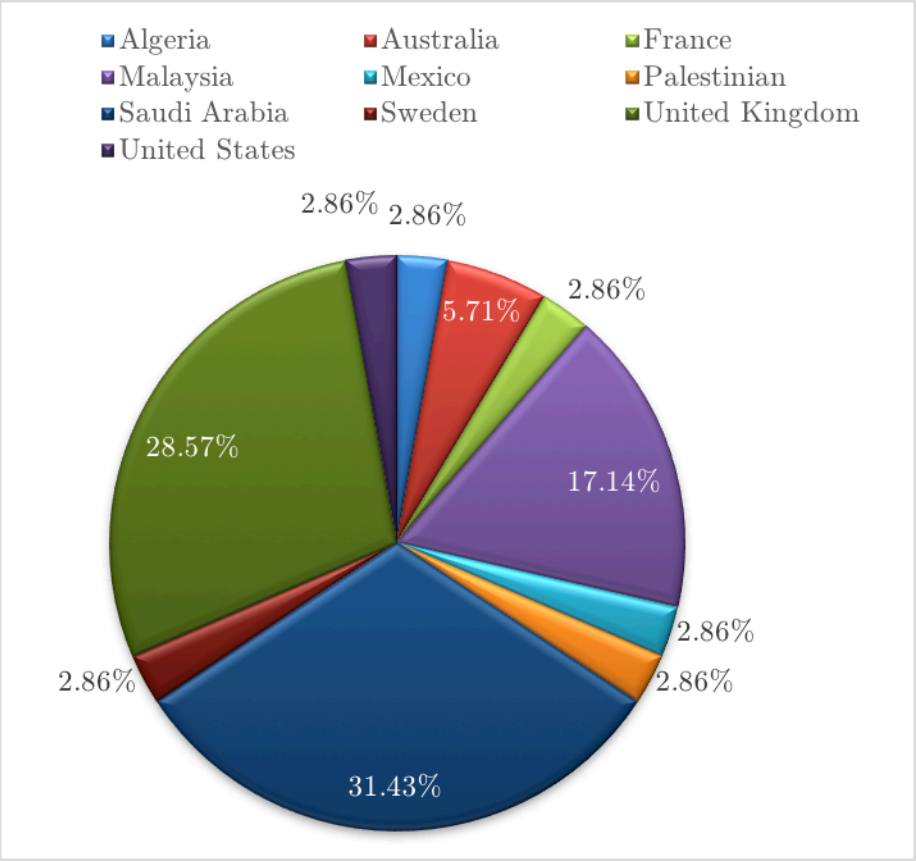

Figure 5-1: Participants by country

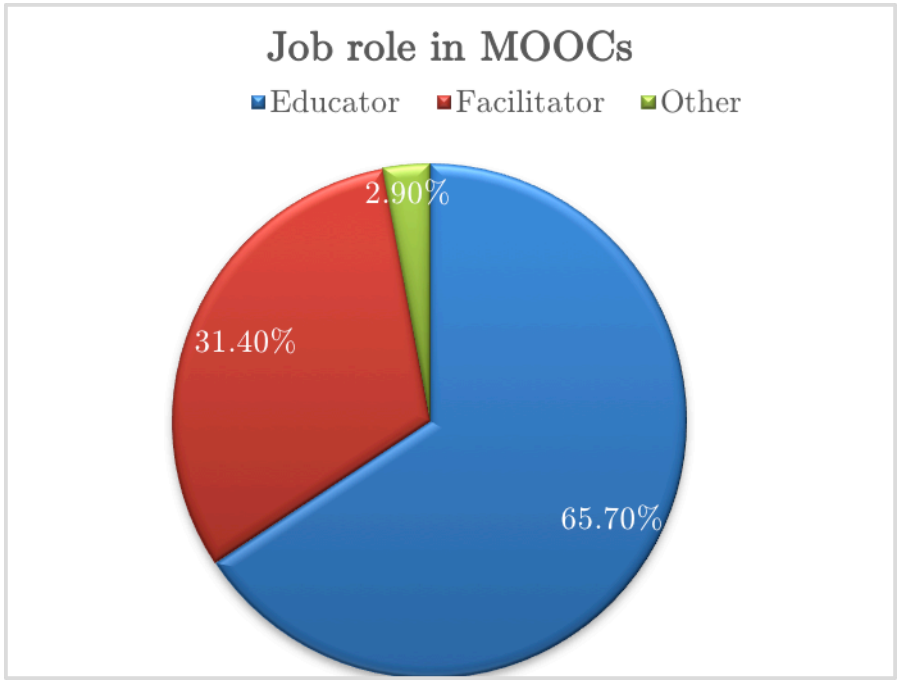

Figure 5-2: Participants by job role

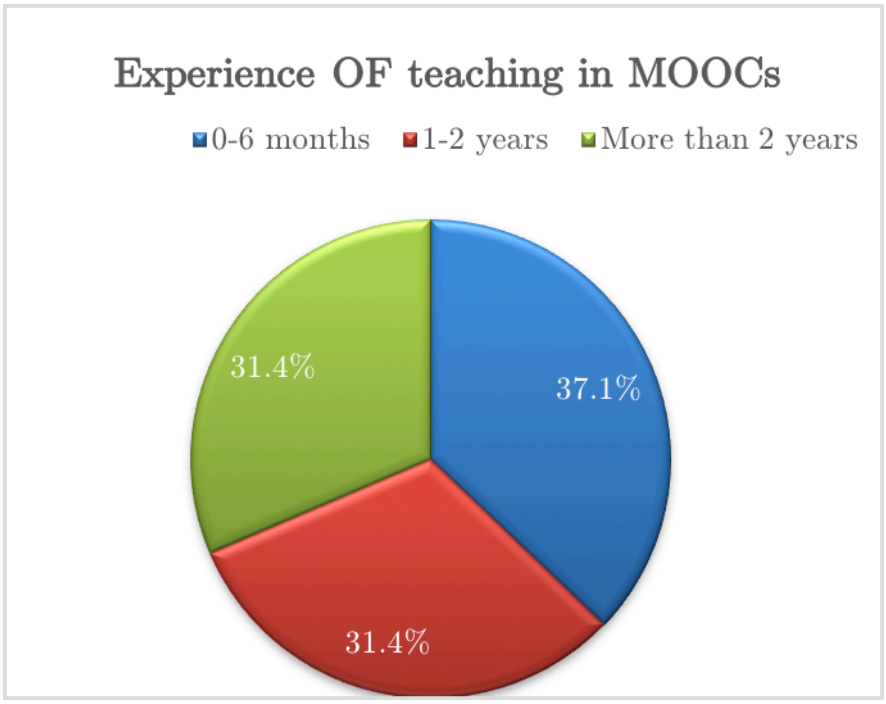

Figure 5-3: Participants by experience

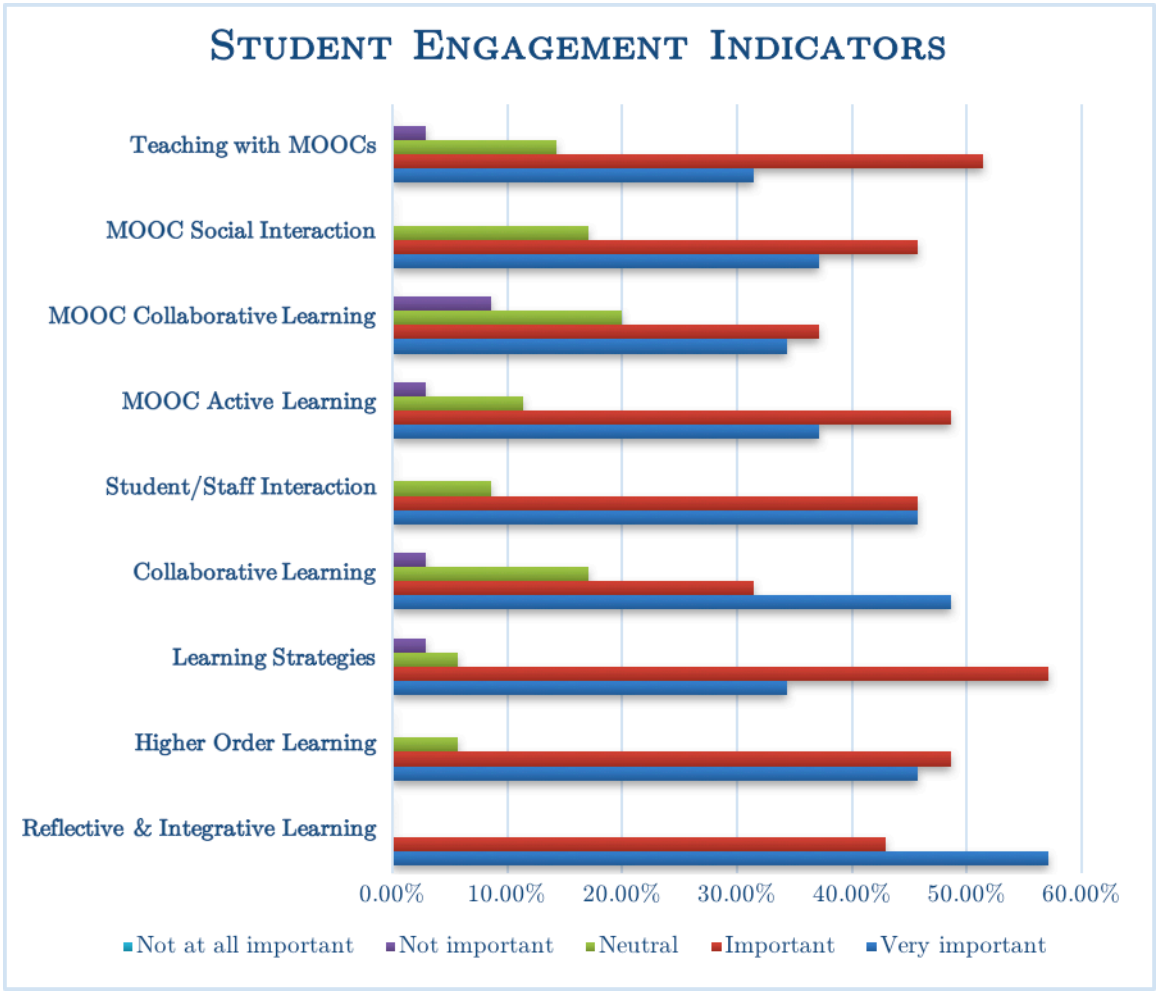

Figure 5-4: Expert survey result - student engagement

As shown in Table 5-2, the analysis of the results indicates that all of the respondents agreed on the importance of the proposed indicators, seeing as the mean value of each indicator was higher than the test value (3.5). The fact that all answers were statistically significant (e.g. p values for all determinants were less than 0.05) confirms that all of the proposed indicators/scales were important to the blended MOOC framework.

Table 5-2: One-sample statistics for all indicators/factors

Student engagement indicator in the blended MOOC context	N	Mean	Std. Deviation	Std. Error Mean	t	Sig. (2-tailed)
Reflective and integrative learning	35	4.57	0.502	0.085	12.62	<.05
Higher-order learning	35	4.4	0.604	0.102	8.81	<.05
Collaborative learning	35	4.26	0.852	0.144	5.52	<.05
Learning strategies	35	4.23	0.69	0.117	6.25	<.05
Student/staff interaction	35	4.37	0.646	0.109	7.89	<.05
MOOC active learning	35	4.2	0.759	0.128	5.45	<.05
MOOC collaborative learning	35	3.97	0.954	0.161	2.92	<.05
MOOC social interaction	35	4.2	0.719	0.122	5.75	<.05
Teaching with MOOCs	35	4.11	0.758	0.128	4.79	<.05

With regards to the open-ended question, the experts made four comments:

- Expert-1 said 'It is important to address internet access and quality, especially in developing and poor countries. Also, MOOCs are just one format. The bottom line is the quality of teaching, facilitation, activities and assessments. So, even though MOOCs can really work, they can just as easily be crap, just as is the case with conventional face-to-face learning. Thus, the focus should be on what works as well as what doesn't work and develop a way with which to make it work.'
- Expert-2 added 'Sometimes the lecturer's style of presentation can be discouraging. There is one MOOC where the lecturers were reading from an iPad kind of device.'
- Expert-3 suggested that 'MOOCs, no matter what its type, is still in its infancy.'
- Expert-4 believe that 'MOOC use will boom in Saudi Arabia due to the number of youths in Saudi Arabia, easy access to the internet, and the possibility that MOOCs in KSA, such as Rwaq or others, may develop an app which may be used on smartphones. I think that MOOCs will contribute to the self-learning environment of Saudi Arabia. We have

many ambitious young males and females, and MOOCs present a solution for people who are geographically far from one another or do not have the ability to go to courses and pay in their cities. It may also present a window for people who want to share their knowledge and ideas, especially where there are important values (this is known as the Zakat of Knowledge). The flexibility of MOOCs, their ease of access and the diversity of knowledge and courses which include skills and behavioural changes will contribute to the future of the Saudi educational environment.'

5.2.2 Results of the Student Questionnaire

The questionnaire was distributed to and collected from students who had taken either the digital marketing or the web science module during the 2015/16 academic year at the University of Southampton. The participants completed questions. These were organised into two categories:

- Thirty-seven student engagement questions which were classified into nine indicators: reflective and integrative learning; higher-order learning; learning strategies; collaborative learning; student-staff interaction; active learning within MOOCs; collaborative learning within MOOCs; social interaction within MOOCs; and teaching within MOOCs.
- One open question asking about their perceptions regarding the questionnaire items and the course design.

As seen in Table 5-3, the participants were comprised of seven students who had attended the Web Science module and six students who had attended the Digital Marketing module. Thus, there was a total of thirteen participants. Another fifteen attempted the questionnaire, but did not complete it.

Table 5-3: General demographic information regarding the student questionnaire

Module	Number of participants	Time spent in the MOOC			
		none	about a quarter	about a half	all or nearly all
Digital marketing	6	0	2	2	2
iPhD Web Science	7	0	2	2	3
Total	13	0	4	4	5

5.2.2.1 Qualitative Data Obtained from the Student Survey

The respondents agreed that the items were meaningful and clear. For example, one participant said that '*the questions were clear to me. However, it would be*

more efficient maybe to keep the survey's length a bit shorter.' Another student, moreover, stated that *'the questionnaire was easy to understand, and the course was really interesting.'*

A small number of participants made comments about the course design. For example:

- One said: *'The MOOC was not currently active when we were taking the module. We were added once it was finished. Thus, there was little, if any, current discussions and support. etc. In that sense, that was just one of the course's major disadvantages. Also, the MOOC was relied on too much with no real teaching, only campus feedback sessions.'*
- Another participant commented: *'I used the MOOC purely for educational materials. I was not interested in the social side of it. That does not, however, detract from my overall impression.'*

5.2.2.2 Reliability and Validity of the Student Questionnaire

The model was built upon three widely used and well-validated models: the NSSE, the UKES and the SEQ. The student questionnaire was reviewed by two experts prior to its distribution to the students in order to highlight any ambiguous or wrong questions.

The reliability of the questionnaire was assessed by relying upon Cronbach's Alpha. Reliability is generally considered to be satisfactory when values are greater than 0.70 (Hair et al., 2006). This score, however, is sensitive to the number of items on the scale. Thus, for short scales, a lower value is acceptable, whereas it is the opposite for longer scales.

Table 5-4 shows that the Cronbach's Alpha value of all apart from two scales were either equal to, or more than, 0.7. The two scales are slightly below the acceptable level, yet satisfactory for short scales. Thus, the constructs were deemed to have adequate reliability.

Table 5-4: Cronbach's Alpha of each indicator

Indicator	Cronbach' s Alpha	N of Items
Integrative & reflective learning	.864	6
Higher-order learning	.700	5
Learning strategies	.513	3
Collaborative learning	.816	4
Student-staff interaction	.714	6
MOOC active learning	.641	5
MOOC collaborative learning	.700	3
MOOC social interaction	.859	2
Teaching with MOOCs	.823	3

5.3 Summary: The Outcomes of the Preliminary Study

This section attempts to answer one of the research questions: viz., RQ2 " Which indicators can be used to measure student engagement in a blended-MOOC course design?"

Upon the review of the student engagement literature, the well-established NSSE model was used, along with two other models (the UKES and the SEQ) in order to build up a model for the full-scale study, as well as to measure student engagement in the context of blended MOOCs.

In this study, an indicator was accepted if the null hypothesis was rejected. Generally, the p-value is required to be .05 or less in order to reject the null hypothesis. The one-sample t-test (as seen in Table 5-2) shows that the p-value of all of the proposed indicators is less than .05. Since the result was found to be statistically significant, the proposed indicators can thus be used to measure student engagement in the blended-MOOC setting.

The results of the questionnaire showed that the experts agreed on the importance of all of the proposed indicators in the context of blended MOOCs. With regards to the qualitative data, most comments were not indicator-related.

Moreover, the findings of the student questionnaire confirmed that: questions in the model look clear and meaningful to most students, and the survey is deemed to have an adequate reliability for all indicators. Thus, the final version of the model would be as follows (Figure 5-5 & Table 5-5):

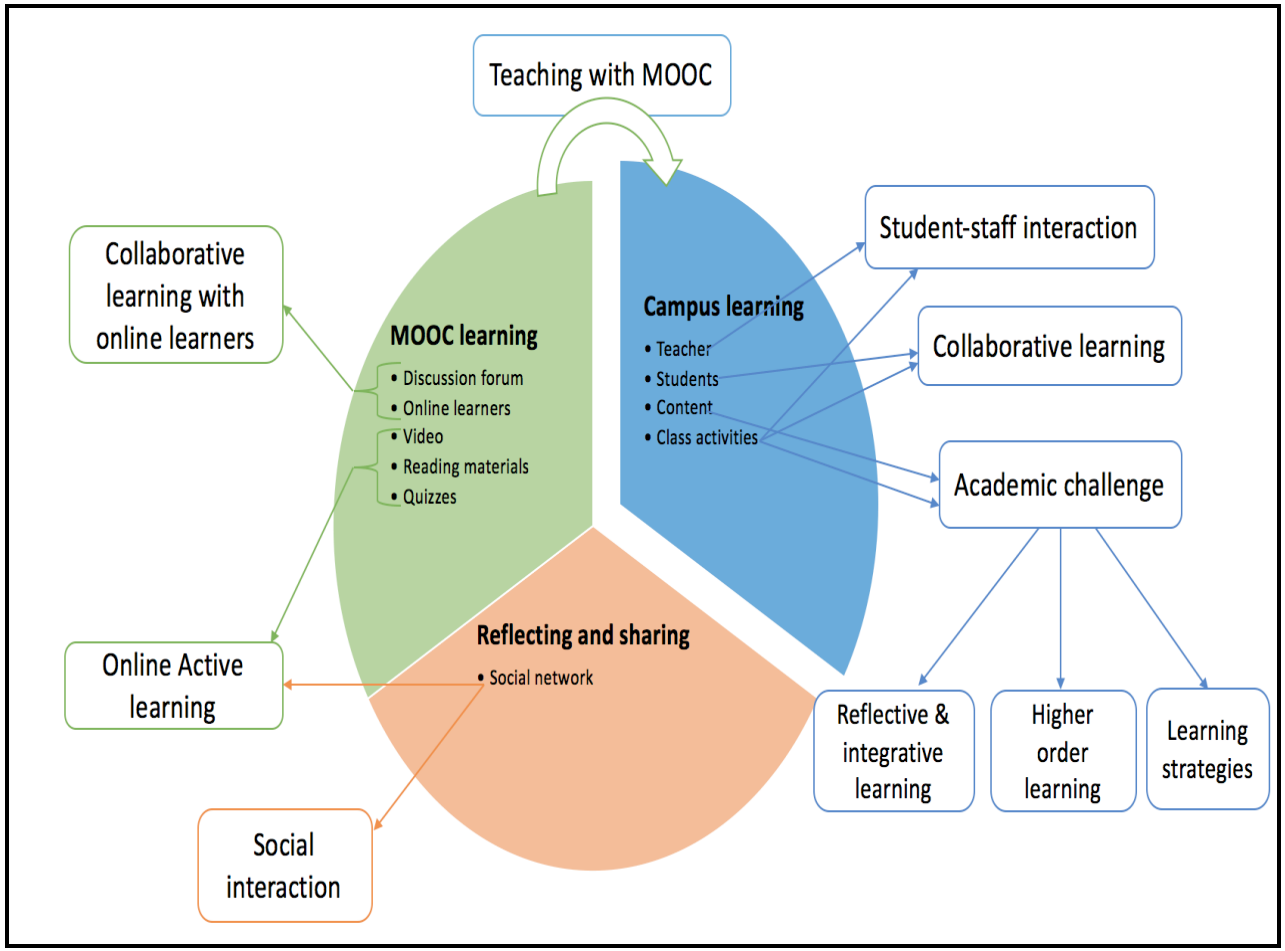

Figure 5-5: The confirmed BMSE model

Table 5-5: The Blended-MOOC Student Engagement (BMSE) Model

Indicators		Items/Metrics	Literature Validity	Preliminary Study Validity
General engagement indicators	Reflective & Integrative Learning	During the module, how often have you: 1. Combined ideas from different courses when completing assignments? 2. Connected your learning to societal problems or issues? 3. Examined the strengths and weaknesses of your own views on a topic or issue? 4. Tried to better understand someone else's views by imagining how an issue looks from his or her perspective? 5. Learned something that changed the way you understand an issue or concept? 6. Connected ideas from your courses to your prior experiences and knowledge?	NSSE, UKES	1. The p value of all indicators is less than 0.05, which means we reject the null hypothesis, and the indicator is accepted as a scale in measuring student engagement in the context of blended MOOCs. 2. The model was meaningful and clear to the participants. 3. The Cronbach alpha showed that the indicators had an adequate reliability.
	Higher-order Learning	During the module, how much has your coursework emphasized the following? 1. Memorising course material 2. Applying facts, theories, or methods to practical problems or new situations 3. Analysing an idea, experience, or line of reasoning in-depth by examining its parts 4. Evaluating a point-of-view, decision, or information source 5. Forming a new idea or understanding from various pieces of information		
	Learning Strategies	During the module, how often have you: 1. Identified key information from reading assignments? 2. Reviewed your notes after class? 3. Summarised what you learned in class or from course materials?	NSSE	

	Collaborative Learning	During the module, how often have you: 1. Asked another student to help you understand course material? 2. Explained course material to one or more students? 3. Prepared for exams by discussing or working through course material with other students? 4. Worked with other students on course projects or assignments?	NSSE, UKES	
	Student/Staff Interaction	About how often have you done each of the following? 1. Asked questions in taught sessions or contributed to discussions about course material in other ways; 2. Discussed your academic performance and/or feedback with teaching staff; 3. Talked about your career plans with teaching staff or advisors; 4. Discussed ideas from your course with teaching staff outside taught sessions, including by email/online; 5. Worked with teaching staff on activities other than coursework; 6. Made significant changes to your work based on feedback.	UKES	
MOOC engagement indicators	Active Learning within MOOCs	During the course, to what extent have you experienced the following? 1. Found that MOOC materials challenged you to learn; 2. Used MOOC resources to improve your learning; 3. Used MOOC materials to make lectures more meaningful; 4. Used MOOC quizzes to improve your understanding of a topic; **5.** Shared and reflected on what you learned about in the MOOC course through blogs, micro-blogging, discussion spaces etc.] – from researcher.	SEQ	

	Collaborative Learning within MOOCs	During the module, how often have you: 1. Asked another online learner to help you understand course material? 2. Explained course material to one or more online learners? 3. Posted a question in the MOOC discussion forum- from researcher?	NSSE, UKES	
	Social Interaction within MOOCs	During the course, about how often have you done the following? 1. Had helpful online conversations with others; 2. Used MOOC tools (discussion spaces, social media, and emails) to communicate with others?	SEQ	
	Teaching within MOOCs	During the course, to what extent have you experienced the following? 1. Teaching staff used MOOC materials to discuss interesting issues; 2. Staff used MOOCs in ways that improved their overall teaching; 3. Staff used MOOCs to provide students with extra assistance.		

Chapter 6. Research Methodology

This chapter focuses on the procedural steps that were undertaken in order to obtain the necessary data for the current study. The chapter provides an overview of the research hypotheses, data collection methods, study design, instrumentation, study sampling, and population and study variables. It also discusses how the study was implemented. Finally, the chapter outlines the statistical tests used to analyse the data, as well as ethical considerations.

6.1 Research Hypotheses

The main purpose of this research is to examine the effect of using the blended-MOOC course design in the institutions of Saudi women' s higher education. To accomplish that, two methods of teaching were examined and compared. Those teaching methods were usual face-to-face teaching and blended-MOOC. Table 6-1 presents the research questions, with each research question being associated with its null and alternative hypotheses.

Table 6-1: Research hypotheses for each research question

Research Question	Null Hypothesis	Alternative Hypothesis
RQ-1: How does integrating MOOCs into campus courses impact the student engagement of Saudi women's higher education?	There is no statistically significant difference (at the 0.05 level) between the engagement indicator of students who were taught with the face-to-face teaching method and the engagement indicator of students who were taught with the blended MOOC style.	There is a statistically significant difference (at the 0.05 level) between the engagement indicator of students who were taught with the face-to-face teaching method and the engagement indicator of students who were taught with the blended MOOC style.
RQ-3: What is the relationship between student engagement indicators and time spent on MOOC systems?	There is no statistically significant relationship (at the 0.05 level) between weekly time spent on the MOOC and the engagement indicators.	There is a statistically significant relationship (at the 0.05 level) between weekly time spent on the MOOC and the engagement indicators.
RQ-4: Are particular patterns, similarities or differences in engagement evident when the behaviours of students in blended-MOOCs are classified based on institution?	There is no statistically significant difference (at the 0.05 level) between the engagement indicators of students who were exposed to the blended-MOOC method based on the institution.	There is a statistically significant difference (at the 0.05 level) between the engagement indicators of students who were exposed to the blended-MOOC method based on the institution.

6.2 Research Method

The research used a triangulated mixed-methods design for collecting the necessary data. That is, the study used both quantitative and qualitative methods for answering the research problem.

Experimental studies were used as quantitative methods. Creswell (2012, p. 294) defines experimental studies as 'procedures in quantitative research in which the investigator determines whether an activity or materials make a difference in results for participants.' The experimental study is the most powerful quantitative research method if the aim of the research is that of establishing cause-and-effect relationships between two or more variables (Gall et al. 1996, p. 463).

Since the current research seeks to study the impact of using the blended MOOC method on student engagement, the experimental method would be the most effective.

To best understand the research problem, the researcher triangulated the quantitative results gathered from the experimental study with three different methods of qualitative research. Those qualitative methods are:

1. **Semi-structured interviews:** the researcher interviewed with three lecturers, asking them pre-determined open questions and allowing them to demonstrate their particular responses in order to best understand the phenomena.
2. **Students' comments and notes:** in the last part of the questionnaire, two open questions were asked regarding: 1) their opinions about the course and 2) any limitations or challenges that they encountered when using the MOOC system.
3. **The research's observations:** the researcher was a member of the online study group, so she was able to observe some of the students' activities and discussions.

The reason for using a triangulation design is to best understand the research problem and explain more fully the complexity of student behaviours and engagement by examining it from more than one perspective. Table 6-2 summarises the methods which were used in this study.

Table 6-2: The research methods, reasons and participants

Research methods	Reasons	Participants
The experimental method, which is considered to be a quantitative method.	To establish cause-and-effect relationships between two or more variables.	Saudi female students who were taking the Artificial Intelligence course during the 2016/17 academic year from three different Saudi universities.
1. Semi-structured interviews with three lecturers; 2. students' comments; and 3. the researcher's own observations all of which were used as qualitative methods.	• To compare and contrast quantitative results with qualitative findings; • To validate and expand quantitative results with qualitative data; • To explain more fully the complexity and richness of student engagement.	1. Three lecturers were interviewed from each participating institution. 2. The students were given two open questions where they could express themselves and give their opinions regarding the course.

6.3 Research Design

The experimental design which was selected to test the hypotheses was counterbalanced within-subjects. The within-subjects design is also called the repeated-measures design because the study repeats the same measures on the same participants with different treatments and at different times. It is usually used to compare different treatment conditions or to investigate changes occurring over time. This is in contrast to a between-subjects design, which is an experimental design which involves more than one group, with each group being tested concurrently by a different testing factor.

The within-subjects design was chosen for ethical and practical reasons. These include:

- It is reasonable to assume that students mix outside of lessons and share ideas, potentially contaminating the results, especially if they know that

the MOOC materials are related to their studies and, ergo, might be beneficial to them;

- It would be unethical to withhold treatment from a control group;
- The within-subjects design eliminates all of the problems associated with individual differences;
- The within-subjects design usually requires fewer participants.

In spite of these advantages, the design has some drawbacks. One of the major drawbacks is carryover effects, where the first experiment adversely affects the others. For example, participants are more confident after the first treatment because the experience of the first test has carried over and has affected the second test. Therefore, for many experiments, it is preferred to use a counterbalanced design, where all possible orders of treatments are included. For that reason, the counterbalanced design was utilised for this research. The research had two groups; each group had a different order of treatments, as illustrated in Figure 6-1 and Table 6-3.

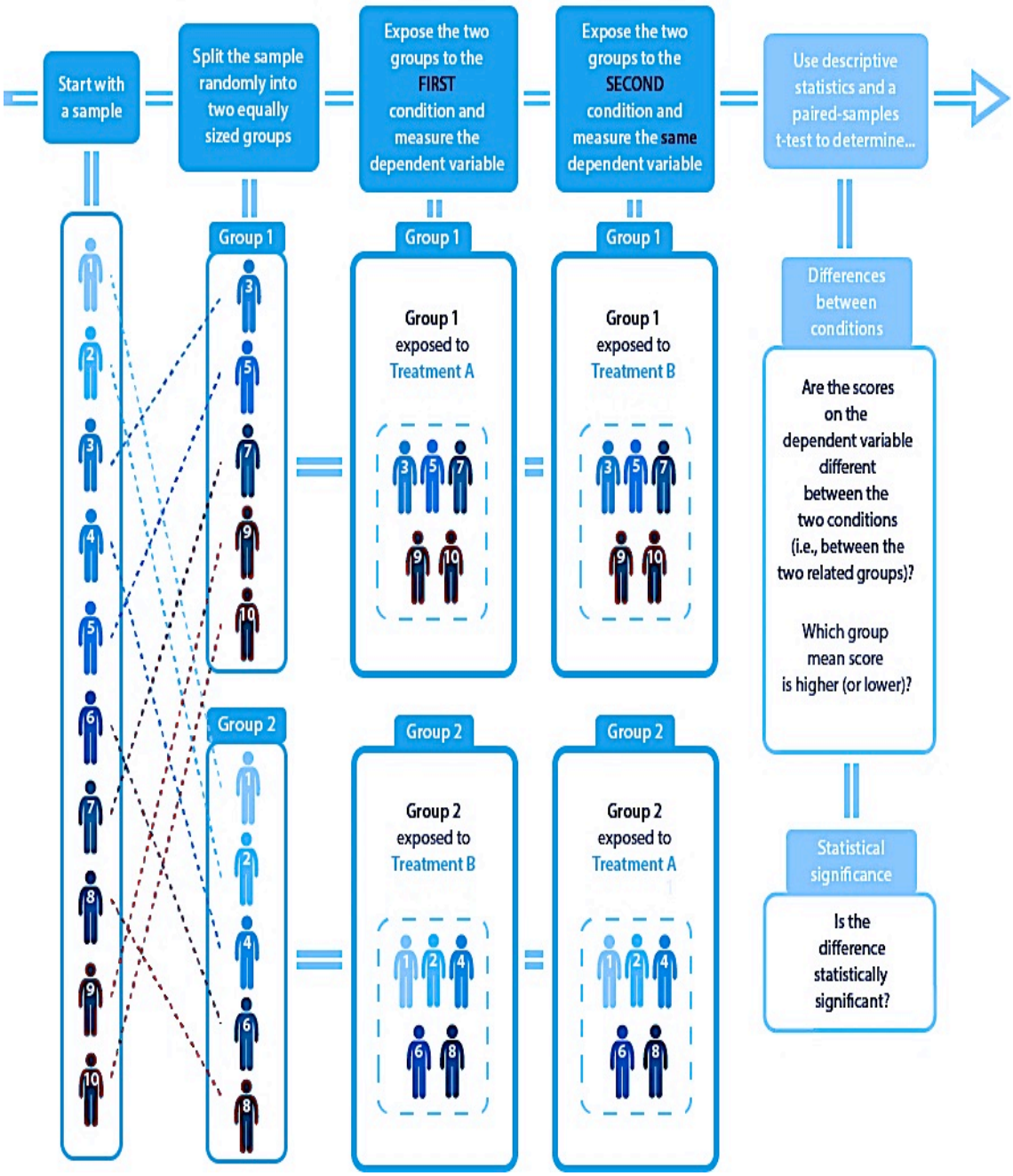

Figure 6-1: A counterbalanced within-subjects design (source: https://statistics.laerd.com/premium/spss/pstt/paired-samples-t-test-in-spss-4.php)

Table 6-3: Order of treatment for the current research

	Location	No. of Participants	Order of Treatment
Group 1	Imam Mohammad bin Saud University in Riyadh and Taif University in Taif.	72 participants; 49 students from Imam Mohammad bin Saud University and 23 from Taif University	Face-to-face teaching→first survey→blended MOOC→second survey
Group 2	King Khalid University in Abha	70 participants from King Khalid University	Blended MOOC →first survey→ Face-to-face teaching→second survey

6.4 Research Instruments and Materials

This section presents the instruments and materials used to achieve the research objectives.

6.4.1 Teaching Unit

The preparation of the teaching unit contained the following:

6.4.1.1 The Selection of the Teaching Unit and MOOC Materials

Only a limited number of modules were suitable for the study due to the constraint of matching curriculums with MOOC resources available online. The Artificial Intelligence (AI) course was selected for a number of reasons:

- The campus AI lecturers at all participating universities had shown their willingness to assist the researcher to carry out her experiment.
- The campus course aligned very well within an existing MOOC that had had good publicity. The MOOC was called "*Intro to Artificial Intelligence*" and was offered by two eminent computer scientists:
    1. Peter Norvig, who is Director of Research at Google Inc. He is also a Fellow of the American Association for Artificial Intelligence and the Association for Computing Machinery.
       Norvig is a co-author of the popular textbook *Artificial Intelligence: A Modern Approach*. This book was assigned to most Saudi universities as a textbook in the AI course.
    2. Sebastian Thrun, who is a Research Professor of Computer Science at Stanford University.

The first run of the AI MOOC was conducted in 2011 with 160,000 registered learners, of which 20,000 completed all of the coursework (Rodriguez, 2012).

Ever since, the course has been run as a self-paced course and offers interactive quizzes, mid-term exam samples, additional reading materials and a discussion board.

6.4.1.2 Matching the Main Topics of the On-campus Course with MOOC Components

The textbook used for the campus course is *Artificial Intelligence: A Modern Approach* by Russell, Staurt J., and Peter Norvig. The main topics that should be covered in the course are:

Introduction:
What Is Ai?
The Foundations of Artificial Intelligence
The History of Artificial Intelligence
The State of the Art

Intelligent Agents:
How Agents Should Act
Structure of Intelligent Agents
Environments

Solving Problems by Searching:
Problem-Solving Agents
Search Strategies
Breadth-First Search
Uninformed Cost Search
Depth-First Search
Depth-Limited Search

Informed (Heuristic) Search Strategies:
Best first search
Heuristic Functions
A* search

Game includes:
Games as Search Problems
State-of-the-Art Game Programs
Chess
Checkers or Draughts
Tic-tac-toe
Alternative Approaches

Knowledge and Reasoning:
Knowledge-Based Agents
The Wumpus World
Representation, Reasoning and Logic
Propositional Logic: Avery Simple Logic
First-Order Logic

Planning:
Definition of Planning
Algorithms for Planning as State-Space Search
Planning Graphs
Other Classical Planning Approaches

Learning:
Forms of Learning
Supervised Learning
Linear Regression
Artificial Neural Networks
Non-parametric Models
Support Vector Machines

Reinforcement Learning:
Passive Reinforcement Learning
Active Reinforcement Learning
Generalisation in Reinforcement Learning

Perception:
Image Formation
Image-Processing Operations
Reconstructing the 3D World
Object Representation and Recognition

There was a good match between these topics and the MOOC content. However, the researcher and the lecturers worked together in aligning and matching the topics of the campus and the MOOC for two weeks prior to the actual application of the experiment (see Appendix F).

6.4.2 Student Questionnaire

The questionnaire used in the experimental study was an outcome of the preliminary study. As seen in Chapter 5, the questions in the questionnaire were classified into four sections:

1. **General Information:** this section asked students general questions including: university name, hours spent in MOOCs/week and student's satisfaction and intention to use the MOOC system in the future.
2. **General Engagement:** this section of the questionnaire was concerned on the general aspects of student engagement. It has five indicators which were drawn from the NSSE and the UKES (see Chapter 5). Each indicator asks a number of closed questions, ranging from (Very often =4) to (Never =1) or (Very much =4) to (Very little =1).
3. **MOOC Engagement:** this section focused on the online (MOOC) part of their student engagement. It includes four indicators adapted from the SEQ and the NSSE (see Chapter 5). Those indicators also asked a number of closed questions, ranging from (Very often =4) to (Never =1).
4. **Open Questions:** this part had two questions: one asked students about their opinions regarding the course, while the other asked them about any challenges they encountered during the use of the MOOC system.

A full version of the student questionnaire can be found in Appendix G.

6.4.3 Interviews with Lecturers

The semi-structured interview was conducted with three different lecturers (i.e. one from each participating institution). The interview was conducted in English. Hand-written notes and recordings were used for the interviews based on the interviewee's preference. The interview's questions were derived from the confirmed model. The interview's questions are available in Appendix H.

6.5 Study Population

"Target population" refers to all the individuals or objects of interest that the researcher wishes to study and investigate. The target population of this research involved all the female undergraduates from all of the universities in the Kingdom of Saudi Arabia (i.e. twenty-four in total) who studied the aforementioned Artificial Intelligence course during the first semester of the academic year of 2016/17.

6.6 Study Sampling and Sample

6.6.1 Sampling

Sampling is one of the most important processes of any research. Gay (1976, p. 66) describes the sampling process as 'the process of selecting a number of individuals for a study in such a way that the individuals represent the larger group from which they were selected.'

A multi-stage random sampling was used to select this study's sample. Multi-stage sampling is a more complex form of cluster sampling which contains two or more stages of sample selection. Cluster sampling is used when the whole population is subdivided into clusters, or groups. The simple random sampling method (SRS) is then applied in order to choose one or more clusters as a study sample.

The reasons for using cluster, or multi-stage, sampling designs over other sampling techniques are that:

- Multi-stage sampling is more effective when obtaining a list of all of the elements in the population is difficult and costly, whereas a list of clusters is easy and cheap (Scheaffer et al., 2011). For example, in this study, it would have been time consuming and expensive to compile all the university students who had taken part in the *Artificial Intelligence* course from all over the country. A list of all of the universities who had offered the course, though, was readily available.
- The cluster and multi-stage sampling designs are useful if the cost of obtaining data increases when the sampled members are spread over a large geographic area. Like in this study, the universities were spread over 2.15 million km² (the country's area). Thus, sampling clusters of members who are geographically close together is often more economical (Scheaffer et al., 2011).

In this research, the whole population was divided into clusters based on region; then, by using simple random sampling, three regions were chosen from the thirteen regions overall. From each region which was chosen, one university was randomly selected (see Figure 6-2). In that way, three universities were selected for inclusion in this study, including: Imam Mohammad ibn Saud Islamic University, Taif University (TU) and King Khalid University (KKU).

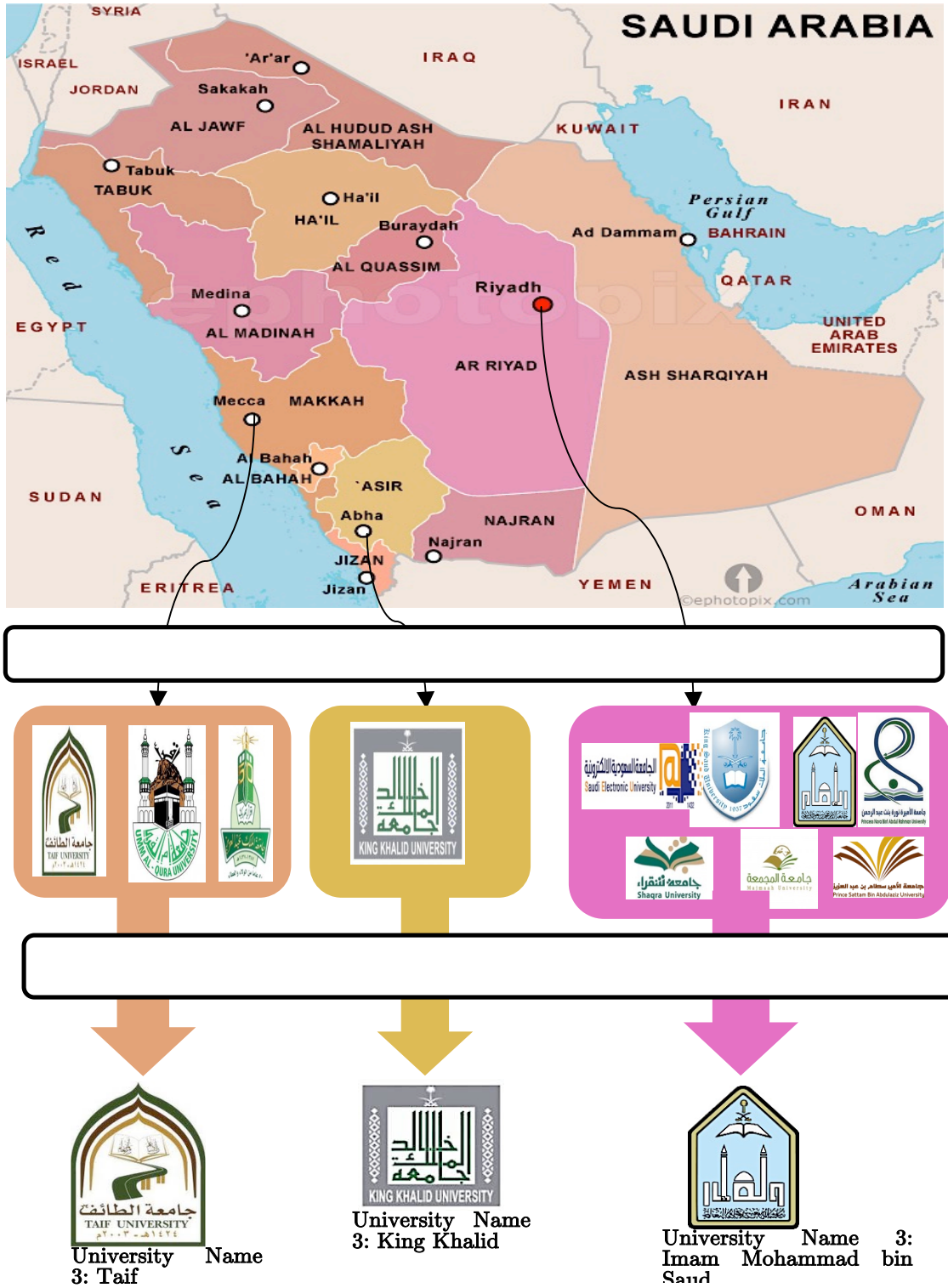

Figure 6-2: Multi-stage cluster sampling method for this study

6.6.2 Sample

The sample is defined as 'a set of elements taken from a larger population according to certain rules' (Johnson, Burke & Christensen 2008, p. 223). The participants were undergraduate students who had taken the *Artificial Intelligence* course during the 2016/17 academic year. All of the participants were from the Departments of Information and Computer Sciences at each of the three different female universities selected for this study. The universities which were to be studied are located in different provinces (see Table 6-4).

Table 6-4: A brief description of the participating universities

University	Description
Imam Mohammad ibn Saud Islamic University	• It was founded in 1974 and located in Riyadh, which is the capital of Saudi Arabia and is located in a central region of the country. • It is one of the largest universities in Saudi Arabia. • It was one of the first Saudi universities that offered distance education courses leading to bachelor degrees. • A Deanship for e-Learning and Distance Learning at the university was founded in 2008. • In the academic year 2011/12, it had 121,738 undergraduate students.[16]
Taif University (TU)	• It was established in 2003 and is located in the eastern province of Makkah and, more specifically, in the city of Taif. • A Deanship for e-Learning and Distance Learning at the university was founded in 2013. • In the academic year 2009/10, the university had around 37,433 students.[17]
King Khalid University (KKU)	• It was founded in 1998 and is located in the Asir Province in south-west Saudi Arabia. • Its colleges are distributed over several cities and towns, including Abha, - the largest city in the Asir province. The study was conducted specifically at its Abha branch. • The region where the university is located is very close to the border with Yemen, as seen in Figure 6-2). Thus, the region can be easily affected by a conflict between Saudi Arabia and Yemen seeing as a number of missiles have been launched towards those regions[18][19] since the start of the current conflict in 2015. • A Deanship for e-Learning and Distance Learning at the King Khalid University was established in 2006. • In the academic year of 2013/14, the university had 83,000 students.[20]

There was an initial total of one hundred and forty-two participants for this study; twenty-three were from Taif University, forty-nine were from Imam Mohammad bin Saud University, and seventy were from King Khalid University. Upon further statistical analysis, that number was then limited to one hundred and eight participants (see Table 6-5); with thirty-eight

[16] https://imamu.edu.sa/en/about/Pages/statistics.aspx.
[17] http://www.tu.edu.sa/en/AboutUs/Pages/default.aspx.
[18] https://www.theguardian.com/world/2015/oct/15/saudi-arabia-strike-response-houthi-scud-attack-forgotten-war.
[19] http://www.bbc.co.uk/news/world-middle-east-33033842#share-tools.
[20] https://ar.wikipedia.org/wiki/جامعة_الملك_خالد

participants coming from Imam University, forty-nine from Khalid University, and twenty-one from Taif University. This was due to the exclusion of some cases; namely:

- Participants who did not participate in both of the surveys (i.e. the face-to-face and blended-MOOC questionnaires); and
- Participants who had to retake the module.

The number of participants in each of the sample groups is acceptable and consistent with Fogelman & Comber (2007), who suggest that fifteen subjects per group is an acceptable number in experimental studies.

With regards to the interview sample, a lecturer from each of the universities was interviewed (i.e. three lecturers were interviewed).

Table 6-5: Participants based on university

University	No. of participants
Imam Mohammad bin Saud University	38
Taif University	21
King Khalid University	49
Total	108

6.7 Study Variables

Gay (1976, p. 202) posits that 'in an experimental study, the researcher manipulates at least one independent variable, controls other relevant variables, and observes the effect on one or more dependent variables.' This section describes each of the independent and dependent variables which were tested in this study.

6.7.1 Independent Variables

The independent variable is that which is manipulated by the researcher for the purpose of determining its effect on dependent variables (Creswell, 2012). The current study, though, has one independent variable with are divided into two levels based on teaching methods:

- the use of the typical face-to-face teaching method in the teaching of the *Artificial Intelligence* course; and
- the use of the blended-MOOC method in the teaching the *Artificial Intelligence* course.

6.7.2 Dependent Variables

Tuckman & Harper (2012, p. 82) defines a dependent variable as ' an outcome observed or measured following manipulation or measurement of the independent variable to determine the presumed effect of the independent variable.' In the current study, the general engagement indicators are considered to be dependent variables, including: integrative & reflective learning; higher-order learning; learning strategies; collaborative learning; and student-staff interaction.

6.7.3 Control of Extraneous Variables

An extraneous variable is any variable that may affect the dependent variable. Those variables can be controlled by a number of techniques, such as randomisation, counterbalancing, or by building the extraneous variable (or variables) into the design (Tuckman and Harper, 2012).
In order to control the extraneous variables of this study, the researcher used the following techniques:

- **Randomisation**: The selection of both the regions and universities were based on random sampling. Johnson, Burke & Christensen (2008, p. 297) state that 'random assignment maximizes the probability that potentially confounding extraneous variables, known and unknown, will not systematically bias the result of the study.'
- **Counterbalancing:** Counterbalancing is usually done to control and eliminate an order effect where an equal number of subjects run through the various possible ways of ordering the treatments. This technique was used in this research, as mentioned earlier in this chapter, with the participant being divided into two groups, with each group being administered the treatments in a different order.
- **Homogeneous Sample:** The homogenisation of samples is done by '[making] every effort to ensure that the groups are as equivalent as possible on all variables except the independent variable' (Gay 1976, p. 162). The use of the within-subjects design helps minimise problems associated with individual differences. The process of equating across sample groups, however, has been confirmed in relation to the following variables: age, gender, English proficiency, and IT skill. All participants were women between the ages of 19 and 22 who all participated in a foundation year with intensive courses in English and IT.

6.8 The Process of Implementing the Experiment

The usual face-to-face teaching method used in most Saudi women's universities is teacher-oriented where the lessons are taught by the teacher, usually by using PowerPoint accompanied with a verbal explanation or lecture. Those presentations are usually delivered to the students via Blackboard beforehand (Alhareth et al., 2015).

The proposed intervention (i.e. the blended-MOOC method), on the other hand, adapted a flipped classroom design. The flipped classroom design is a form of blended learning where students learn and watch course content online before class so that they can use class time for the purpose of deepening their understanding by means of group projects, discussions and homework.

In this study, the students learned fundamental concepts independently at home by watching MOOC videos and by reviewing their understanding by taking MOOC quizzes. Then, they came to class prepared to obtain further materials, engage in group discussions, and ask questions about the lesson.

The intervention itself has three main phases (see Figure 6-3):

1. The first phase, "Learning via the MOOC platform" takes place before class. This is when the students either watch or read MOOC materials at their own pace and then evaluate their understanding by taking online quizzes on the MOOC platform.
2. The second phase, "Face-to-Face Learning" takes place during class time. This is when the students come to class in order to participate in more detailed lectures, discussions and further activities, as well as for the purpose of obtaining more materials relating to the MOOC resources provided them.
3. The last phase, "Online Collaborative Learning" takes place after class. This is when the students can reflect upon and share what they learned, both before and during the lesson, and discuss it with others through discussion forums and/or on social networks.

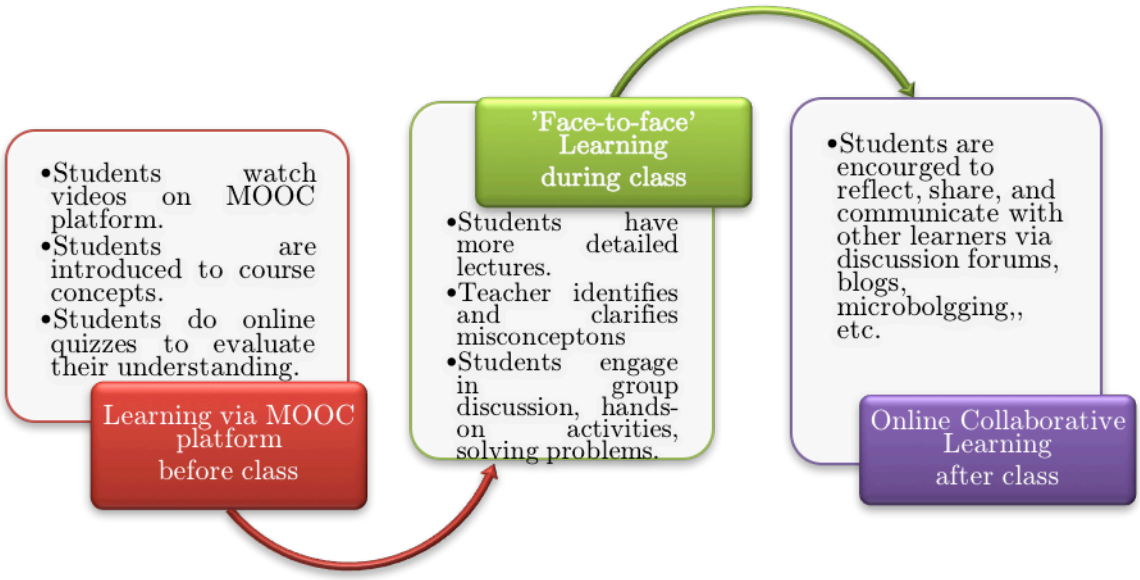

Figure 6-3: Intervention Phases

After the selection of the teaching unit, the researcher started the application of the experiment study in accordance with the following steps:

1. Three regions were randomly selected. From each selected region, one university was selected by using the simple random sampling technique;
2. The researcher received approvals from the three universities to carry out her experiment;
3. The researcher's supervisor issued a letter to the Saudi cultural attaché in London to facilitate with the implementation of the experimental study in Saudi Arabia;
4. The researcher worked for two weeks with the lecturers on the alignment between the campus and the MOOC lessons. This was done on 4 September, 2016, - two weeks prior to the start of the 2016/17 academic year. The summary of that work can be found in Appendix F.
5. The participants were divided into two groups who received the treatments in different orders:
    - The first group consisted of the participants from two of the three selected universities: 1) the Imam Mohammad bin Saud University located in Riyadh and 2) Taif University located in Taif. They were randomly assigned to the first order of treatment, as shown in Figure 6-4;

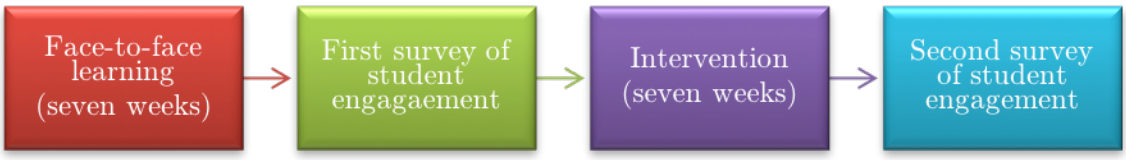

Figure 6-4: Timeline of the first group

- The second group were the participants from King Khalid University. They underwent the same procedure as the first group. The only difference was that the order of teaching methods that they were exposed to was reversed. They adhered to the following timeline (Figure 6-5):

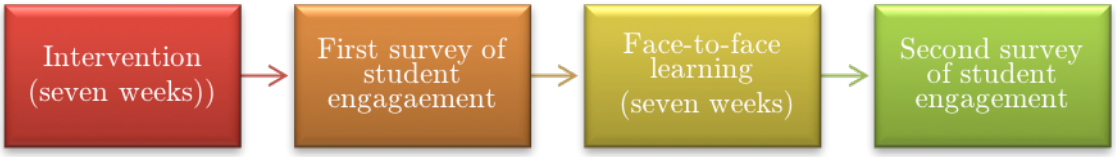

Figure 6-5: Timeline of the second group

6. The first teaching method was administered to each group on 18 September, 2016, respective of which group they were in;
7. Create an online study group (using the *What'sApp* application) to open up further space for more discussions and collaborative work to be taken place throughout the experience. The *What'sApp* application was chosen based on students' preferences
8. The following steps were taken to introduce the participants to the intervention phase:
    - Present a presentation on what the intervention is and how to register onto the AI MOOC in order to ensure that everyone registered;
    - Use the online study group to refer the students to the lessons and videos that were related to their campus study.
9. After seven weeks, on 31 October, 2016, all of the participants were invited to complete the first online self-administered questionnaire relating to their experiences as students based on the teaching method that had been used with them during the first seven weeks of their module;
10. On 6 November, 2016, the teaching method administered to the groups was reversed;

11. After another seven weeks, on 1 January, 2017, the participants were asked again to complete the second self-administered questionnaire relating to their experiences as students based on the teaching method that had been used with them during the second seven weeks of their module;
12. The researcher interviewed the lecturers between 15 and 20 January, 2017.

6.9 Statistical Tests

The data obtained from the research instruments were analysed using the Statistical Package for Social Sciences (SPSS) programme, Version 24. The analysis procedure went as follows:

1. A paired t-test (also called a dependent t-test) was carried out to examine whether there was any statistically significant difference (at the 0.05 level) between the engagement indicator of the students who were taught using the face-to-face learning method and the engagement indicator of the students who were taught using the blended-MOOCs learning method. The paired t-test is an appropriate tool if one wishes to compare between two related groups (such as before and after the intervention) (Morgan, 2004);
2. Analysis Of Variance (ANOVA) was used to investigate whether there were any statistically significant differences (at the 0.05 level) between the engagement indicators of students who were taught using the blended-MOOC method based on their institution. ANOVA is a suitable tool if one wants to compare the means of three or more groups (Morgan, 2004). As part of this study aims to compare between the three participating institutions, ANOVA was utilized;
3. The Spearman's rank correlation was deployed to investigate the relationship between the engagement indicators and the weekly time spent on the MOOC system in the study sample. The Spearman's rank correlation usually used to identify and understand the strength and directions of a relationship between two variables (Morgan, 2004).
4. Elliot & Sammons (2004) and Dreder (2005) argued that researchers should not rely solely on statistical significance for the purpose of addressing their research problem, but should also consider practical significance by calculating the effect size. Two measures of the effect size were considered in this study:

    I. Cohen's d which is commonly used for mean differences (including t-tests) (Morgan, 2004). The Cohen's d can be calculated to identify the size of effect of the independent

variable (methods of teaching) on the dependent variables (engagement indicators). The calculation of the effect size was done by means of two steps:

1. Calculating the mean difference between the two groups;
2. Dividing it by the pooled standard deviation.

$$d = M_1 - M_2 / S_{pooled}$$

II. Eta squared (η^2) which is commonly used with analysis of variance contexts (such as ANOVA) (Olejnik and Algina, 2003). The eta squared (η^2) was calculated to identify the size of effect of the independent variable (institution) on the dependent variables (engagement indicators). This can be done as follows:

$$\eta^2 = SS_{effect} / SS_{total}, \text{ where}$$

SS_{effect} is the sums of squares for whatever effect is of interest.

SS_{total} is the total sums of squares for *all* effects, errors and interactions in the ANOVA study.

6.10 Ethical Considerations

The study meets with the ethical standards of the University of Southampton seeing as both the questionnaire and the interview questions which were to be used in this study were reviewed and approved by the Ethical Committee of the Faculty of Physical Science and Engineering (FPSE) at the University of Southampton under the reference numbers 18889 and 20778 (see Appendix D and Appendix I).

The NSSE items were used with the permission of College Student Report, National Survey of Student Engagement, Copyright 2001-13 the Trustees of Indiana University (see Appendix E).

6.11 Summary

This chapter aimed at describing the methodology of the research by discussing the study's hypothesis; design; data collection methods, and variables. Table 6-6 shows a summary of the chapter overall.

The counterbalanced within-subjects experimental design was selected in order to test the hypotheses. The results of the experiment were triangulated with the

qualitative findings gathered from the interviews with the three lecturers, the researcher's observations, and the students' comments.

The chapter also illustrated the sampling method which was used for selecting the study sample. Multi-stage random sampling was used in order to select the participants. The participants were computer science undergraduate students who applied for the *Artificial Intelligence* course during the 2016/17 academic year. These were female students from three different Saudi universities.

The chapter also explained the implementation process of the experiment and the instruments used to assess the change in student engagement. Finally, the chapter outlined the statistical tests which were used to analyse the data, as well as the study's ethical issues.

The next chapter presents the results of the experiment and the qualitative data which was obtained.

Table 6-6: The summary of the methodology chapter

Research Question	Null Hypothesis	Methods	Statistical Tests
RQ-1: How does integrating MOOCs into campus courses impact student engagement in Saudi women's higher education?	There is no statistically significant difference (at the 0.05 level) between the engagement indicator of students who were taught using the face-to-face learning method and the engagement indicator of the students who were taught using the blended MOOCs learning method.	Student questionnaire (post-tests), interviews, researcher's observations and students' comments.	Paired t-test, thematic analysis.
RQ-3: What are the relationships between the student engagement indicators and time spent on the MOOC systems?	There is no statistically significant relationship (at the 0.05 level) between weekly time spent on the MOOC and the engagement indicators.	Student questionnaire	Spearman's rank correlation
RQ-4: Are particular patterns, similarities or differences in engagement evident when the behaviours of students who were taught using the blended-MOOC method	There is no statistically significant difference (at the 0.05 level) between the engagement indicators of students who were taught with the	Student questionnaire, interviews, researcher's observations and students' comments.	One-way ANOVA, thematic analysis

classified based on institution?	blended-MOOC method based on institution.		

Chapter 7. Research Results and Findings

This chapter reports the results of the questionnaires and the key findings from the lecturers' interviews, students' comments, and the researcher's observations. The analysis of the data is presented in four major themes which correspond to the research questions:

- The effect of the blended-MOOC course design on the engagement indicators;
- The association between time spent on the MOOC system and the engagement indicators. This section also presents a descriptive analysis of each indicator;
- A comparison of student engagement in the blended-MOOC based on institution;
- The results and key findings of the qualitative data.

The fourteen-week counterbalanced-measures experimental study was carried out with the involvement of one hundred and eight participants. As shown in Figure 7-1, the participants were from three different universities: 45.4% of the participants (=49) were from King Khalid University; 35.2% of the participants (=38) were from Imam Muhammad ibn Saud Islamic University; and 19.4% of the participants (=21) were from Taif University.

66.7% of the sample liked the MOOC's lecture videos and 27.8% liked the *What'sApp* study group which was created by the researcher. Integral features, however, were much less popular, seeing as 2.8% liked the lesson notes which were provided. Furthermore, only 2.8% liked the UDACITY's discussion board (see Figure 7-2).

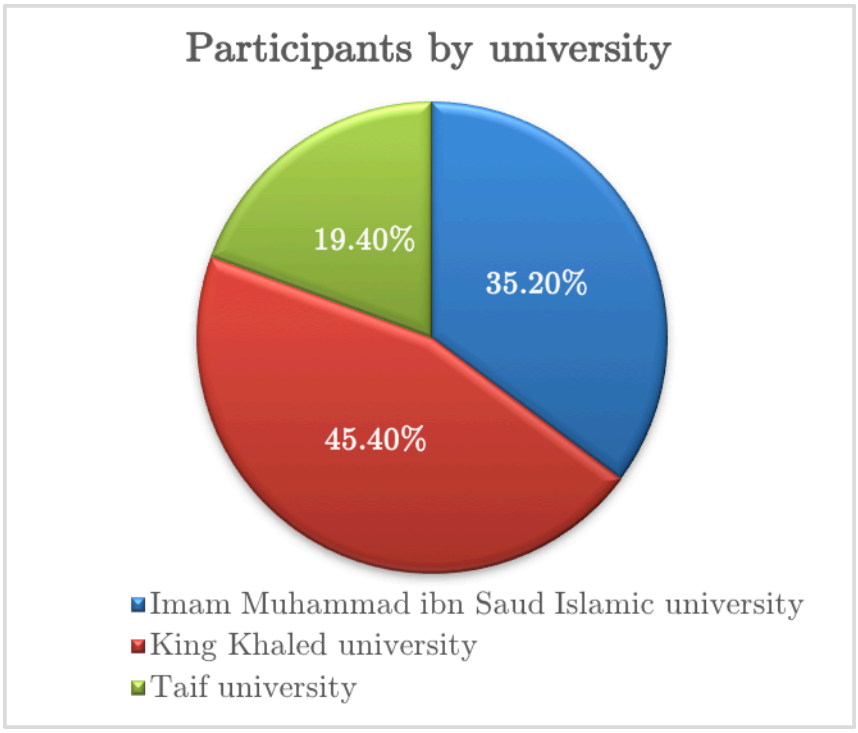

Figure 7-1: Participants by university

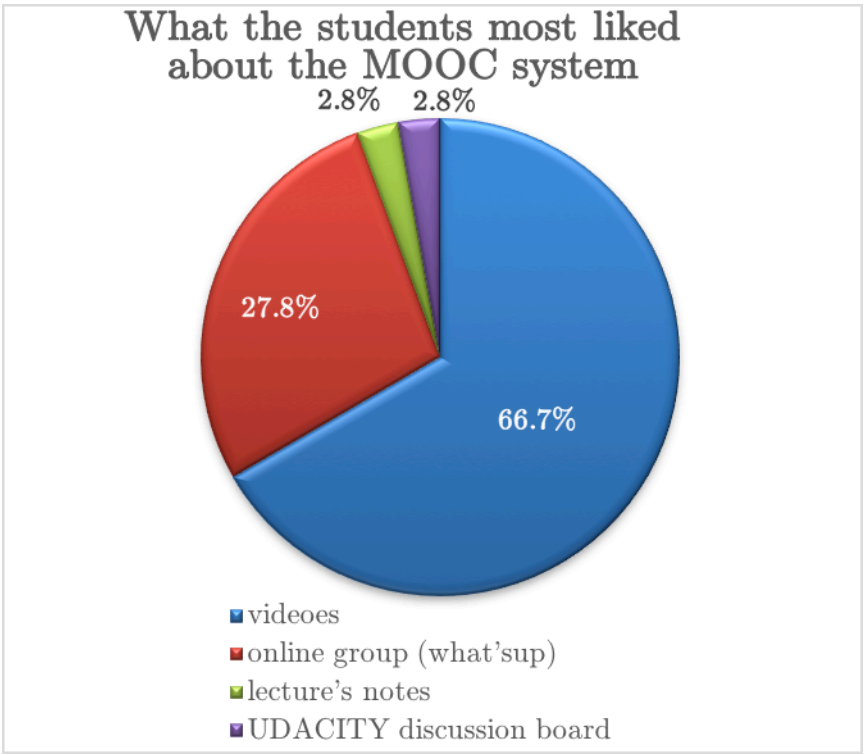

Figure 7-2: What the students most liked about the MOOC system

Figure 7-3 provides a summary of the statistics relating to the number of hours that the students spent weekly on the MOOC system:

- 43.5% spent 11-15 hours/week;
- 25.9% spent 16-20 hours/week;
- 20.4% spent 6-10 hours/week;
- 10.2% spent 1-5 hours/week; and
- no one reported that they spent more than 20 hours/week.

Table 7-1 below reports the number of hours spent on the MOOC when students were classified based on their institution.

Table 7-1: Weekly Time Spent on the MOOC by Institution

	Hour/week	Frequency	Percent	Mean
Imam	1-5	3	7.9	10.87
	6-10	7	18.4	
	11-15	16	42.1	
	16-20	12	31.6	
	Total	38	100.0	
Taif	6-10	2	9.5	12.43
	11-15	11	52.4	
	16-20	8	38.1	
	Total	21	100.0	
King Khalid	1-5	8	16.3	8.86
	6-10	13	26.5	
	11-15	20	40.8	
	16-20	8	16.3	
	Total	49	100.0	

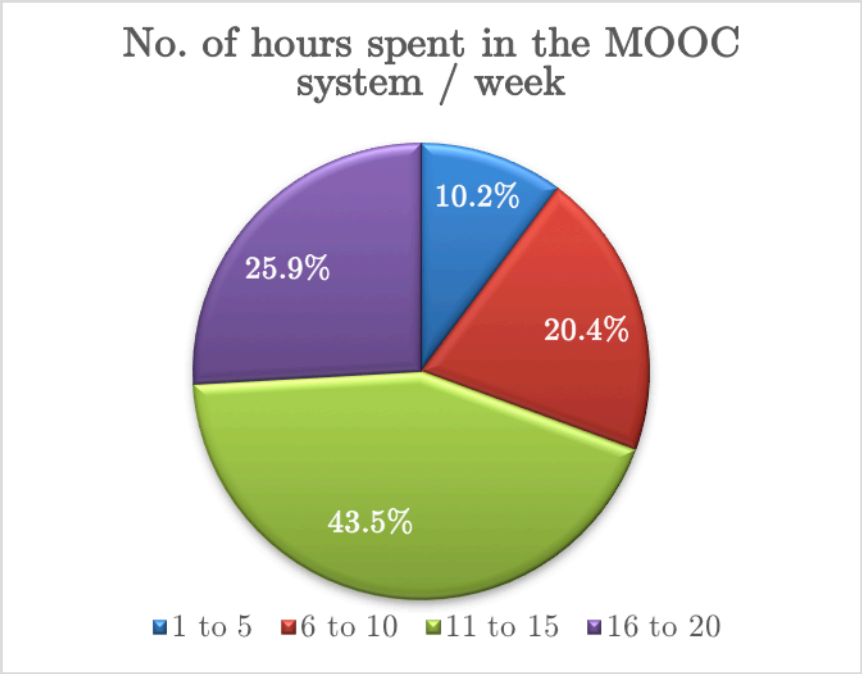

Figure 7-3: No. of hours spent in the MOOC system/week

7.1 The Results regarding the Effect that the Blended-MOOC Course Design had on the Engagement Indicators

A paired-samples t-test was used to determine whether there was a statistically significant mean difference between student engagement when participants were exposed to the blended-MOOC format compared to the face-to-face teaching format.

Before carrying out the test, there were four assumptions which needed to be met in order to ensure that the data could be analysed using this test.

The first two assumptions relate to the study design and variables; namely, that:

1. The study should have a continuous dependent variable (in this instance, the engagement indicators). The engagement indicators were measured by a four-point Likert scale. The Likert scales could be treated as continuous variables and tested using Parametric tests (such as t-tests). The Parametric tests are more robust than non-Parametric tests when analysing Likert scale responses (Norman, 2010);
2. The study should have an independent variable being categorical with two related groups. This was satisfied because the study had two methods of teaching: face-to-face and blended-MOOC.

The other two assumptions relate to the paired-samples t-tests themselves and can be tested using SPSS Statistics. These two assumptions are that:

3. There should be no significant outliers in the differences between the two related groups; and
4. The distribution of the differences in the dependent variable between the two related groups should be approximately normally distributed.

There were no outliers in the data, as assessed by an inspection of the boxplots (see Appendix J). The differences between each indicator for the blended-MOOC and face-to-face learning methods were normally distributed, as assessed by the Shapiro-Wilk's test ($p > .05$), except for the learning strategies and collaborative learning indicators ($p < .05$) (see Appendix J). Since the paired-samples t-test is fairly robust to deviations from normality (Norman, 2010), the test was run on these indicators regardless of their non-normality.

As stated earlier, the study's hypotheses regarding the effect that the blended-MOOC course design would have on the engagement indicators are as follows:

> ***Null hypothesis:*** there is no difference (at the 0.05 level) between the student engagement indicator for the face-to-face learning method vis-à-vis the blended-MOOC learning method;
>
> ***Alternative hypothesis:*** there is a difference between the student engagement indicator for the face-to-face learning method vis-à-vis the blended-MOOC learning method.

To test these hypotheses, the researcher set the confidence level at 95% and the alpha α at 0.05. The null hypothesis would be rejected if the p-value of the student engagement indicator was less than .05.

According to Table 7-2: Paired Samples Statistics, the p-values were less than .05 for the following indicators*:* reflective & integrative learning, higher-order learning, learning strategies, and collaborative learning. Therefore, we can reject the null hypothesis and accept the alternative hypothesis for these indicators. Nevertheless, the null hypothesis failed to be rejected for the faculty-student interaction indicator.

Table 7-2: Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean	Dif.	Std. Deviation	t	sig. (2-tailed)
Pair 1	Reflective & integrative learning - BM	3.34	108	.363	.0349	1.03	.547	19.546	<.05
	Reflective & integrative learning - F2F	2.31	108	.465	.0447				
Pair 2	Higher-order learning - BM	3.37	108	.323	.0311	1.09	.664	17.061	<.05
	Higher-order learning - F2F	2.28	108	.588	.0565				
Pair 3	Learning strategies - BM	2.78	108	.553	.0532	.47	.295	16.411	<.05
	Learning strategies - F2F	2.31	108	.600	.0577				
Pair 4	Collaborative learning - BM	3.21	108	.401	.0386	.63	.500	14.456	<.05
	Collaborative learning - F2F	2.59	108	.377	.0363				
Pair 5	Student-faculty interaction - BM	2.04	108	.320	.0308	.02	.454	.459	.647
	Student-faculty interaction – F2F	2.02	108	.412	.0396				

* BM- Blended-MOOC ** F2F-Face-to-face Learning

From the table, we can conclude the following:

1. The participants engaged more in reflective & integrative learning when introduced to the blended-MOOC design (3.34 ± 0.363) [mean ± std. deviation] as opposed to the face-to-face learning design (2.31 ± 0.465), with there being a statistically significant increase of 1.03 ± 0.053 [mean ± standard error], $t(107) = 19.55$, $p < 0.001$, $d = 1.88$;
2. The participants engaged more in higher-order learning when introduced to the blended-MOOC design (3.37 ± 0.323) [mean ± std. deviation] as opposed to the face-to-face learning design (2.28 ± 0.588), with there being a statistically significant increase of 1.09 ± 0.064[mean ± standard error], $t(107) = 17.06$, $p < 0.001$, $d = 1.64$;
3. The participants engaged more in learning strategies when introduced to the blended-MOOC design (2.78 ± 0.553) [mean ± std. deviation] as opposed to the face-to-face learning design (2.31 ± 0.600), with there being a statistically significant increase of .47 ± 0.028 [mean ± standard error], $t(107) = 16.41$, $p < 0.001$, $d = 1.59$;
4. The participants engaged more in collaborative learning when introduced to the blended-MOOC design (3.21 ± 0.401) [mean ± std. deviation] as opposed to the face-to-face learning design (2.58 ± 0.377), with there being a statistically significant increase of .62 ± 0.048 [mean ± standard error], $t(107) = 13.072$, $p < 0.001$, $d = 1.26$;
5. The participants engaged at the same level (2.0 ± .320, .412) when interacting with the faculty for both teaching methods.

7.2 The Correlation between Time Spent on the MOOC and the Engagement Indicators with Descriptive Results

This section provides descriptive results for each of the indicators, as well as the results of the Spearman's test which was used to test the correlation between the time spent on the MOOC system and the engagement indicators.

7.2.1 Reflective and Integrative Learning

This indicator examined the level at which students integrated ideas and concepts in the course. Table 7-3 shows that there is a noticeable difference between the two methods in the level of engagement under this indicator. The response for the method of face-to-face learning falls close to *"sometimes"* (≈2) on the scale, while the response for the blended-MOOC falls close to *"often" (≈3).*

Combining ideas from different resources and *connecting ideas from their course to prior experience* scored the highest mean rates among the items in this indicator for both methods.

The Spearman's test (see Table 7-4) revealed a strong positive correlation (statistically significant) between weekly time spent on the MOOC and reflective and integrative learning, $r(106) = .787$, $p < .01$.

Table 7-3: A t-test of Reflective and Integrative Learning

	N	Mean		Std. Deviation		Sig
		BM*	F2F**	BM*	F2F**	
Combined ideas from different courses when completing assignments	108	3.54	2.39	.554	.609	<.05
Connected your learning to societal problems or issues	108	3.43	2.39	.630	.667	<.05
Examined the strengths and weaknesses of your own views on a topic or issue	108	3.19	2.11	.643	.688	<.05
Tried to better understand someone else's views	108	3.12	2.21	.637	.762	<.05
Learned something that changed the way you understand an issue or concept	108	3.21	2.29	.597	.798	<.05
Connected ideas from your course to your prior experience and knowledge	108	3.58	2.50	.566	.690	<.05
Total	**108**	**3.34**	**2.31**	**.363**	**.465**	<.05

* Blended-MOOC ** Face-to-face Learning

Table 7-4: Correlations between reflective and integrative learning and time spent on the MOOC system

		Time spent on the MOOC/week	Reflective & integrative learning
Time spent on the MOOC/week	Correlation Coefficient	1	.793**
	Sig. (2-tailed)		<0.001
	N	108	108
Reflective & integrative learning	Correlation Coefficient	.793**	1
	Sig. (2-tailed)	<0.001	
	N	108	108

**Correlation is significant at the 0.01 level (2-tailed).

7.2.2 Higher-order Learning

With regards to the face-to-face learning method, respondents engaged *some* in higher-order learning activities (memorising, evaluating, analysis forming, and applying information), achieving a mean value of 2.3 (see Table 7-5). Whereas, with regards to the blended-MOOC learning method, they engaged *quite a bit* (≈3.4) with relation to this indicator. The blended-MOOC method presented statistically significant higher rates in all items (p-values <.05 in all items).

Closer inspection of Table 7-6 shows that there is a strong positive correlation (statistically significant) between weekly time spent on the MOOC and higher-order learning, $r(106) = .816$, $p<.01$.

Table 7-5: A t-test of higher-order learning

	N	Mean		Std. Deviation		Sig
		BM*	F2F**	BM*	F2F**	
Memorising course material	108	3.15	2.32	.577	.759	<.05
Applying facts, theories, or methods to practical problems or new situations	108	3.74	2.46	.536	.836	<.05
Analysing ideas experience, or line of reasoning in depth by examining its parts	108	3.62	2.43	.524	.776	<.05
Evaluating a point of view, decision, or information source	108	3.22	2.13	.553	.737	<.05
Forming a new idea or understanding from various pieces of information	108	3.17	2.10	.634	.842	<.05
Total	**108**	**3.37**	**2.29**	**.323**	**.588**	**<.05**

* Blended-MOOC ** Face-to-face Learning

Table 7-6: Correlations between higher-order learning and time spent on the MOOC system

		Time spent on the MOOC/week	Higher-order learning
Time spent on the MOOC/week	Correlation Coefficient	1	.816**
	Sig. (2-tailed)		<0.001
	N	108	108
Higher-order learning	Correlation Coefficient	.816**	1
	Sig. (2-tailed)	<0.001	
	N	108	108

**Correlation is significant at the 0.01 level (2-tailed).

7.2.3 Learning Strategies

This indicator asked students how often they applied some effective learning strategies in the course. The respondents who were taught with the face-to-face teaching method engaged "*sometimes*" in reviewing their notes after class, summarising what they learned, and identifying key information from reading (the mean value being ≈2.3; see Table 7-7). On the other hand, they "*often*" engaged in this indicator when they were being taught using the blended-MOOC design (the mean value being ≈3; see Table 7-7). Nevertheless, students showed no statistically significant change between the two methods with regards to the indicator of summarising what they learned (p-value >0.05).

It is apparent from the Spearman's test in

Table 7-8 that there is a statistically significant relationship between weekly time spent on the MOOC and learning strategies, $r(106) = .244$, $p < .05$.

Table 7-7: A t-test of learning strategies

	N	Mean		Std. Deviation		Sig
		BM*	F2F**	BM*	F2F**	
Identified key information from reading assignments	108	2.58	2.17	.887	.619	<.05
Reviewed your notes after class	108	3.36	2.37	.633	.768	<.05
Summarised what you learned in class or from course materials	108	2.41	2.42	.798	.908	.902
Total	**108**	**2.78**	**2.31**	**.553**	**.600**	**<.05**

* Blended-MOOC ** Face-to-face Learning

Table 7-8: Correlations between learning strategies and time spent on the MOOC system

		Time spent on the MOOC/week	Learning strategies
Time spent on the MOOC/week	Correlation Coefficient	1	.276*
	Sig. (2-tailed)		0.011
	N	108	108
Learning strategies	Correlation Coefficient	.276*	1
	Sig. (2-tailed)	0.011	
	N	108	108

*Correlation is significant at the 0.05 level (2-tailed).

7.2.4 Collaborative Learning

This indicator gathered information about how often the students became involved in collaborative work. The mean score of the face-to-face learning items is ≈2.6 (as seen in Table 7-9, it falls between *"often"* and *"sometimes"* on the scale). In the blended-MOOC, however, the mean score is 3.2, suggesting that the participants engaged *"often"* in collaborative learning. It is worth mentioning that respondents showed no statistically significant change (p-value >0.05) in working with others on course projects or assignments.

According to the Spearman's correlation test (see Table 7-10), there was a moderately positive (statistically significant) correlation between weekly time spent on the MOOC and collaborative learning, $r(106) = .450$, $p<.01$.

Table 7-9: A t-test of collaborative learning

	N	Mean		Std. Deviation		Sig
		BM*	F2F**	BM*	F2F**	
Explained course material to one or more students	108	3.08	2.17	.699	.704	<.05
Prepared for exams by discussing or working through course material with other students	108	3.18	2.31	.667	.692	<.05
Worked with other students on course projects or assignments	108	3.54	3.55	.571	.519	.893
Asked another student to help understand course materials	108	3.06	2.31	.708	.716	<.05
Total	**108**	**3.21**	**2.59**	**.401**	**.377**	**<.05**

* Blended-MOOC ** Face-to-face Learning

Table 7-10: Correlations of collaborative learning and time spent on the MOOC system

		Time spent on the MOOC/week	Collaborative learning
Time spent on the MOOC/week	Correlation Coefficient	1	.443**
	Sig. (2-tailed)		<0.001
	N	108	108
Collaborative learning	Correlation Coefficient	.443**	1
	Sig. (2-tailed)	<0.001	
	N	108	108

** Correlation is significant at the 0.01 level (2-tailed).

7.2.5 Student-faculty Interaction

This indicator focused on the interaction between students and teaching staff. Students who were taught with both methods conformed to the same level of engagement when one examines the overall means of this indicator (the mean values of both methods are ≈ 2; see Table 7-11). The blended-MOOC students, however, engaged with most of the items statistically significant higher (p-value < 0.05) when compared to the face-to-face students.

It is worth noting that students tend to *often/sometimes* make significant changes to their work based on feedback when they were taught using face-to-face teaching but *sometimes/never* when being taught with the blended-MOOC design. In other word, the face-to-face students showed a statistically significant higher level of engagement in making significant changes to their work based on feedback than the blended-MOOC students.

According to the Spearman's test, there was a moderate positive correlation (statistically significant) between weekly time spent on the MOOC and the interaction between student and faculty, $r(106) = .389$, p ¡ .01 (see Table 7-12).

Table 7-11: A t-test of student-faculty interaction

	N	Mean		Std. Deviation		Sig
		BM*	F2F**	BM*	F2F**	
Discussed your academic performance and/or feedback with teaching staff in this course	108	2.34	2.35	.554	.763	.927
Asked questions in taught sessions or contributed to discussions about course material in other ways	108	2.69	2.42	.630	.755	<.0.05
Talked about your career plans with teaching staff or advisors	108	1.67	1.56	.643	.580	.212
Discussed ideas from your course with teaching staff outside taught sessions, including by email/online	108	2.16	1.72	.637	.811	<.0.05
Worked with teaching staff on activities other than coursework	108	1.70	1.44	.597	.701	<.0.05
Made significant changes to your work based on feedback	108	1.68	2.62	.566	.708	<.0.05
Total	**108**	**2.04**	**2.02**	**.320**	**.412**	**>0.05**

* Blended-MOOC ** Face-to-face Learning

Table 7-12: Spearman's correlations of student-faculty interaction and time spent on the MOOC system

		Time spent on the MOOC/week	Student faculty interaction
Time spent on the MOOC/week	Correlation Coefficient	1	.346**
	Sig. (2-tailed)		<0.001
	N	108	108
Student-faculty interaction	Correlation Coefficient	.346**	1
	Sig. (2-tailed)	<0.001	
	N	108	108

** Correlation is significant at the 0.01 level (2-tailed).

7.2.6 MOOC Active Learning

This indicator captured the degree to which students actively used the MOOC to enhance their learning. The overall mean of this indicator (≈3, Table 7-13) depicts that the participants *often* engaged in active learning on the MOOC system.

Table 7-13: Descriptive statistics of MOOC active learning

	N	Mean	Std. Deviation
Used MOOC materials to improve my learning	108	3.06	.765
Shared and reflected on what you learned in the MOOC course through blogs, micro-blogging, discussion space etc.	108	2.62	.733
The MOOC resources helped you do your coursework	108	3.04	.831
Used MOOC quizzes to improve your understanding of a topic	108	3.21	.809
Used MOOC materials to make lectures more meaningful	108	3.17	.717
Found that MOOC materials challenged you to learn.	108	2.81	.787
Total		**2.98**	**.502**

7.2.7 MOOC Collaborative Learning

This indicator measured the degree to which students used MOOCs to do academic work with other online learners. The overall mean of this indicator (=2.09, Table 7-14) suggests that the participants sometimes engaged in collaborative learning on the MOOC system.

Table 7-14: Descriptive Statistics of MOOC collaborative learning

	N	Mean	Std. Deviation
Posted a question in the MOOC discussion forum.	108	1.89	.765
Asked another online learner to help you understand course material	108	2.15	. 830
Explained course materials to one or more online learners	108	2.26	.900
Total	**108**	**2.09**	**.638**

7.2.8 MOOC Social Interaction

Respondents *sometimes* (mean value ≈2.4, Table 7-15) used the MOOC to interact and communicate with others. Respondents conformed the same level of engagement in all of the items of this indicator.

Table 7-15: Descriptive statistics of MOOC social interaction

	N	Mean	Std. Deviation
Used MOOC tools (discussion spaces, social media, and emails) to communicate with others	108	2.42	.898
Had helpful online conversations with others	108	2.36	.755
Total	**108**	**2.38**	**.718**

7.2.9 Teaching with MOOCs

Respondents felt that teaching staff *often* used the MOOC in effective ways (mean rate= 3.11, Table 7-16).

Table 7-16: Descriptive statistics of teaching with the MOOC system

	N	Mean	Std. Deviation
Teaching staff used MOOC materials to discuss interesting issues	108	3.15	.508
Staff used the MOOC in ways that improved their overall teaching	108	3.06	.645
Staff used the MOOC to provide students with extra assistance	108	3.14	.618
Total	**108**	**3.11**	**.387**

7.3 Comparisons of Blended-MOOC Student Engagement by Institution

A one-way analysis of variance (ANOVA) was conducted for determining whether the engagement indicator of the blended-MOOC students differed based on institution.

The ANOVA tested the following hypotheses:

> ***Null hypothesis:*** There is no statistically significant difference (at the 0.05 level) between the engagement indicators of students who were taught with the blended-MOOC method based on their university.
>
> ***Alternative hypothesis:*** There is a statistically significant difference (at the 0.05 level) between the engagement indicators of students who were taught with the blended-MOOC method based on their university.

Before carrying out the analysis test, the data was tested for ANOVA assumptions. The ANOVA had six assumptions which needed to be met in the data. The first three assumptions of the one-way ANOVA related to the study design, while the remaining assumptions related to the data itself and could be tested using the SPSS software. The assumptions are discussed in detail in Appendix K.

Table 7-17 provides some useful descriptive statistics, including the mean, standard deviation, and 95% confidence intervals for the dependent variables (i.e. engagement indicators) for each separate group (Imam, Taif and King Khalid), as well as when all of the groups are combined (total).

According to Table 7-18, the p-value of all of the engagement indicators is greater than .05 apart from the reflective & integrative learning, MOOC active learning, and teaching with the MOOC indicators. The researcher concluded that she does not have sufficient evidence to reject the null hypothesis, i.e. there are no statistically significant differences (at the 0.05 level) between the engagement indicators of the students who were taught with the blended-MOOC method based on institution except for the reflective & integrative learning, MOOC active learning, and teaching with the MOOC indicators.

Post hoc tests are usually run to confirm where differences occur between groups. They should only be run on variables that have statistically significant differences in group means. The Turkey *post hoc* test was used on the three indicators which were statistically significant ($p < .05$) (see Table 7-19).

1. A Tukey *post hoc* test revealed that the *reflective and integrative learning* indicator was statistically significantly higher in Imam ($3.44 \pm .308$, $p < .05$) when compared to King Khalid ($3.23 \pm .372$). There was no statistically significant difference between the Taif and King Khalid groups or between the Imam and Taif groups ($p = .63$ and $p = .997$).
2. A Tukey *post hoc* test revealed that the *MOOC active learning* indicator was statistically significantly higher in Taif ($3.24 \pm .305$, $p < .05$) and Imam ($3.09 \pm .359$, $p < .05$) when compared to King Khalid ($2.80 \pm .593$). There was no statistically significant difference between the Imam and Taif groups ($p = .475$).
3. A Tukey *post hoc* test revealed that the *teaching with the MOOC* indicator was statistically significantly higher in King Khalid ($3.27 \pm .317$, $p < .05$) compared to Imam ($2.95 \pm .368$). There was no statistically significant difference between the Taif and King Khalid groups or between the Imam and Taif groups ($p = .074$ and $p = .467$).

Table 7-17: Descriptive comparison of blended-MOOC student engagement based on institution

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval		Min	Max
						Lower Bound	Upper Bound		
Reflective & Integrative learning	Imam	38	3.44	0.308	0.0500	3.34	3.54	2.67	4.00
	Taif	21	3.44	0.371	0.0809	3.27	3.61	2.83	4.00
	Khalid	49	3.23	0.372	0.0532	3.12	3.33	2.33	3.83
	Total	108	3.34	0.363	0.0350	3.27	3.41	2.33	4.00
Higher-order learning	Imam	38	3.33	0.324	0.0525	3.22	3.43	2.20	4.00
	Taif	21	3.50	0.206	0.0450	3.40	3.59	3.20	3.80
	Khalid	49	3.37	0.356	0.0508	3.27	3.47	2.20	4.00
	Total	108	3.38	0.323	0.0311	3.32	3.44	2.20	4.00
Learning Strategies	Imam	38	2.92	0.669	0.1085	2.70	3.14	1.67	4.00
	Taif	21	2.60	0.442	0.0966	2.40	2.80	1.67	3.33
	Khalid	49	2.76	0.475	0.0679	2.62	2.89	1.67	4.00
	Total	108	2.78	0.553	0.0532	2.68	2.89	1.67	4.00
Collaborative Learning	Imam	38	3.23	0.400	0.0649	3.10	3.36	2.50	4.00
	Taif	21	3.35	0.383	0.0836	3.17	3.52	2.75	4.00
	Khalid	49	3.14	0.402	0.0574	3.03	3.26	2.00	3.75
	Total	108	3.21	0.401	0.0386	3.14	3.29	2.00	4.00
Student-faculty Interactions	Imam	38	1.94	0.298	0.0484	1.84	2.04	1.33	2.50
	Taif	21	2.06	0.276	0.0603	1.94	2.19	1.50	2.50
	Khalid	49	2.11	0.341	0.0488	2.01	2.20	1.17	2.83
	Total	108	2.04	0.321	0.0308	1.98	2.10	1.17	2.83
MOOC Active Learning	Imam	38	3.09	0.359	0.0582	2.97	3.21	2.17	3.67
	Taif	21	3.24	0.305	0.0666	3.10	3.38	2.83	4.00
	Khalid	49	2.80	0.593	0.0847	2.63	2.97	1.50	3.83

	Total	108	2.99	0.502	0.0483	2.89	3.08	1.50	4.00
MOOC Collaborative learning	Imam	38	2.12	0.690	0.112	1.89	2.35	1.00	3.67
	Taif	21	2.11	0.475	0.103	1.89	2.33	1.33	3.00
	Khalid	49	2.07	0.667	0.0953	1.88	2.27	1.00	3.67
	Total	108	2.09	0.638	.0614	1.98	2.22	1.00	3.67
MOOC Social Interaction	Imam	38	2.34	0.708	0.1149	2.11	2.58	1.50	4.00
	Taif	21	2.38	0.669	0.1460	2.08	2.69	1.50	4.00
	Khalid	49	2.43	0.757	0.1081	2.21	2.65	1.00	4.00
	Total	108	2.39	0.718	0.0691	2.25	2.53	1.00	4.00
Teaching with the MOOC	Imam	38	2.95	0.368	0.0597	2.83	3.07	2.00	3.33
	Taif	21	3.06	0.442	0.0966	2.86	3.26	2.33	3.67
	Khalid	49	3.27	0.317	0.0453	3.18	3.36	2.67	4.00
	Total	108	3.12	0.388	0.0373	3.04	3.19	2.00	4.00

Table 7-18: ANOVA - comparison of blended-MOOC student engagement based on institution

		Sum of Squares	df	Mean Square	F	Sig.	η^2
Reflective & Integrative	Between Groups	1.21	2	0.606	4.93	<.05	.09
	Within Groups	12.91	105	0.123			
	Total	14.13	107				
Higher-order	Between Groups	0.39	2	0.196	1.905	0.154	.03
	Within Groups	10.80	105	0.103			
	Total	11.20	107				
Learning Strategies	Between Groups	1.44	2	0.721	2.418	0.094	.04
	Within Groups	31.30	105	0.298			
	Total	32.74	107				
Collaborative Learning	Between Groups	0.62	2	0.31	1.959	0.146	.04
	Within Groups	16.61	105	0.158			
	Total	17.23	107				

Student-faculty Interactions	Between Groups	0.58	2	0.29	2.92	0.058	.05
	Within Groups	10.41	105	0.099			
	Total	10.99	107				
MOOC Active Learning	Between Groups	3.435	2	1.718	7.67	<.05	.13
	Within Groups	23.516	105	0.224			
	Total	26.951	107				
MOOC Collaborative	Between Groups	.053	2	.027	.064	.938	.00
	Within Groups	43.56	105	.415			
	Total	43.61	107				
MOOC Social interaction	Between Groups	0.162	2	0.081	0.154	0.857	.00
	Within Groups	55.005	105	0.524			
	Total	55.167	107				
Teaching with the MOOC	Between Groups	2.332	2	1.166	8.914	<.05	.14
	Within Groups	13.738	105	0.131			
	Total	16.07	107				

Table 7-19:Turkey post hoc test

Dependent Variable	(I) University Name	(J) University Name	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Reflective & Integrative Learning	Imam	Taif	0.01	0.0954	0.997	-0.22	0.23
		Khalid	0.22	0.0758	0.015	0.03	0.40
	Taif	Imam	-0.01	0.0954	0.997	-0.23	0.22
		Khalid	0.21	0.0915	0.063	-0.01	0.43
	Khalid	Imam	-0.22	0.0758	0.015	-0.40	-0.03
		Taif	-0.21	0.0915	0.063	-0.43	0.01
MOOC Active Learning	Imam	Taif	-0.15	0.1287	0.475	-0.46	0.16
		Khalid	0.29	0.1023	0.016	0.05	0.53
	Taif	Imam	0.15	0.1287	0.475	-0.16	0.46
		Khalid	0.44	0.1234	0.002	0.15	0.73
	Khalid	Imam	-0.29	0.1023	0.016	-0.53	-0.05
		Taif	-0.44	0.1234	0.002	-0.73	-0.15
Teaching with the MOOC	Imam	Taif	-0.12	0.0984	0.467	-0.35	0.12
		Khalid	-0.32	0.0782	<0.001	-0.51	-0.14
	Taif	Imam	0.12	0.0984	0.467	-0.12	0.35
		Khalid	-0.21	0.0943	0.074	-0.43	0.02
	Khalid	Imam	0.32	0.0782	<0.001	0.14	0.51
		Taif	0.21	0.0943	0.074	-0.02	0.43

*. The mean difference is significant at the 0.05 level.

7.4 The Findings of the Qualitative Study

As was mentioned in Chapter 6, this study collected qualitative data from three different sources: interviews with lecturers, students' comments, and the researcher's observations.

The qualitative data were divided into four themes which were adapted from the NSSE's themes. They are as follows: academic challenge; learning with peers in local and MOOC communities; experiences with faculty; and student attitudes.

7.4.1 Academic Challenge

According to the lecturers' interviews and students' notes, the blended-MOOC course design enabled a large number of students to work harder and take responsibility for their own learning. Lecturer-T,[21] for instance, stated that 'students improved to a very large extent in working hard in the course.' Lecturer-K echoed a similar observation, saying that 'blended-MOOC students worked harder and usually connected the ideas and what they learned in class to their homework better.'

When students were exposed to the blended-MOOC method, all of the lecturers noticed an improvement in students' reflective and integrative learning and higher-order learning. Observing that students tried to connect their learning and ideas to the real-world and to their prior knowledge, Lecturer-I commented that 'students are now combining ideas from different sources of information and re-considering their solutions before handing in their coursework.'

Lecturer-K added: 'I noticed that some blended-MOOC students come with innovative ideas to solve some problems and to do their project (...). As part of the course, we were dealing with games and how to solve tic-tac-toe and chess games. Blended-MOOC students were able to understand the ideas of methodology of tree searches and how to build search algorithms easier and better. Moreover, during the last five mins of the lab (the practical part of the course), the lab instructor usually gave students some problems to solve. The

[21] The data was anonymised, even though the institution of the participants is identified, as follows: Lecturer-T (Taif University), Lecturer-K (King Khalid University) and Lecturer-I (Imam Muhammad ibn Saud Islamic University).

instructor noticed that the blended-MOOC students got the answers and fully understood better than those taught with face-to-face teaching.'

Moreover, students believed that the blended-MOOC design helped them acquire some critical thinking skills. One student noted that 'the online course opened up so many ways of thinking by allowing one to view the problem from different angles, combining different info and ideas to answer the problem, and connecting what I learnt to our world'.

Another stated that 'I have learned so much and developed my thinking skills. I examined the parts of the problems and considered others solutions and ideas.'

Still another said that 'I found the MOOC system, including its videos, visual tools, examples, discussions, and the online group very stimulating... It had a large impact on my thinking.' Lecturer-I, however, believed that 'students need more time to master those [thinking] skills.'

The lecturers found the MOOC to be effective at introducing fundamental concepts. Lecturer-I, for instance, stated that 'Since the MOOC introduced students to the fundamental concepts, so I found more time for discussion and solving problems.' Lecturer-K also commented, saying 'The MOOC helped me give students the fundamental concepts and ideas of some advanced algorithms, such as artificial neural network, expert, and fussy systems, which I could not have covered during the lecture.'

They also noticed that blended-MOOC students asked more questions and that the discussions that they had with them improved. Lecturer-K found that '...class discussion has increased and that the quality of the discussions has improved.' Moreover, Lecturer-I stated that 'the blended-MOOC students engaged more with the lecture by asking more questions.' This supported lecturer-T's observation that 'the blended-MOOC students were more interactive with me during the lecture and learned many algorithms and learned how to solve the problems better.'

Finally, the MOOC system helped students become more responsible for their learning. As one student commented, 'The course made me more responsible and sociable.'

7.4.2 Learning with Peers in Local and MOOC Communities

The researcher asked the lecturers whether they noticed any change in the class discussion. Lecturer-I replied, saying that 'the discussion during lecture time has increased compared to those exhibited with the traditional [face-to-face] teaching method.' This aligns with Lecturer-K's observation: 'I found class discussion had increased and that its quality had improved.'

Besides the class discussion, students were able to discuss and participate in UDACITY (MOOC) discussion board and online study group.

With regard to the online study group, the researcher found through her observations a moderate improvement in the quality of the discussion of the online study group.

Before the intervention, the group's discourse showed little critical thinking and tended to be conversational and opinionated. They used the online group for sharing personal experiences and for non-academic questions — for example, asking about lecture times, copies of lecture notes, etc.

During the intervention, however, the discussion of the online group was modestly improved. The students used the study group to ask questions which had appeared in the MOOC, helped each other understand the content, and connected what was learnt in the lecture with the MOOC resources.

One student commented about the study group, saying that 'the study group helped me a lot, it allowed me to ask questions whenever I wanted.'

Another said that, 'with the new teaching method [the blended-MOOC], I had opportunities to work and collaborate with my colleagues more often than in normal courses... Our thoughts and arguments could also be discussed during the lecture time with others, as well as with the teacher.'

Another believed that the discussion and the peer support in the study group was a useful tool for her learning.

With regard to the MOOC discussion board, few students described posting questions on the discussion forum, having not actively engaged in the UDACITY discussion forum. Students explained the reasons as follows:

- **Time Constrains and Internet Connectivity:** a number of participants (n=24) mentioned time as being one of the constraints from their

participating in the MOOC system. For example, one commented that 'I use the discussion [forum] for only looking for specific information because I don't have the time.' Another echoed a similar thought: 'Due to a lack of Internet connection and a shortage of time, [I wasn't] able to be active in the online discussion.'

- **Cultural Barriers:** one out of the one hundred and eight participants mentioned that they didn't' want to discuss with males, even over the Internet.
- **Design Issues:** participants identified a number of design constraints which were:
    - **Alignment:** The MOOC course did not run concurrently with the campus course, for this reason, the discussion was not active as expected.
    - **User Interface Design:** the discussion forum was located in a webpage which was separate to the course lessons and lectures.
    - **Smartphone Accessibility:** the discussion forum was not accessible via smartphones.
    - **Functionality:** some questions posted by the learners were not relevant to the *Artificial Intelligence* course, with some not being academically related — for example, reporting about technical problems.
- **Hesitation:** only one participant declared that she was hesitant to participate in the discussion forum, stating that 'hesitancy sometimes prevented me to participate in the discussion forum and with experts in the MOOC.'

7.4.3 Experiences with Faculty

Faculty-student interaction is one of the crucial aspects of student engagement (Astin, 1984; Kuh, 2003). Here are how the lecturers and students responded in that regard:

- Lecturer-I said: 'The interaction between teacher and student has increased after the MOOC. Students asked questions outside the class and most of these questions were related to the class discussions (...) very few asked about their future career.'

- Lecturer-T said: '...blended-MOOC students sometimes asked questions outside the class but (...) they never talked about their future plans or work.'
- Lecturer-K said: '...students worked with me on activities other than coursework. They contacted me very often during office hours about other projects.'
- One student commented: 'I tried to do my best and discussed all my thoughts and questions with my teacher.'
- Another echoed a similar thought, saying: 'Using the new teaching method [the blended-MOOC method], we learned the concepts at home. Thus, we had more time to discuss and get support from our teacher.'
- Another student stated: 'After using the online course, I interacted with my lecturer more often than before ... I asked a number of questions inside and outside of the class.'

7.4.4 Student Attitudes

The general response was positive, with the students appreciating the flexibility of the MOOC system and its usefulness. What follows are several examples of what the students said during their interviews with the researcher:

- 'the online course was very useful to understand some topics that I couldn't understand with my teacher. The MOOC teacher was a good, knowledgeable lecturer. He explained the content in a very clear, easy way.'
- 'It's easy to understand and I can learn at any time'
- 'In this course, if I was stuck with some problems, I could ask for help or advice from my teacher or the MOOC teacher. Both were available to help me.'
- 'I engaged with the visual tools, quizzes, discussion board, and exam examples. They were very useful"
- 'موقع جميل ويسهل فهم المعلومات (the online course was very helpful and useful)'
- 'جميل وتعلمت منه الكثير (I learned so much from the MOOCs).'

Most of the sample (82.4%) were very satisfied/satisfied with the blended-MOOC course design, with only .9% not being very satisfied, as shown in

Figure 7-4. 84.3% intended to use the MOOC system in the future (Figure 7-5). Here are some of the comments that the students made:

- 'I enjoyed the lessons; they had a large impact on my way of thinking.'
- 'I liked the MOOC.'
- هذا الكورس ممتع وانا احبه (I enjoyed taking this kind of course I really love it).'
- 'The online course and the course in general were really interesting.'

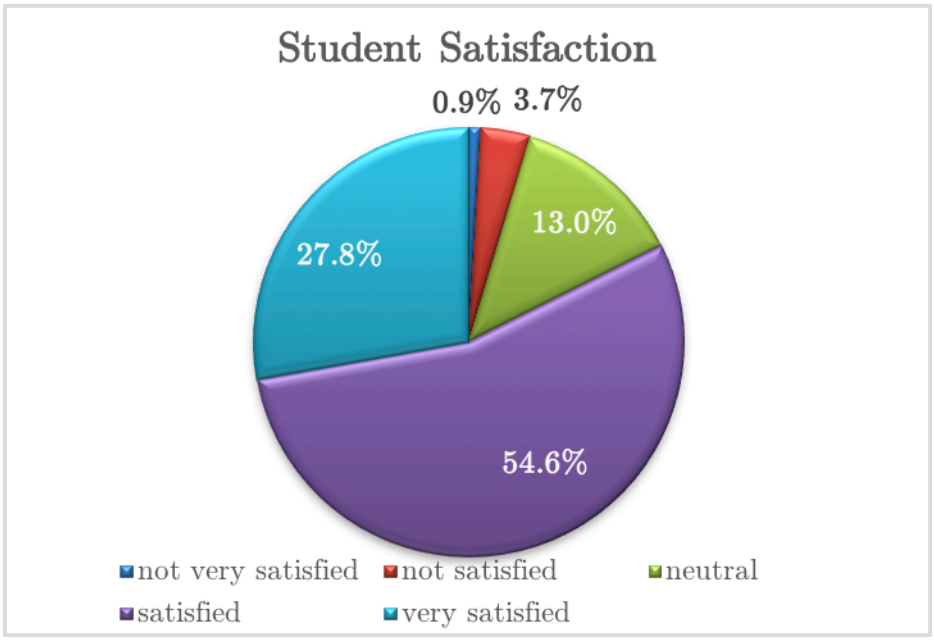

Figure 7-4: Student satisfaction with the blended-MOOC

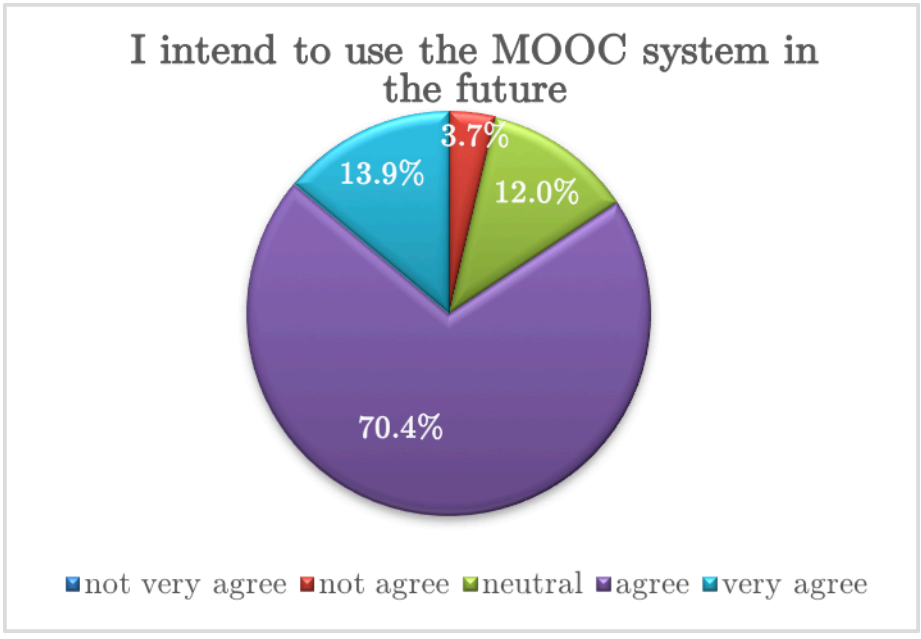

Figure 7-5: Student's intention to use the MOOC system in the future

7.5 Summary

This section has attempted to provide a brief summary of the results and key findings from the quantitative and qualitative methods. The results of the questionnaire have indicated that there was a statistically significant difference in all of the indicators regarding student engagement between the blended-MOOC design and the face-to-face learning design except for the faculty-student interaction indicator.

In terms of the comparisons made between student engagement and behaviours based on the student's institution, the students showed similar engagement patterns in all of the indicators except for the reflective & integrative learning, MOOC active learning, and teaching with the MOOC indicators.

1. Imam students had a higher level of engagement in integrative & reflective learning compared to King Khalid students. Nevertheless, there was no statistically significant difference between the Taif and King Khalid groups or between the Imam and Taif groups.
2. The Taif and Imam students showed a higher level of engagement in the MOOC active learning indicator when compared to the King Khalid group.
3. The King Khalid group showed a higher level of engagement in the "teaching with the MOOC" Indicator when compared to the Imam group. Nonetheless, there was no statistically significant difference found between the Taif and King Khalid groups or between the Imam and Taif groups.

The study also showed there was a positive correlation between the time spent on the MOOC system and all of the engagement indicators. The key findings of the qualitative data, however, could be summarised as follows (Table 7-20):

Table 7-20: Summary of the qualitative findings

Themes	Key Findings
Academic Challenge	The blended-MOOC teaching method tends to enrich the learning environment and improve students' critical thinking skills. The Students' reflective and integrative learning was improved. They tended to connect what they learnt with the real-world and re-examined their ideas with others' views. The MOOC system is a useful tool for introducing fundamental concepts. The MOOC system helps students become more responsible about their learning.
Learning with Peers in Local and MOOC Communities	The findings have indicated that the blended-MOOC method provides better opportunities for interaction between learners than the face-to-face learning method does. The blended-MOOC method helped provide a suitable learning environment for enhancing class discussions and productivity. The students engaged more in the study group (created by the researcher) than in the MOOC discussion board. The findings highlighted a number of challenges associated with the use of the MOOC discussion board: • Time constraints and a lack of internet connectivity; • Cultural barriers; • Design issues, including problems with user interface, alignment, and functionality; • Hesitation and reluctance.
Experiences with Faculty	The interaction between faculty and students has been modestly improved. Most of these interactions are related to the lecture's contents. Few discussed their future plans/careers/work with their instructors.
Student Attitudes	Students appreciated the flexibility of the MOOC system and were generally satisfied with the course design. A large proportion of the participants have the intention to use MOOC systems in the future.

Chapter 8. Discussion

This chapter discusses the results and the key findings presented in the previous chapter. The chapter is organised to address three major themes which relate back to the research questions:

1. The impact of the blended-MOOC course design on on-campus student engagement;
2. The association between weekly time spent on the MOOC system and student engagement indicators;
3. The pattern of student engagement in a blended-MOOC setting.

8.1 The Impact of the Blended-MOOC Course Design on On-campus Student Engagement

The literature suggests that there is a direct link between how likely students are to learn and the extent to which they engage with the subject matter (Coates, 2005; Carini et al., 2006; Kuh et al., 2008). Measures of student engagement are a reliable proxy for student learning because they come 'close to providing necessary and sufficient information about student learning' (Coates 2005, p. 32).

Previous studies have investigated the impact of integrating MOOC resources into campus courses on a variety of learning outcomes, including: grades (Pérez-Sanagustín et al., 2016; Griffiths et al., 2014; Najafi et al., 2014; Freihat and Zamil, 2014); student satisfaction (Griffiths et al., 2014; Bruff et al., 2013); and skills improvement (Freihat and Zamil, 2014; Griffiths et al., 2014; Pérez-Sanagustín et al., 2016). So far, very little attention has been paid to the effect that the use of the blended-MOOC course design has on student engagement. Thus, it was important to ascertain the extent to which students engaged in the blended-MOOC context.

The present study set out to determine the impact on student engagement brought about by integrating MOOC elements into campus courses in the Saudi women's higher education system. A preliminary study was conducted before carrying out the main study. The study aimed to confirm and validate a model of measuring student engagement in the blended-MOOC context which was proposed in Chapter 4.

As discussed in Chapter 5, the model was confirmed quantitatively by a panel of thirty-five MOOC experts and then evaluated by thirteen participants who had attended a blended-MOOC. The resultant model was drawn from: the well-established NSSE, the UKES, and the SEQ. It has nine indicators, with five being related to general course engagement and four being concerned with online (MOOC) engagement (see Table 8-1).

Table 8-1: The result of the preliminary study: The Blended-MOOC Student Engagement (BMSE) model

Engagement indicators		Description	
General Engagement Indicators	Academic Challenge theme	Reflective and Integrative Learning (source: NSSE)	**Reflective and Integrative Learning:** This indicator aims to examine the level of integration and connection of ideas and concepts.
		Higher-order Learning (source: NSSE)	**Higher-order Learning:** It captures the extent to which course materials and assessments emphasise challenging mental tasks, such as application, analysis, judgment, and synthesis.
		Learning Strategies (source: NSSE)	**Learning Strategies:** It assesses the extent to which students performed some effective learning strategies, such as reviewing/ identifying/ summarising the course materials.
	Collaborative Learning (source: NSSE)	**Collaborative Learning:** This indicator examines the extent to which two or more students worked together in academic activities.	
	Student-faculty Interaction (source: UKES)	**Student-faculty Interaction**: This indicator explores the degree to which students contacted and interacted with their teachers.	
MOOC Engagement Indicators	MOOC Active Learning (adapted from: SEQ)	**MOOC Active Learning:** The items in this indicator collect information about the degree to which students actively used the MOOC to enhance their learning.	
	MOOC Collaborative Learning (adapted from: NSSE)	**MOOC Collaborative Learning:** This indicator captures the degree to which students used the MOOC to do academic work with other online learners.	
	MOOC Social Interaction (adapted from: SEQ)	**MOOC Social Interaction:** it aims to ask about how students used the MOOC to experience a range of interactions and communications with others.	
	Teaching with MOOCs (adapted from: SEQ)	**Teaching with MOOCs:** The questions under this indicator capture students' perceptions of whether instructors used the MOOC in pedagogically effective ways.	

Having confirmed the model with the preliminary study, an experimental study was run at three different Saudi women's universities (see Chapter 6) to assess the change of student engagement between the face-to-face teaching method and the blended-MOOC method. The following four research instruments were used to measure the change and gather the final research data set:

1. The confirmed model
2. Interviews with the lecturers
3. Students' notes and comments
4. The researcher observations.

The data, presented in detail in Chapter 7, revealed that a statistically significant number of the participants felt more engaged in the blended-MOOC teaching design compared to the usual face-to-face teaching design. This was evidenced in four indicators. These were associated with reflective & integrative learning; higher-order learning; learning strategies; and collaborative learning (see Figure 8-1).

Within these broader constructs, the blended-MOOC students succeeded in achieving a higher level of engagement in intellectual endeavours, such as combining ideas from different sources; relating new materials to prior knowledge and experiences; thinking critically and analytically; and working effectively with others.

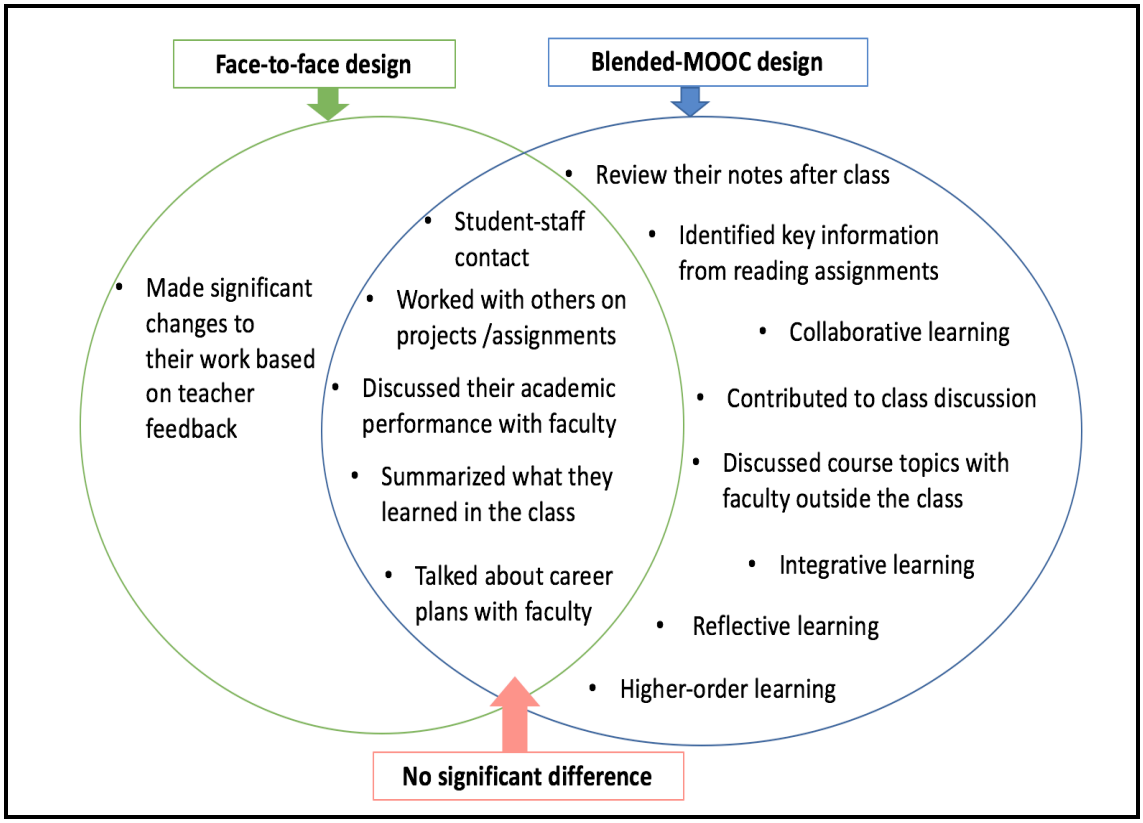

Figure 8-1: Summary of the impact of using MOOC systems on on-campus student engagement

Although conducted in a traditional form of blended course design and within a different cultural context, the findings are broadly consistent with Jamaludin & Osman (2014); Elmaadaway (2017); Herreid & Schiller (2013); Aycock et al. (2002); Chen et al. (2010); Laird & Kuh (2005); Garnham & Kaleta (2002); Kuh & Hu (2001b); and Ravenscroft & Luhanga (2014).

The results are also broadly in line with a more recent study which was conducted at the University of Aberdeen by Cornelius et al. (2017). Their study aimed to re-design a campus course to incorporate a MOOC in place of traditional lectures. The participants (N=45) were assessed using the UKES (adapted from the NSSE) and then compared with a wider cohort of face-to-face campus students (N=577). They found that MOOCs had a positive impact on some engagement aspects of the students.

8.1.1 Academic Challenge Indicators

This section examines the impact of the blended-MOOC course design on students' academic challenge indictors. As seen in Table 8-1, the theme consists of three indicators: integrative and reflective learning; higher-order learning; and the use of learning strategies.

Generally, students who participated in activities which emphasise higher-order learning and reflective and integrative learning are more likely to approach

learning in a deep way and, thus, to acquire knowledge beyond a shallow-level of understanding (Marton and Säljö, 1976, 1984; Laird et al., 2005; Asikainen and Gijbels, 2017).

The study provided statistically significant evidence for the positive impact of the blended-MOOC design on academic challenge indicators (see Table 7-2). This included students' integrative & reflective learning; higher-order learning, and the use of some learning strategies.

These findings were corroborated by the lecturers' observations (see section 7.4.1). For example, a lecturer commented on the students' behaviours after using the blended-MOOC in the following way: 'students are now combining ideas from different sources of information and re-considering their solutions before handing in their coursework.'

This combined evidence clearly confirms that the blended-MOOC teaching method improved the students' critical thinking skills and helped them learn and think more reflectively (see Figure 8-1).

- These results match those observed in earlier studies (Griffiths et al., 2014, 2015; Ravenscroft and Luhanga, 2014) which had found a strong improvement in students' critical thinking skills after being exposed to the blended-MOOC course design.
- The findings also align with Cornelius et al.'s (2017) results, who perceived an improvement in students' reflective & integrative learning after using MOOCs in campus teaching. They (ibid) demonstrated, however, that face-to-face students engaged in critical thinking and higher-order learning more than their blended-MOOC counterparts. This differs from the findings of the current research. This interesting difference could be due to a number of possible reasons, such as: cultural differences; subject/disciplinary differences; and course design and delivery. The differences between the two studies, however, might be an area for further investigations.

The observed improvements on the academic challenge indicators are not surprising findings because they replicate the results of flipped classroom research which have found that the flipped classroom model promotes deep learning by freeing up lecture time for active and constructive learning activities (Ritchhart et al., 2011; James et al., 2014; Murphy et al., 2016; Elmaadaway, 2017). Nonetheless, this finding suggests that the flipped classroom design

continues to have a positive impact on student learning and engagement, even though a new technology was introduced.

Despite having similar findings with the flipped classroom research, the participants benefitted from affordances of the blended-MOOC design. Namely, the blended-MOOC design provided students with two instructors with contrasting roles: one served as an informative lecturer (via the MOOC) and the other served as an engaging facilitator (via the face-to-face setting). Having two instructors with different ways of presenting the course content and who played different roles helped students better understand the content and make real-world connections (Bruff et al., 2013). This affordance was recognised by the students themselves (see section 7.4.4). One of them, for instance, stated that 'the online course was very useful [in that it allowed me] to understand some topics that I couldn't understand with my teacher. The MOOC teacher was a good, knowledgeable lecturer. He explained the content in a very clear, easy way.' Another said commented that, 'in this course, if I was stuck with some problems, I could ask for help or advice from my teacher or the MOOC teacher. Both were available to help me.'

8.1.2 Learning with Peers in Local and MOOC Communities

Collaborative learning improves student success by increasing students' motivation, the sharing of knowledge, facilitating peer-support, as well as other benefits (McKeachie and Svinicki, 2010; Ormrod, 2011). This section assesses the impact of the blended-MOOC course design on students' collaborative learning behaviours.

It is clear from the paired t-test (Table 7-2) that the blended-MOOC design had a positive impact on students' collaborative learning activities (see Figure 8-1). The students reported higher levels of engagement in explaining the course materials to other students, preparing for exams by discussing the topics with others, and asking others to help them with understanding the materials.

Nonetheless, the paired t-test showed no statistically significant change in collaborative learning behaviours in terms of working with each other on assignments and/or projects.

The students who participated in the blended-MOOC reported that they worked more effectively and collaboratively with peers than with the face-to-face design. This quantitative result is consistent with the qualitative data drawn from the students' comments, lecturers' interviews, and the researcher's

own observations (see section 7.4.2). For example, one student valued the collaborative opportunities offered by the blended-MOOC course design. She said: '[W]ith the new teaching method [the blended-MOOC], I had opportunities to work and collaborate with my colleagues more often than in normal courses... Our thoughts and arguments could also be discussed during lecture time with others, as well as with the teacher.'

A lecturer echoed a similar thought: "the discussion during lecture time has increased compared to those exhibited with the traditional [face-to-face] teaching method." Still another said that 'I found class discussion had increased and that its quality had improved.'

Taken together, the results further support the idea of Aycock et al. (2002), Garnham & Kaleta (2002), and Ravenscroft & Luhanga (2014) who argue that the general forms of blended courses facilitate interaction among students. The findings also agree with Cornelius et al.'s (2017) findings which show that students who participate in a blended-MOOC format engage in collaborative learning more than students who are only taught using the face-to-face method.

Consistent with previous studies (Caulfield et al., 2013; Bruff et al., 2013; Milligan and Littlejohn, 2014), the students did not participate actively in the MOOC discussion forum. They preferred to ask questions among their local peers, both on-campus and online (via their study group). This result, however, runs contrary to Cornelius et al. (2017) who had found that blended-MOOC students actively contributed in the MOOC discussion board that they had studied. This discrepancy could be attributed to the MOOC platform itself. Cornelius et al. (2017) used a course offered by the FutureLearn platform. As Ferguson & Clow (2015) note, though, 'courses on the FutureLearn platform are underpinned by a social-constructivist pedagogy, which includes discussion as an important element' (p. 1).

The qualitative data of this study revealed some possible explanations for inactivity in the UDACITY discussion forum (see Figure 8-2).

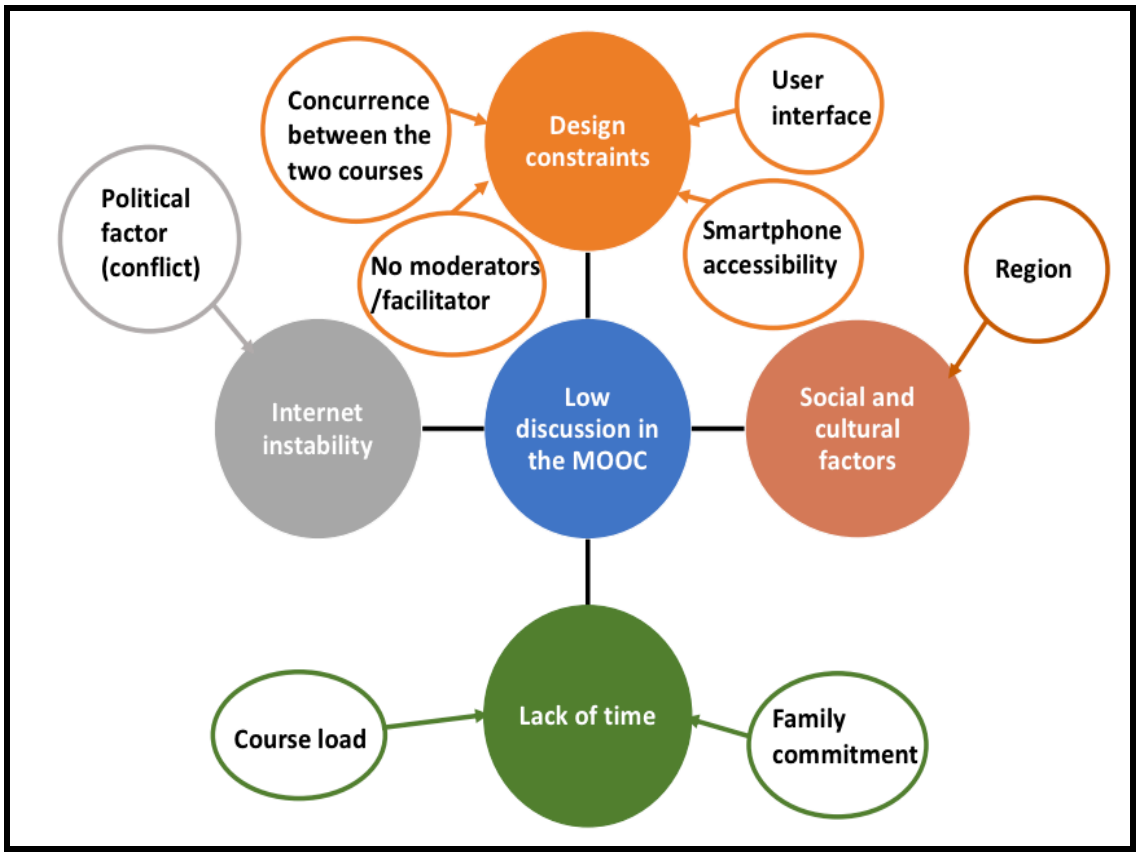

Figure 8-2: Factors that affected students' active participation in the MOOC discussion forum

1. **Shortage of time:** 22.2% of the participants mentioned that it was due to a lack of time that they did not actively participate in the forum, either because of family or other course commitments.
2. **Design constraints:** The study identified four design constraints that hindered the students' active participation in the online discussion board. Those constraints were as follows:
    a. **Smartphone Accessibility:** The UDACITY discussion forum was not accessible via the UDACITY smartphone application; the users needed to use the UDACITY website in order to participate;
    b. **User Interface**: The discussion webpage was separate from the course lessons and videos, which made it hard for them to follow the flow of the discussion. According to Vonderwell & Zachariah (2005) and Swan (2004), the course interface design can significantly affect the quality and the quantity of the interactions between learners. MOOCs that can afford well-organised and well-situated discussions can help enable coherent, active and meaningful participation (Vonderwell and Zachariah, 2005);

c. **Concurrence of the Campus and the MOOC Courses**: The MOOC did not run concurrently with the campus course. It was run as a self-paced course after its first run in the autumn of 2011. Previous comments and discussions remained but were not active as in its first run. This implied that some features of the MOOC had been disabled, resulting in less discussion and interaction between participants. Nevertheless, the online study group which was created by the researcher helped to facilitate collaboration and interaction amongst the students;
d. **Lack of Moderators and Facilitators:** The students reported that the discussion forum was used by other learners for reporting technical problems and for non-academic questions. Running the two courses concurrently and having facilitators who regularly read/answer/filter learners' questions may help promote active participation on the platform.

3. **Social and Cultural Factors:** A minority of the participants reported that hesitation was their reason for not being active in the online discussions. This supports Milligan, Littlejohn and Margaryan, (2013)'s findings as they showed that confidence is a factor that can affect learner's active participation and engagement in cMOOCs
However, the most likely cause for this hesitation is related to cultural and social constraints. This assertion is supported by other students who felt inhibited about communicating with the opposite gender due to their gender segregated culture.

Moreover, with in-depth analysis, most of these comments, if not all, were made by students who were from King Khalid University, which is located in the southern region of Saudi Arabia. It is therefore likely that such connections exist between region and cultural constraints. This corroborates the ideas of Alanazy (2011) who found that region plays a significant role in how students' beliefs affect their applying to coeducational online cooperative learning programmes in Saudi Arabia. It further supports the ideas of Alshahrani (2014) and Alhareth et al. (2015) who believe that the people who live in the southern and northern regions of the country are more attached to their culture and traditions than those from other regions in the country. Accordingly, region could be a contributory factor affecting students' willingness to actively participate in the online discussion forum (see Figure 8-2).

I would expect such social and cultural constraints to diminish over time as more students reap the advantages of collaborating and interacting with one another. MOOC providers will ideally focus more on stimulating active participation by making a significant investment in discussion design and by creating more collaborative learning opportunities and activities.

4. **Internet Connectivity:** This constraint was raised by the students from the King Khalid group. As mentioned earlier, King Khalid University is located in the southwest of the country; specifically, the region in which it is located shares a border with Yemen (Figure 6-2). The region could be affected by the current violent conflicts raging between Saudi Arabia and Yemen which started in 2015. As a result, the region's infrastructure could also be affected, including its Internet's connectivity and stability.

8.1.3 Experiences with the Faculty

Meaningful interactions with the faculty influences students' experiences and engagement (Kuh and Hu, 2001a; Axelson and Flick, 2010) and can have a positive effect on cognitive growth, development, and retention (Pascarella and Terenzini, 2005). This section is designed to study the effect of the blended-MOOC teaching method on student-faculty interaction.

The students who participated in the blended-MOOC method reported higher engagement in most items for the student-faculty interaction indicator compared to those who had been taught using the face-to-face teaching method (see section 7.2.5). They reported that they had been strongly engaged (statistically significant) with the following items:

- asking questions and contributing to the class discussions;
- discussing course topics with the teaching staff outside the class; and
- working with the faculty on activities other than coursework.

Nonetheless, there was no reported change between the two teaching methods in terms of discussing their academic performance with the staff and talking about their career plans with the faculty.

One interesting finding was that the students who participated in the face-to-face design engaged more in making significant changes to their work based on teacher feedback than those being taught using the blended-MOOC design.

The quantitative results agree with the qualitative findings, as two out of three interviewees from the current study believed that the interaction between students and teachers was improved in terms of contributing to class discussions

and asking questions outside of the class. As one lecturer noted, 'The interaction between teacher and student increased after the [implementation] of the MOOC. Students asked questions outside the class and most of these questions were related to the class discussions (...) very few asked about their future career. (see section 7.4.3)

Some students commented that the blended-MOOC design made an impact on their interaction with the faculty. One student, for instance, said that, '[When using] the new teaching method [the blended-MOOC method], we learned the [main] concepts at home. Thus, we had more time to discuss and get support from our teacher' (section 7.4.3). Still another commented that 'After using the online course, I interacted with my lecturer more often than before... I asked a number of questions inside and outside the class.'

Although the students reported higher engagements in most of the questions found under the student-faculty interaction indicator, the overall mean of the impact of that indicator was not statistically significant (p-value > .05) as shown in the paired t-test (Table 7-2). This is contrary to previous studies (Aycock et al., 2002; Garnham and Kaleta, 2002) which suggest that blended courses facilitate interaction between students and the faculty. Our results, however, are consistent with those of Cornelius et al. (2017), which revealed no statistically significant difference between the two methods in terms of student-faculty interaction.

8.2 The Correlation between Time Spent on the MOOC and Student Engagement Indicators

The results of this study showed that there were positive correlations between time spent on the MOOC system and the five aspects of student engagement. According to the Spearman's correlation test (section 7.2), the strength of these correlations was strong for the reflective & integrative learning and higher-order learning indicators; moderate for the collaborative learning and student-faculty contact indicators; and small for the learning strategies indicator. These results, coupled with the high frequency (84.3%) with which students intended to continue using MOOC systems, suggest that investments of both time and effort in MOOC systems from both students and institutions are worthwhile.

The positive relationships between the use of the MOOC and the student engagement measures evidenced in this study support earlier information technology researches which have found a positive relationship between use of

technology and engagement (Chen et al., 2010; Hu and Kuh, 2001; Laird and Kuh, 2005; Kuh and Hu, 2001b). This study's findings suggest that this relationship persists even when a new technology is being incorporated within face-to-face teaching experiences. While this study does not investigate the exact nature of this relationship, it raises the need for future investigation to further examine the nature of this positive correlation.

Moreover, given the strengths of the correlations between the use of the MOOC and student engagement may suggest that asking students about their use of MOOCs could be used as reliable measures of other forms of engagement. Future work is needed to study whether these measures can be used as predictors of student outcomes and whether such predictions are reliable.

8.3 The Similarities and Differences between the Universities in the Context of the Blended-MOOC

The one-way ANOVA (presented in section 7.3) found a number of similarities and differences between the three universities in terms of student engagement in the blended-MOOC context.

Similarities:

Having the students classified according to institution, the ANOVA revealed that the students reported similar levels of engagement in six indicators. Those indicators are: higher-order learning; learning strategies; collaborative learning; student-faculty interaction; MOOC collaborative learning; and MOOC social interaction.

Figure 8-3 visually demonstrates the similarities and differences between the institutions with relation to the student engagement indicators. With an inspection of Figure 8-3, one can observe four main similarities between the institutions:

S.1. The mean score was high (>3) for feeling academically challenged, as well as for thinking analytically and critically. This indicates that the blended-MOOC course design can be an effective way of maintaining one's personal development.

S.2. All three groups reported a high mean score (>3) in working collaboratively with each other. This may suggest that the use of MOOCs in on-campus teaching may enhance student opportunities for communicating and working with one's peers within the campus community.

S.3. The students from all of the institutions reported a low mean score (<2.5) for student-faculty interaction. This low interaction with faculty warrants further investigation.

S.4. All students also reported a low mean score (<2.5) for both collaborative learning and social interaction within the MOOC discussion board. This may suggest that these forms of engagement are sensitive to both the MOOC's design and delivery.

Differences:

The one-way ANOVA found that the students showed statistically significant differences with relation to their level of engagement in three indicators. These differences were evidenced in the reflective & integrative learning, MOOC active learning, and teaching with the MOOC indicators.

According to the Turkey post hoc test (Table 7-19),

D.1. The Imam students reported a higher level of engagement in the integrative & reflective learning indicator when compared to the students from King Khalid. Although the cause of this result is unknown, it could be something to do with types of classroom activities. The Imam students may have been exposed to a higher level of cognitive tasks in-class which may have helped them to think more reflectively and to integrate concepts and ideas across contexts better than other groups.

D.2. The Imam and Taif groups demonstrated more MOOC active learning engagement than did the King Khalid group (see Figure 8-3). As mentioned earlier in this chapter, the students from King Khalid reported problems with their Internet stability. This could have resulted in their using the MOOC less with relation to the active learning process.

D.3. When asked whether the teacher had used the MOOC effectively in the class, the ANOVA showed that the King Khalid teacher was perceived to be more effective in using the MOOC materials in the classroom than the Imam teacher. This may be due to the King Khalid tutor's trying to compensate for their Internet's instability.

These differences between the universities suggest that some indicators may be affected by external factors, such as: class size (Iaria and Hubball, 2008; Monks and Schmidt, 2010); institutional rank (National Survey of Student Engagement, 2010; Porter, 2006; Zilvinskis and Rocconi, 2018); teacher qualification and region (Alanazy, 2011; Alshahrani, 2014; Alhareth et al., 2015).

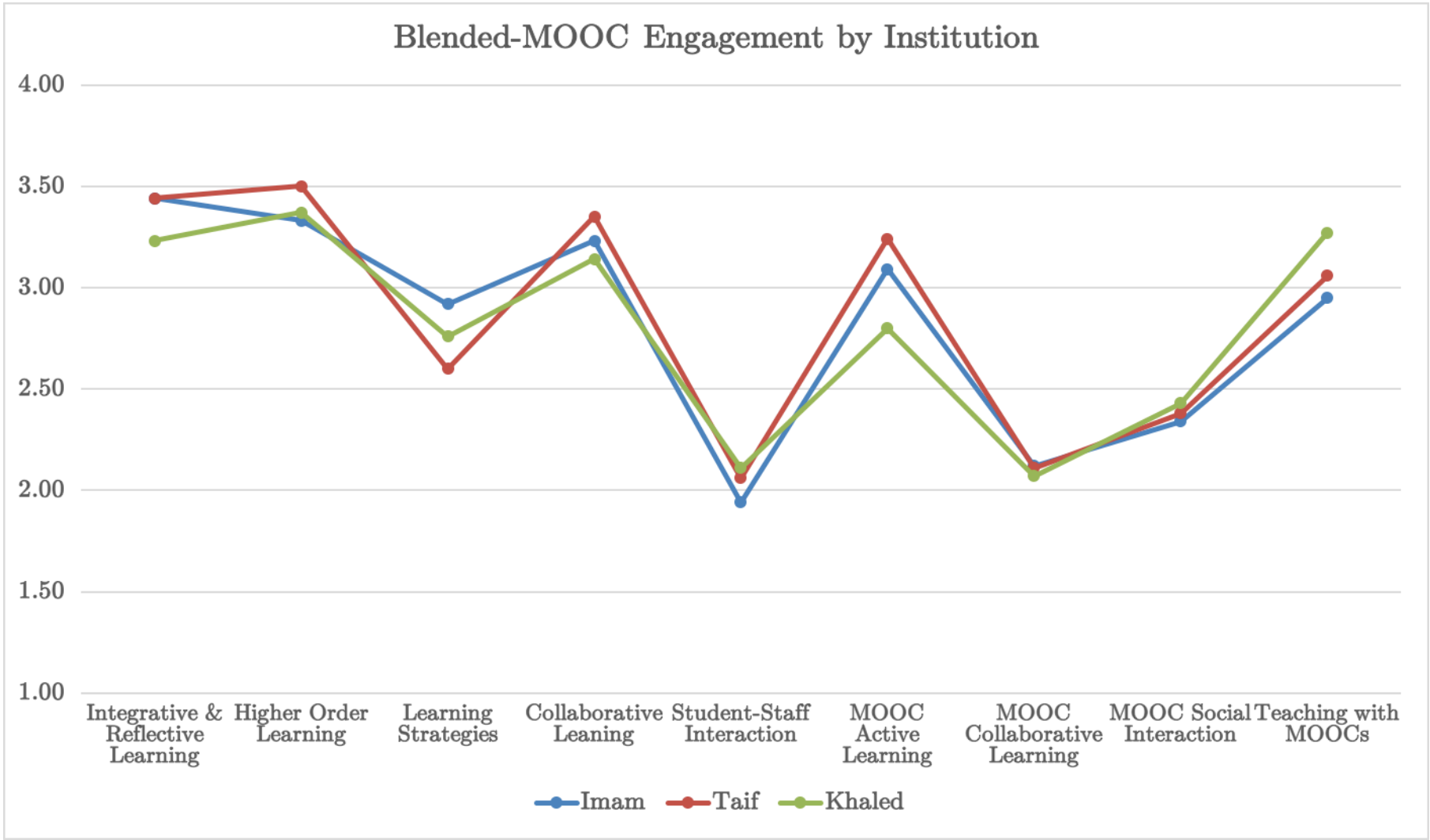

Figure 8-3: Composite index of engagement by institution

8.4 Summary

The results of the questionnaire, the findings drawn from the interviews, the students' comments and the researcher's observations were all examined in this chapter in order to answer this study's three research questions.

With regards to RQ1, "How does integrating MOOCs into campus courses impact student engagement in Saudi women's higher education?", according to the triangulation data, it can be concluded that the MOOC had a positive impact on most of the student engagement indicators, including the reflective & integrative learning, higher-order learning, and collaborative learning indicators. Nevertheless, the study failed to provide any evidence for the MOOC's use having a positive impact on student-faculty contact.

With regards to RQ3, "What are the relationships between the student engagement indicators and time spent on the MOOC systems?", the study demonstrated a positive correlation between time spent on the MOOC system and the student engagement indicators.

With regards to RQ4, "Are particular patterns, similarities or differences in engagement evident when the behaviours of students in the blended-MOOC are classified based on institution?", it was found that the student engagement patterns in the blended-MOOC context had a number of similarities and differences:

- The students exhibited relatively similar (no statistically significant) levels of engagement in six indicators; viz., in the higher-order learning, learning strategies, collaborative learning, student-faculty interaction, MOOC collaborative learning, and social interaction indicators.
- The differences were statistically significant for three indicators, including the reflective & integrative learning, MOOC active learning, and teaching with the MOOC indicators.

The following chapter provides a summary of the research, a further examination of the research findings, and proposals for further research.

Chapter 9. Conclusion and Future Works

This chapter highlights the main aspects of this study. It also presents the main findings of the research before then proposing directions for future research based on this research's limitations and findings, as well as on new ideas that the researcher has gleaned from conducting this research.

9.1 Research Summary

The present study was designed to investigate the impact of integrating MOOC elements into campus courses on student engagement within Saudi women's higher education.

To accomplish the objective of the study, two studies were carried out: 1) a preliminary study, and 2) an experimental study.

1. A preliminary study was carried out first in order to develop a model of measuring student engagement in a blended-MOOC context. The framework of the model was drawn from the well-established National Survey of Student Engagement (NSSE), the UK Engagement Survey (UKES), and the Student Engagement Questionnaire (SEQ).
   Thirty-five expert practitioners with different backgrounds and disciplines were recruited to confirm the model. After the confirmation of the experts using one sample t-test, a trial evaluation was conducted with thirteen students who had taken a course in a blended-MOOC format. The final model had nine indicators that provided information about distinct aspects of student engagement in a blended-MOOC setting.
2. Subsequently, a fourteen-week experimental study was undertaken using the counterbalanced within-subjects design and involved one hundred and eight participants from three different Saudi universities. The participants were female undergraduate students from the Departments of Information and Computer Science of their respective universities and had enrolled in a particular *Artificial Intelligence* course during the 2016/17 academic year.

Data triangulation was used to test the hypothesis and to assess the change of student engagement between the face-to-face teaching method and the blended-MOOC course design. Four data collection methods were used to collect the final research dataset:

1) The confirmed model
2) Interviews with the lecturers
3) Students' notes and comments
4) The researcher's observations.

The research has shown that:

- Students who used the MOOC systems in their learning tended to report higher scores in the general engagement measures (e.g. level of academic challenge, active and collaborative learning);
- Students who used the MOOC systems in their learning were also more likely to utilise deep approaches towards learning, such as reflective and integrative learning and higher-order thinking, whilst studying for their blended-MOOC module;
- There was a positive correlation between time spent on the MOOC system and the engagement indicators. The more students used the MOOC system for educational activities, the more they engaged in the learning process;
- The blended-MOOC engagement patterns had a number of similarities and differences when students were classified based on their institution. The students reported similar levels of engagement for six indicators: viz., higher-order learning, learning strategies, collaborative learning, student-staff interaction, MOOC collaborative learning and MOOC social interaction. Furthermore, students reported statistically significant different levels of engagement for three indicators. Those indicators included reflective & integrative learning, MOOC active learning, and teaching with MOOCs. The differences between the institutions suggest that some engagement indicators may be sensitive to external factors, such as class size, region, institutional rank and teacher.

The study compared the findings with other established publications. The publication fell in two broad categories:

1) Publications regarding the general forms of blended course design, including the flipped classroom design (see Aycock et al. 2002; Dziuban et al. 2004; James et al. 2014; Ravenscroft & Luhanga 2014; Elmaadaway 2017);
2) More recent publications which focused on the blended-MOOC course design (see Griffiths et al. 2014; Griffiths et al. 2015; Cornelius et al. 2017).

Table 9-1 provides a summary of the comparison between the findings of the current and existing studies.

Table 9-1: Comparing the current study results with established findings

Current Study		Existing Studies	
Null Hypothesis	**Research Results**	**Consistent with**	**Not Consistent with**
There is no statistically significant difference (at the 0.05 level) between the higher-order learning of students who are taught using the face-to-face teaching method with those who are taught using the blended-MOOC method.	Statistically significant difference for blended-MOOC design	(Griffiths et al., 2014, 2015; Ravenscroft and Luhanga, 2014)	(Cornelius et al., 2017)
There is no statistically significant difference (at the 0.05 level) between the reflective & integrative learning of students who were taught using the face-to-face teaching method when compared to those who were taught using the blended-MOOC method.	Statistically significant difference for blended-MOOC design	(Cornelius et al., 2017)	
There is no statistically significant difference (at the 0.05 level) between the collaborative learning of students who were taught using the face-to-face teaching method and those who were taught using the blended-MOOC method.	Statistically significant difference for blended-MOOC design	(Cornelius et al., 2017; Aycock et al., 2002; Dziuban and Moskal, 2001; Ravenscroft and Luhanga, 2014)	
There is no statistically significant difference (at the 0.05 level) between the student-faculty interaction of students who were taught using the face-to-face teaching method when compared to those who were taught using the blended-MOOC method.	No statistically significant difference between the two teaching methods	(Cornelius et al., 2017)	(Aycock et al., 2002; Dziuban and Moskal, 2001)
There is no statistically significant relationship (at the 0.05 level) between weekly time spent on the MOOC and the engagement indicators.	Statistically significant relationship between time spent on the MOOC and the engagement indicators.	(Chen et al., 2010; Hu and Kuh, 2001; Laird and Kuh, 2005; Kuh and Hu, 2001b).	

9.2 Research Findings

This section provides a summary of the research findings, based on the following research questions:

RQ1) How does integrating MOOCs into campus courses impact on student engagement in Saudi women's higher education?

This question is answered in section 8.1. The results can be summarised as follows:

- The blended-MOOC course design succeeded in enabling noticeable proportions of participants to feel highly engaged (statistically significant) in reflective and integrative learning, higher-order learning, and collaborative learning when compared to the face-to-face teaching method.
- The participants reported the same level of engagement in terms of student-faculty interaction for both of the two teaching methods.
- In the study, learners did not participate actively in the MOOC discussion board, but some explanations were offered, including design constraints, social and cultural factors, internet instability, and lack of time.
- Overall, there are encouraging signs that integrating MOOC elements into campus courses has the potential of enriching on-campus learning environments and supporting personal and social development, including that of students' critical thinking skills.

RQ2) What indicators can be used to measure student engagement in a blended-MOOC course design?

The findings related to this question are available in Section 5.3. They are summarised as follows:

Upon the review of the student engagement literature, the NSSE, the UKES and the SEQ were chosen as the theoretical frameworks with which to answer this question. The reasons behind choosing these instruments as a framework are mentioned in Section 4.1. The model was validated by a panel of thirty-five experts and thirteen students (see Chapter 5). Table 9-2 presents the final model developed for measuring student engagement in a blended-MOOC.

Table 9-2 Final model of measuring student engagement in blended MOOCs

	Indicators	Description	Literature Validity	Expert and Student Validity
General Engagement	Reflective & Integrative learning	Examines the level of integration and connection of ideas and concepts.	NSSE	The p value of all indicators was less than 0.05, which means that the researcher rejected the null hypothesis, and the indicator was accepted as a scale for measuring student engagement in the context of a blended MOOC. The preliminary study also confirmed that the indicators and items were clear and understandable to blended-MOOC students.
	Higher-Order Learning	Captures the extent to which course materials and assessments emphasise challenging mental tasks, such as application, analysis, judgment, and synthesis.		
	Collaborative Learning	Assesses the extent to which students performed some effective learning strategies, such as reviewing/identifying/summarising the course materials.		
	Learning Strategies	Examines the extent to which two or more students work together in academic activities.		
	Student-staff Interaction	Explores the degree to which students contact and interact with their teachers.	UKES	
MOOC Engagement	MOOC Active Learning	Collects information about the degree to which students actively used the MOOC to enhance their learning.	SEQ	
	MOOC Collaborative Learning	Captures the degree to which students used the MOOC to do academic work with other online learners.	NSSE	
	MOOC Social Interaction	Asks how students used the MOOC to experience a range of interactions with others.	SEQ	
	Teaching with the MOOC	Captures students' perceptions of whether instructors used the MOOC in pedagogically effective ways.		

RQ3) What are relationships between student engagement indicators and time spent on the MOOC systems?

The relationships between the weekly time spent on the MOOC system and student engagement are discussed Section 8.2. Overall, the results of this study found a positive relationship between MOOC system use and student engagement. That suggests that, the more the students use MOOCs for educational purposes, the more they engage in effective educational practices (e.g., active and collaborative learning).

RQ4) Are particular patterns, similarities or differences in engagement evident when the behaviours of students in the blended-MOOC are classified based on institution?

A comparison between the participating universities was discussed in Section 8.3. Student engagement patterns in the blended-MOOC context had a number of similarities and differences, namely:

- The students exhibited relatively similar (no statistically significant) levels of engagement in six indicators, including higher-order learning, learning strategies, collaborative learning, student-faculty interaction, MOOC collaborative learning, and social interaction in the MOOC.
    - The participants reported high level of engagement in both higher-order learning and collaborative learning.
    - All participants showed low level of student-faculty interaction and social interaction and collaborative work within the MOOC system.
- The differences were significant for three indicators, including reflective & integrative learning, MOOC active learning, and teaching with the MOOC.

9.3 Research Contributions

This section highlights the main contributions of the current research.

1. First, a student engagement framework was developed to be applicable to use in the blended-MOOC course designs (see Figure 5-5)
2. Second, the student engagement instrument was built and validated to measure and assess student engagement in the context of blended-MOOC (see Table 5-5).

3. Third, the impact of integrating MOOC elements into Saudi women's higher education was examined and summarised in Figure 8-1.
4. Last, the factors that hindered students from using MOOC systems were identified (see Figure 8-2).

9.4 Proposals for Future Research

This section provides some future directions for research which are drawn from 1) the limitations of the study, 2) the study's findings, and 3) new research ideas.

9.4.1 Future Directions based on the Limitations of this Study

This study is not exempt from limitations. The limitations are discussed below based on each of the study phases.

Preliminary study: The preliminary study used a quantitative method because the study aimed to test the hypothesis and confirm the proposed model. Due to the time and resource constraints, the researcher asked a set of thirty-five experts two open questions for the purpose of exploring whether there were any indicators of engagement needed to be incorporated into the model. This kind of approach did not provide richer data as expected. So, it would be interesting to conduct an exploratory study using qualitative methods, such as a focus group or interviews with experts, to explore this question further and let them express themselves in more detailed, richer ways.

Another limitation is that the evaluation of the model was only conducted once and only with a small number of participants. Measure development is an iterative procedure, though, and ongoing evaluations are needed to refine them and make them more valid.

Experimental study: The experiment was conducted on an *Intro to Artificial Intelligence* course at three Saudi women's universities in the 2016/17 academic year. It would have been extremely difficult, given the time and resources available to the researcher, to include more than three universities. Furthermore, the study was limited to a small number of modules due to the constraint of matching curriculums with MOOC resources available online. Other studies of the same type as this research may allow more scope to verify and generalise the results. Studies that are conducted at different universities and with different modules/disciplines is highly recommended.

This study was also limited by the absence of some sociodemographic and socio-economic data, such as income, health, marital status and family size. Further

work needs to be done to establish whether these factors have an impact on this research's findings.

9.3.2 Future Directions based on this Study's Findings

1) The study found that students from each institution reported a low mean score (<2.5) on the interaction between students and faculty. This study was not able to explain the reasons behind these low interactions with faculty. Seeing as this kind of interaction is important and has been evidenced to impact student learning and overall academic development (Pascarella and Terenzini, 2005), further research could be conducted to explore and investigate the reasons for there being such a low level of interactions with staff.
2) The study revealed a positive correlation between engagement and time spent using the MOOC for educational activities. This finding suggests that the correlation persists even if a new technology is being incorporated within face-to-face teaching experiences. While this study does not define the exact nature of that relationship, it raises the need for future investigation in order to further explore the nature of this relationship.
3) Having strong correlations between the use of the MOOC and engagement may suggest that asking students about their use of MOOCs could be used as reliable measures for other forms of engagement. Future studies are needed to investigate whether these measures can be used as predictors of student outcomes as well as the reliability of using those measurements for that purpose.
4) Cornelius et al. (2017) show that students who are taught in a face-to-face learning setting engage in critical thinking and higher-order learning more than those who are taught in blended-MOOC setting. This differs from the findings of the current research. The differences between the two studies might be an area for further investigations.

9.3.3 Future Directions based on New Research Ideas

Since examining student engagement within the blended-MOOC course design is still in its infancy, it would be a fruitful area for further investigations. Here are some suggestions for such researches:

1) The main target of this research was Saudi female undergraduate students; however, having the study replicated with male students would be interesting seeing as one could then attempt to identify the similarities and differences between the two genders.

2) Seeing as this study compared the blended-MOOC course and face-to-face course designs, it would be a novelty to conduct this study again for the purpose of comparing blended-MOOCs with general forms of blended-learning or with e-learning teaching methods.
3) Comparative studies can be applied on this study. The NSSE publishes engagement data annually, allowing for a comparison with other data and other contexts. A study which focuses on a comparison of the data of this study and the data from the NSSE would be interesting for it would then be able to situate this study's findings in the broader international context.
4) The use of MOOC elements within a campus study can take different forms. For example:
    - Use MOOC materials as supplement resources — that is, no change is made to face-to-face sessions and activities;
    - Use MOOC elements to replace parts of classroom activities.

    Since this study used the flipped classroom design, other experimental studies can be conducted with different forms of blended-MOOCs in order to determine which forms of blended-MOOC design are most useful.
5) This study focused on higher education, so one could suggest to conduct further studies at Saudi community colleges, as well as in the vocational, industry and business sectors.

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Appendix A

Expert Questionnaire - A Model of Measuring Student Engagement in A Blended-MOOC Context

I am currently pursuing PhD research at the University of Southampton, United Kingdom. A key aim of my research is to investigate and measure the impact of blended-MOOC course design on student engagement with a particular focus on Saudi women's higher education. This questionnaire aims to investigate indicators of student engagement in a blended-MOOC course design.

I would like your kind contribution in the research process by completing the questionnaire. I would also like to stress that anyone has the right to withdraw up until the final submission of their responses. All responses will be treated confidentially and respondents will be anonymous during the collection, storage and publication of research material. Responses are collected online and stored in a secure database.

Should you have any questions about the study or you wish to receive a copy of the results, please contact the researcher.

(Blended-MOOC course design is a campus course that used MOOC elements in teaching and learning)

Fadiyah Almutairi

Electronics and Computer Science (ECS)

The University of Southampton

Southampton

United Kingdom

Mail to: Fa1v13@ecs.soton.ac.uk

Consent Form*

□ I have read and understood the information sheet (insert date /version no. of participant information sheet) and have had the opportunity to ask questions about the study. I also I agree to take part in this research project and agree for my data to be used for the purpose of this study. I understand my participation is voluntary and I may withdraw at any time without my legal rights being affected. I am happy to be contacted regarding other unspecified research projects. I therefore consent to the University retaining my personal details on a database, kept separately from the research data detailed above. The 'validity' of my consent is conditional upon the University complying with the Data Protection Act and I understand that I can request my details be removed from this database at any time.

Data Protection *

□ I understand that information collected about me during my participation in this study will be stored on a password protected computer and that this information will only be used for the purpose of this study. All files containing any personal data will be made anonymous.

Student Engagement Indicators in A Blended-MOOC Context

Demographic Information

1) Job role/ Classification in MOOC:

( ) Administrator

( ) Facilitator

( ) Teaching Staff

( ) Other: .....

2) How long have you been working in MOOC-related field?

( ) 0-6 months

( ) 1-2 years

( ) More than 2 years

Student Engagement indicators in blended MOOC design

3) Reflective and Integrative Learning: this indicator examines the level of integration of ideas and concepts, and reflect such mental activities as connecting new ideas to previous learning and to social issues and problems, and viewing ideas from new perspectives.
How important for you is this indicator? *

( ) Very important

( ) Important

( ) Neutral

( ) Not important

( ) Not at all important

4) Higher-order learning: this indicator reflects mental activities such as memorising, evaluating, synthesising, analysing and applying information.
How important for you is this indicator? *

( ) Very important

( ) Important

( ) Neutral

( ) Not important

( ) Not at all important

5) Collaborative learning: Collaborating with peers in solving problems or mastering difficult material deepens understanding and prepares students to deal with the messy, unscripted problems they encounter during and after college. . How important for you is this indicator? *

( ) Very important

( ) Important

( ) Neutral

( ) Not important

( ) Not at all important

6) Learning Strategies is defined as behaviours and thoughts that a learner engages in during learning. Examples of effective learning strategies include identifying key information in readings, reviewing notes after class, and summarizing course material. How important for you is this characteristic ? *

( ) Very important

( ) Important

( ) Neutral

( ) Not important

( ) Not at all important

7) Student/staff interaction: Interactions with faculty can positively influence the cognitive growth, development, and persistence of college students. Through their formal and informal roles as teachers, advisors, and mentors, faculty members model intellectual work, promote mastery of knowledge and skills, and help students make connections between their studies and their future plans. How important for you is this indicator? *

( ) Very important

( ) Important

( ) Neutral

( ) Not important

( ) Not at all important

8) **MOOC Active Learning: items in this indicator designed to collect information about the extent to which students actively use MOOC to enhance their learning. How important for you is this indicator? ***

( ) Very important

( ) Important

( ) Neutral

( ) Not important

( ) Not at all important

9) **MOOC Collaborative Learning: this indicator measures students' use of MOOC in collaborative work with their peers. How important for you is this indicator? ***

( ) Very important

( ) Important

( ) Neutral

( ) Not important

( ) Not at all important

10) **MOOC Social Interaction: this indicator asks about how students use MOOC tools to experience a range of salient interactions with others. How important for you is this indicator? ***

( ) Very important

( ) Important

( ) Neutral

( ) Not important

( ) Not at all important

11) **Teaching with MOOCs: this indicator captures students' perceptions of whether teaching staff used MOOC in pedagogically effective ways. How important for you is this indicator? ***

( ) Very important

( ) Important

( ) Neutral

( ) Not important

( ) Not at all important

---

12) **Is there any indicator mentioned earlier that needs more clarification?**

( ) No

( )Yes , please

specify:.....

13) **Finally, do you have any further comments?**

.....

Thank You!

Appendix B

A Model of Measuring Student Engagement in A Blended-MOOC Context – Preliminary Study

I am currently pursuing PhD research at the University of Southampton, United Kingdom. A key aim of my research is to investigate and measure the impact of blended-MOOC course design on student engagement with a particular focus on Saudi women's higher education. This questionnaire aims to test the clarity of the questionnaire for use in a larger study and have your feedback/opinion on the blended-MOOC you had taken.

I would like your kind contribution in the research process by completing the questionnaire. I would also like to stress that anyone has the right to withdraw up until the final submission of their responses. All responses will be treated confidentially and respondents will be anonymous during the collection, storage and publication of research material. Responses are collected online and stored in a secure database.

Should you have any questions about the study or you wish to receive a copy of the results, please contact the researcher.

(Blended-MOOC course design is a campus course that used MOOC elements in teaching and learning)

Fadiyah Almutairi

Electronics and Computer Science (ECS)

The University of Southampton

Southampton

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Mail to: Fa1v13@ecs.soton.ac.uk

Consent Form*

□ I have read and understood the information sheet (insert date /version no. of participant information sheet) and have had the opportunity to ask questions about the study. I also I agree to take part in this research project and agree for my data to be used for the purpose of this study. I understand my participation is voluntary and I may withdraw at any time without my legal rights being affected. I am happy to be contacted regarding other unspecified research projects. I therefore consent to the University retaining my personal details on a database, kept separately from the research data detailed above. The 'validity' of my consent is conditional upon the University complying with the Data Protection Act and I understand that I can request my details be removed from this database at any time.

Data Protection *

□ I understand that information collected about me during my participation in this study will be stored on a password protected computer and that this information will only be used for the purpose of this study. All files containing any personal data will be made anonymous.

About yourself

1. **Module Name:**

□ Web Science □ Digital Marketing

COURSE ENGAGEMENT: (pre-& post-test)

Reflective & Integrative Learning:

During the module, how often have you

2. **Combined ideas from different resources when completing assignments. ***

□ Very Often □ Often □ Sometimes □ Never

3. **Connected your learning to societal problems or issues***

□ Very Often □ Often □ Sometimes □ Never

4. **Examined the strengths and weaknesses of you own views on a topic or issue***

□ Very Often □ Often □ Sometimes □ Never

5. **Tried to better understand someone else's views by imagining how an issue looks from his or her perspective***

□ Very Often □ Often □ Sometimes □ Never

6. **Learned something that changed the way of understanding an issue or concept***

□ Very Often □ Often □ Sometimes □ Never

7. **Connected ideas from your course to your prior experience and knowledge***

□ Very Often □ Often □ Sometimes □ Never

Higher-Order Learning:

During the module, how much has your coursework emphasized the following

8. **Memorising course material ***

□ Very much □ Quite a bit □ Some □ Very little

9. **Applying facts, theories, or methods to practical problems or new situations***

□ Very much □ Quite a bit □ Some □ Very little

10. Analysing ideas or theories in depth by examining their parts *

□ Very much □ Quite a bit □ Some □ Very little

11. Evaluating or judging a point of view, decision, or information source*

□ Very much □ Quite a bit □ Some □ Very little

12. Forming a new understanding from various pieces of information*

□ Very much □ Quite a bit □ Some □ Very little

Learning Strategies:

During the module, how often have you

13. Identified key information from reading assignments*

□ Very Often □ Often □ Sometimes □ Never

14. Reviewed your notes after class*

□ Very Often □ Often □ Sometimes □ Never

15. Summarized what you learned in class or from course materials*

□ Very Often □ Often □ Sometimes □ Never

Collaborative Learning:

During the module, how often have you

16. Explained course material to one or more students*

□ Very Often □ Often □ Sometimes □ Never

17. Prepared for exams or assessments by discussing or working through course material with other students*

□ Very Often □ Often □ Sometimes □ Never

18. Worked with other students on course projects or assignments*

□ Very Often □ Often □ Sometimes □ Never

19. Asked another student to help understand course materials*

□ Very Often □ Often □ Sometimes □ Never

Student-Staff Interaction:

During the module, about how often have you

20. Discussed your academic performance and/or feedback with teaching staff in this course*

□ Very Often □ Often □ Sometimes □ Never

21. **Asked questions or contributed to course discussions in other ways***

□ Very Often □ Often □ Sometimes □ Never

22. **Discussed course topics, ideas, or concepts with teaching staff outside taught sessions, including by email/online***

□ Very Often □ Often □ Sometimes □ Never

23. **Worked with teaching staff on activities other than coursework***

□ Very Often □ Often □ Sometimes □ Never

24. **Made significant changes to your work based on feedback***

□ Very Often □ Often □ Sometimes □ Never

MOOC ENGAGEMENT (only post-survey)

MOOC active learning:

During the module, to what extent have you experienced the following

25. **Found that MOOC materials challenged you to learn***

□ Very Often □ Often □ Sometimes □ Never

26. **Used MOOC resources to improve your learning***

□ Very Often □ Often □ Sometimes □ Never

27. **Used MOOC materials to make lectures more meaningful***

□ Very Often □ Often □ Sometimes □ Never

28. **Used MOOC quizzes to improve your understanding of a topic***

( ) Very often ( ) often ( ) Sometimes ( ) Never

29. **Shared and reflected on what you learnt in the MOOC course through blogs, micro-blogging, discussion space etc]**

□ Very Often □ Often □ Sometimes □ Never

During the module, how often have you:

30. **Asked another online learner to help you understand course material***

□ Very Often □ Often □ Sometimes □ Never

31. **Explained course material to one or more online learners***

□ Very Often □ Often □ Sometimes □ Never

32. **Posted a question in the MOOC discussion forum- from researcher***

( ) Very often ( ) often ( ) Sometimes ( ) Never

MOOC Social Interaction

During the course, about how often have you done the following

33. Used MOOC tools (discussion spaces, social media, and emails) to communicate with others*.

□ Very Often □ Often □ Sometimes □ Never

34. Had helpful online conversations with others*

□ Very Often □ Often □ Sometimes □ Never

Teaching with MOOC

During the course, about how often have you done the following

35. Teaching staff used MOOC materials to discuss interesting issues*

□ Very Often □ Often □ Sometimes □ Never

36. Staff used MOOCs in ways that improved the overall teaching*

□ Very Often □ Often □ Sometimes □ Never

37. **Staff used MOOCs to provide students with extra assistance**

□ Very Often □ Often □ Sometimes □ Never

Open Questions:

38. Kindly give your feedback and comments on the questionnaire or on the blended-MOOC course design

---

Appendix C

Participant Information – Expert Questionnaire

Ethics reference number: 15021	**Version:** 1	**Date:** 2014-12-11
Study Title: Investigating student engagement indicators in Blended MOOC contexts		
Investigator: Fadiyah Almutairi		

Please read this information carefully before deciding to take part in this research. If you are happy to participate you will be asked to sign a consent form. Your participation is completely voluntary.

What is the research about? This is a student project which aims to explore and investigate indicators that measure student engagement in blended MOOC. At the end of the study, you can email me to see how your data was used, if you wish.

Why have I been chosen? You have been approached because you have taught/facilitated a module with MOOC elements.

What will happen to me if I take part? You will first do sign a consent and then will be asked to do a survey. It will take about five-ten minutes in total.

Are there any benefits in my taking part? The study will add to current knowledge about blended MOOCs.

Are there any risks involved? There are no particular risks associated with your participation.

Will my data be confidential? All data collected is anonymous and your data will be kept confidential. It will be held on a password protected computer/secure University server, and used only in accordance with the Data Protection Act (1998). In addition, the data will be anonymised by separating identifying data. Your data will be linked to your consent form by a code. It will be destroyed by the investigator once the study is done. If you would like to access your data after your participation, change it, or withdraw it, please contact the investigator (e-mail: fa1v13@soton.ac.uk).

What happens if I change my mind? You may withdraw at any time and for any reason. You may access, change, or withdraw your data at any time and for any reason prior to its destruction. You may keep any benefits you receive.

What happens if something goes wrong? Should you have any concern or complaint, contact me if possible (investigator e-mail fa1v13@soton.ac.uk), otherwise please contact the FPSE Office (e-mail lg11@soton.ac.uk) or any other authoritative body such as Dr Martina Prude, Head of Research Governance (02380 595058, mad4@soton.ac.uk).

Appendix D

Participant Information Sheet – Student Questionnaire

Ethics reference number: 18889	**Version:** 1	**Date:** 2015-04-28
Study Title: The impact of the use of MOOC materials on campus student engagement		
Investigator: Fadiyah Almutairi		

Please read this information carefully before deciding to take part in this research. If you are happy to participate you will be asked to sign a consent form. Your participation is completely voluntary.

What is the research about? This is a student project which aims to explore Saudi students' engagement in blended MOOC. There is no fund agency to this study. At the end of the study, you can email me to see how your data was used, if you wish.

Why have I been chosen? You have been approached because you have taken a module with MOOC elements.

What will happen to me if I take part? You will first receive consent information and then will be asked to do a survey. It will take about 20 to 30 mins in total. Once the data is submitted it will not be possible to remove. If wish to withdraw just email me and I will delete your participation.

Are there any benefits in my taking part? The study will add to current knowledge about blended MOOCs.

Are there any risks involved? There are no particular risks associated with your participation.

Will my data be confidential? All data collected is anonymous and your data will be kept confidential. It will be held on a password protected computer/secure University server, and used only in accordance with the Data Protection Act (1998). In addition, the data will be anonymised by separating identifying data. Your data will be linked to your consent form by a code. It will be destroyed by the investigator once the study is done. If you would like to

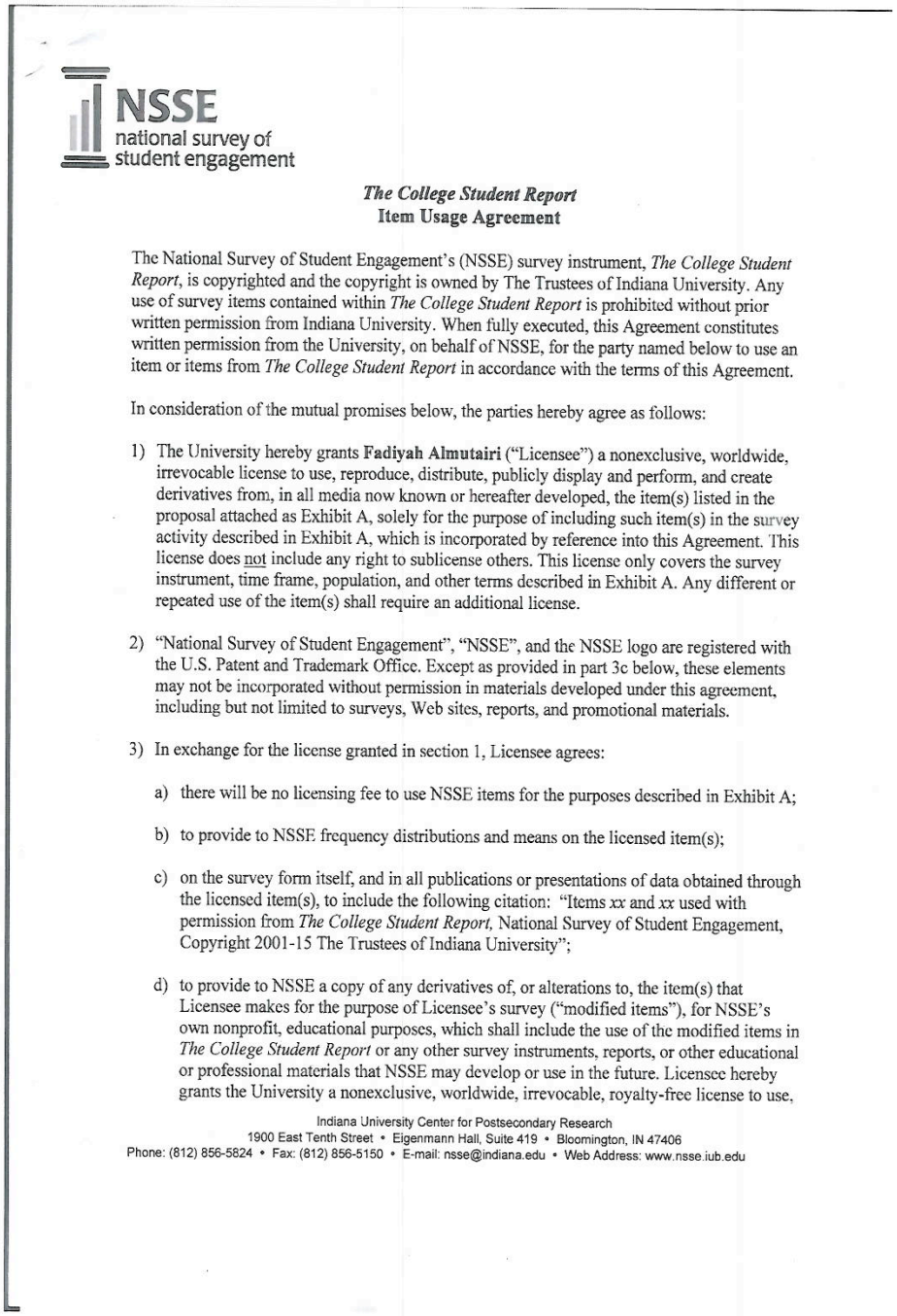
access your data after your participation, change it, or withdraw it, please contact the investigator (e-mail: fa1v13@soton.ac.uk).

What happens if I change my mind? You may withdraw at any time and for any reason before submission. You may access, change, or withdraw your data at any time and for any reason prior to its destruction. You may keep any benefits you receive.

What happens if something goes wrong? Should you have any concern or complaint, contact me if possible (investigator e-mail fa1v13@soton.ac.uk), otherwise please contact the FPSE Office (Email: fpse-student@southampton.ac.uk) or any other authoritative body such as Head of Research Governance (Dr Martina Prude, Head of the Governance Office, at the Research Governance Office (Address: University of Southampton, Building 37, Highfield, Southampton, SO17 1BJ ; Tel: +44 (0)23 8059 5058; Email: rgoinfo@soton.ac.uk . mad4@soton.ac.uk).

Appendix E

NSSE Agreement



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The undersigned hereby consent to the terms of this Agreement and confirm that they have all necessary authority to enter into this Agreement.

For The Trustees of Indiana University:

Alexander C. McCormick
Director
National Survey of Student Engagement

19 June 2015
Date

For Licensee:

Fadiyah Almutairi
Student
University of Southampton

15/6/2015
Date

For Advisor:

Su White or Liz Carr
Lecturer
University of Southampton

15 June 2015.
Date

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Appendix F

An Alignment between MOOC topics and Campus Content

Below is a summary of the topics of the on-campus course and their corresponding in the MOOC.

Table F-1: Taif University's syllabus

	Main Topics	Sub-topics	MOOC lessons
Week 8	Representation with logic	Propositional Logic, truth table, First Order Logic, models	Go to Lesson 7
Week 9	Representation with logic	Propositional Logic, truth table, First Order Logic, models	Go to Lesson 7
Week 10	Computer vision	Image formation, lenses, stereo, dynamic programming	Go to Lesson 16, 17 & 18
Week 11	Computer vision (2)	Image formation, lenses, stereo, dynamic programming	Go to Lesson 16, 17 & 18
Week 12	Machine learning	What is machine learning, supervised, unsupervised, reinforcement learning	Go to Lesson5, 6 &10
Week 13	Planning Under Uncertainty	Problem solving vs planning, vacuum cleaner, progression and regression search, sliding puzzle example	Go to Lesson 8 & 9
Week 14	Games	Tic-tac-toe, Chess, game tree, sliding blocks puzzle	Go to Lesson 2 & 13

Table F-2: Imam University's syllabus

	Main Topics	Sub-topics	MOOC lessons
Week 8	Games	Tic-tac-toe Chess, game tree, sliding blocks puzzle	Go to Lesson 2 & 13
Week 9	Games (2)	Tic-tac-toe, Chess, game tree, sliding blocks puzzle	Go to Lesson 2 & 13
Week 10	Representation with logic	Propositional Logic, truth table, First Order Logic, models	Go to Lesson 7
Week 11	Machine learning	What is machine learning, supervised learning	Go to Lesson 5
Week 12	Unsupervised learning	K Means clustering, Gaussian learning, supervised vs unsupervised learning	Go to Lesson 6
Week 13	Reinforcement learning	Forms of learning, agents of reinforcement learning,	Go to lesson 10
Week 14	Planning Under Uncertainty	Problem solving vs planning, vacuum cleaner, progression and regression search, sliding puzzle example	Go to Lesson 8 & 9

Table F-3: Khalid University's syllabus

	Main Topics	Sub-topics	MOOC lessons
Week 1	Introduction and Intelligent Agent	what is artificial intelligence, agents	Go to Lesson 1 &2
Week 2	Representation with logic	Propositional Logic, truth table, First Order Logic, models	Go to Lesson 7
Week 3	Representation with logic	Propositional Logic, truth table, First Order Logic, models	Go to Lesson 7
Week 4	Searching Methodology	tree search, graph search, breadth first search	Go to Lesson 2
Week 5	Searching Methodology-2	uninform cost search, A* search, state spaces,	Go to Lesson 2
Week 6	Searching Methodology-heuristic search	A* search, heuristic search	Go to Lesson 2
Week 7	Games	Tic-tac-toe, chess, sliding block puzzle	Go to Lesson 13& 2

Appendix G

Student Questionnaire for Full Study

I am currently pursuing PhD research at the University of Southampton, United Kingdom. A key aim of my research is to investigate and measure the impact of blended-MOOC course design on student engagement with a particular focus on Saudi women's higher education. The survey aims to investigate the impact of blended-MOOC course design on student engagement.

I would like your kind contribution in the research process by completing the questionnaire. I would also like to stress that anyone has the right to withdraw up until the final submission of their responses. All responses will be treated confidentially and respondents will be anonymous during the collection, storage and publication of research material. Responses are collected online and stored in a secure database.

Should you have any questions about the study or you wish to receive a copy of the results, please contact the researcher.

(Blended-MOOC course design is a campus course that used MOOC elements in teaching and learning)

Fadiyah Almutairi

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Consent Form*

□ I have read and understood the information sheet (insert date /version no. of participant information sheet) and have had the opportunity to ask questions about the study. I also I agree to take part in this research project and agree for my data to be used for the purpose of this study. I understand my participation is voluntary and I may withdraw at any time without my legal rights being affected. I am happy to be contacted regarding other unspecified research projects. I therefore consent to the University retaining my personal details on a database, kept separately from the research data detailed above. The 'validity' of my consent is conditional upon the University complying with the Data Protection Act and I understand that I can request my details be removed from this database at any time.

Data Protection *

□ I understand that information collected about me during my participation in this study will be stored on a password protected computer and that this information will only be used for the purpose of this study. All files containing any personal data will be made anonymous.

About yourself

1. **University Name:**

□ King Khalid University □ Taif University □ Imam Mohammad ibn Saud Islamic University

2. What do you like most about the MOOC system?

□ MOOC videos □ Lecture notes □ Online study group □ UDACITY discussion forum

3. How many hours do you usually spend in the MOOC system per week?

□ 1-5 □ 6-10 □ 11-15 □ 16-20 □ more than 20

4. **Generally, how satisfied you have been with the use of the MOOC system?***

□ Very Satisfied □ Satisfied □ Neutral □ Dissatisfied □ Very Dissatisfied

5. I intend to continue using/use the MOOC system in the future

□ Strongly Agree □ Agree □ Neutral □ Disagree □ Strongly disagree

---

COURSE ENGAGEMENT: (pre & post-test)

Reflective & Integrative Learning:

During the module, how often have you

6. Combined ideas from different resources when completing assignments. *

□ Very Often □ Often □ Sometimes □ Never

7. Connected your learning to societal problems or issues*

□ Very Often □ Often □ Sometimes □ Never

8. Examined the strengths and weaknesses of you own views on a topic or issue*

□ Very Often □ Often □ Sometimes □ Never

9. **Tried to better understand someone else's views by imagining how an issue looks from his or her perspective***

□ Very Often □ Often □ Sometimes □ Never

10. **Learned something that changed the way of understanding an issue or concept***

□ Very Often □ Often □ Sometimes □ Never

11. **Connected ideas from your course to your prior experience and knowledge***

□ Very Often □ Often □ Sometimes □ Never

Higher-Order Learning:

During the module, how much has your coursework emphasized the following

12. **Memorising course material ***

□ Very much □ Quite a bit □ Some □ Very little

13. **Applying facts, theories, or methods to practical problems or new situations***

□ Very much □ Quite a bit □ Some □ Very little

14. **Analysing ideas or theories in depth by examining their parts ***

□ Very much □ Quite a bit □ Some □ Very little

15. **Evaluating or judging a point of view, decision, or information source***

□ Very much □ Quite a bit □ Some □ Very little

16. **Forming a new understanding from various pieces of information***

□ Very much □ Quite a bit □ Some □ Very little

Learning Strategies:

During the module, how often have you

17. **Identified key information from reading assignments***

□ Very Often □ Often □ Sometimes □ Never

18. **Reviewed your notes after class***

□ Very Often □ Often □ Sometimes □ Never

19. **Summarized what you learned in class or from course materials***

□ Very Often □ Often □ Sometimes □ Never

Collaborative Learning:

During the module, how often have you

20. **Explained course material to one or more students***

□ Very Often □ Often □ Sometimes □ Never

21. **Prepared for exams or assessments by discussing or working through course material with other students***

□ Very Often □ Often □ Sometimes □ Never

22. **Worked with other students on course projects or assignments***

□ Very Often □ Often □ Sometimes □ Never

23. **Asked another student to help understand course materials***

□ Very Often □ Often □ Sometimes □ Never

Student-Staff Interaction:

During the module, about how often have you

24. **Discussed your academic performance and/or feedback with teaching staff in this course***

□ Very Often □ Often □ Sometimes □ Never

25. **Asked questions or contributed to course discussions in other ways***

□ Very Often □ Often □ Sometimes □ Never

26. **Discussed course topics, ideas, or concepts with teaching staff outside taught sessions, including by email/online***

□ Very Often □ Often □ Sometimes □ Never

27. **Worked with teaching staff on activities other than coursework***

□ Very Often □ Often □ Sometimes □ Never

28. **Made significant changes to your work based on feedback***

□ Very Often □ Often □ Sometimes □ Never

MOOC ENGAGEMENT (only post-survey)

MOOC active learning:

During the module, to what extent have you experienced the following

29. **Found that MOOC materials challenged you to learn***

□ Very Often □ Often □ Sometimes □ Never

30. **Used MOOC resources to improve your learning***

□ Very Often □ Often □ Sometimes □ Never

31. **Used MOOC materials to make lectures more meaningful***

□ Very Often □ Often □ Sometimes □ Never

32. **Used MOOC quizzes to improve your understanding of a topic***

( ) Very often ( ) often ( ) Sometimes ( ) Never

33. **Shared and reflected on what you learnt in the MOOC course through blogs, micro-blogging, discussion space etc]**

□ Very Often □ Often □ Sometimes □ Never

During the module, how often have you:

34. **Asked another online learner to help you understand course material***

□ Very Often □ Often □ Sometimes □ Never

35. **Explained course material to one or more online learners***

□ Very Often □ Often □ Sometimes □ Never

36. **Posted a question in the MOOC discussion forum- from researcher***

( ) Very often ( ) often ( ) Sometimes ( ) Never

MOOC Social Interaction

During the course, about how often have you done the following

37. Used MOOC tools (discussion spaces, social media, and emails) to communicate with others*.

□ Very Often □ Often □ Sometimes □ Never

38. Had helpful online conversations with others*

□ Very Often □ Often □ Sometimes □ Never

Teaching with MOOC

During the course, about how often have you done the following

39. Teaching staff used MOOC materials to discuss interesting issues*

□ Very Often □ Often □ Sometimes □ Never

40. Staff used MOOCs in ways that improved the overall teaching*

□ Very Often □ Often □ Sometimes □ Never

41. **Staff used MOOCs to provide students with extra assistance**

□ Very Often □ Often □ Sometimes □ Never

Open Questions:

42. Kindly give your feedback and comments on the course in general?

---

43. Did you have any challenges/problems when using MOOC system during the course?

Appendix H

Student Engagement in The Blended-MOOC Course Design - Interview with Lecturers

I am currently pursuing PhD research at the University of Southampton, United Kingdom. A key aim of my research is to investigate and measure the impact of blended-MOOC course design on student engagement with a particular focus on Saudi women's higher education. The interview aims to investigate the impact of blended-MOOC course design on student engagement.

I would like your kind contribution in the research process by completing the questionnaire. I would also like to stress that anyone has the right to withdraw up until the final submission of their responses. All responses will be treated confidentially and respondents will be anonymous during the collection, storage and publication of research material. Responses are collected online and stored in a secure database.

Should you have any questions about the study or you wish to receive a copy of the results, please contact the researcher.

(Blended-MOOC course design is a campus course that used MOOC elements in teaching and learning)

Fadiyah Almutairi

Electronics and Computer Science (ECS)

The University of Southampton

Southampton

United Kingdom

Mail to: Fa1v13@ecs.soton.ac.uk

INTERVIEW QUESTIONS:

1. **Have you (as a teacher) noticed any changes in student behaviour after the use of MOOC components? (Please give detailed info.)?**
2. **How do you think this design has impacted on lecture time?**
3. **Comparing to the situation before the use of MOOC, how would you describe the following aspects:**

1. Student involvement in collaborative work (such as group project/class discussions).
2. Student higher order thinking (such as applying theories, forming new understandings)
3. Student learning strategies (such as identifying key information from the assignments, reviewing their notes, summarizing what they learned)
4. Student integrative and reflective learning (the process of making connections among concepts and experiences so that information and skills can be applied to novel and complex issues or challenges)
5. Class discussion
   1. Teacher/student interaction (such as asking more questions inside and outside the class, discussing more with you about their academic performance and/or their future plan, working with you in non-academic work)

2. **Comparing to the situation before the use of MOOC, how often have students come to class prepared (completed assignments, readings, reports, etc.)?**

3. **Comparing to the situation before the use of MOOC, to what extent did the course challenge student to work hard and to take their responsibility for their own learning?**

GLOSSARY

MOOCs: online courses most often taught by leading universities or well-qualified instructors with the promise of providing free, high quality education to an unlimited number of learners.

Student Engagement: *"*The quality of effort students themselves devote to educationally purposeful activities that contribute directly to desired outcomes".

Higher-order learning: *"*Challenging intellectual and creative work is central to student learning and collegiate quality. Colleges and universities promote high levels of student achievement by calling on students to engage in complex cognitive tasks requiring more than mere memorization of facts. This Engagement Indicator captures how much students' coursework emphasizes challenging cognitive tasks such as application, analysis, judgment, and synthesis".

Learning strategies: *"*College students enhance their learning and retention by actively engaging with and analysing course material rather than approaching learning as absorption. Examples of effective learning strategies include identifying key information in readings, reviewing notes after class, and summarizing course material. Knowledge about the prevalence of effective learning strategies helps colleges and universities target interventions to promote student learning and success. Examples of effective learning strategies include identifying key information in readings, reviewing notes after class, and summarizing course material".

Reflective and integrative learning: *"*Personally, connecting with course material requires students to relate their understandings and experiences to the content at hand. Instructors emphasizing reflective and integrative learning motivate students to make connections between their learning and the world around them, re-examining their own beliefs and considering issues and ideas from others' perspectives" [22].

[22] http://nsse.indiana.edu/html/engagement˙indicators.cfm

Appendix I

Participant information sheet for the interview

Ethics reference number: 20778	**Version:** 1	**Date:** 2016-05-14
Study Title: The impact of the use of MOOC materials on campus student engagement		
Investigator: Fadiyah Almutairi		

Please read this information carefully before deciding to take part in this research. If you are happy to participate you will be asked to sign a consent form.

What is the research about?

I am PhD student at the University of Southampton and interested in the blended MOOCs and how MOOC-related materials and activities impacted campus student engagement. As your university conducted a course with MOOC materials. I would like to interview with the lecturers who involved in this course.

Why have I been chosen?

You have been chosen because you used MOOC materials in your teaching practice.

What will happen to me if I take part?

You will be asked some questions about your observation on student engagement in the blended MOOC course. The interview may be recorded, however it will be transcribed as soon as we finish data collection.

Are there any benefits in my taking part?

The study will add to current knowledge about the state art of the impact of MOOC materials on campus student engagement.

Are there any risks involved?

There are no particular risks associated with your participation.

Will my participation be confidential?

All data collected is anonymous and will be held on a password protected computer, and used only in accordance with the Data Protection Act (1998). In addition, the data will be anonymised by separating identifying data. Your data will be linked to your consent form by codes. It will be destroyed by the investigator. If you would like to access your data after your participation, change it, or withdraw it, please contact the investigator (e-mail fa1v13@soton.ac.uk) or the student's supervisor (e-mail saw@ecs.soton.ac.uk) who will arrange this through the matching codes between the consent form and your participation.

What happens if I change my mind?

You may withdraw at any time and for any reason. You may access, change, or withdraw your data at any time and for any reason prior to its destruction. You may keep any benefits you receive.

What happens if something goes wrong?

Should you have any concern or complaint, contact me if possible (investigator e-mail fa1v13@soton.ac.uk), otherwise please contact the FPSE Office (e-mail fpse-grad@soton.ac.uk) or any other authoritative body such as Research Governance Manager (02380 595058, rgoinfo@soton.ac.uk).

Where can I get more information?

Contact me if need any more information (investigator e-mail fa1v13@soton.ac.uk).

Appendix J

Paired T-Test Assumptions

there are four assumptions which need to be met in order to ensure that the data can be analysed using paired t-test. The first two assumptions relate to the study design and the other two assumptions relate to the paired-samples t-test itself and can be tested using SPSS software.

1) A continuous dependent variable Assumption:

The study should have a continuous dependent variable (in this instance the engagement indicators). The engagement indicators were measured through four point Likert scale. The Likert scales could be treated as continuous variables and tested using Parametric tests (such as t-tests). The Parametric tests are more robust than non-Parametric tests when analysing Likert scale responses (Norman, 2010).

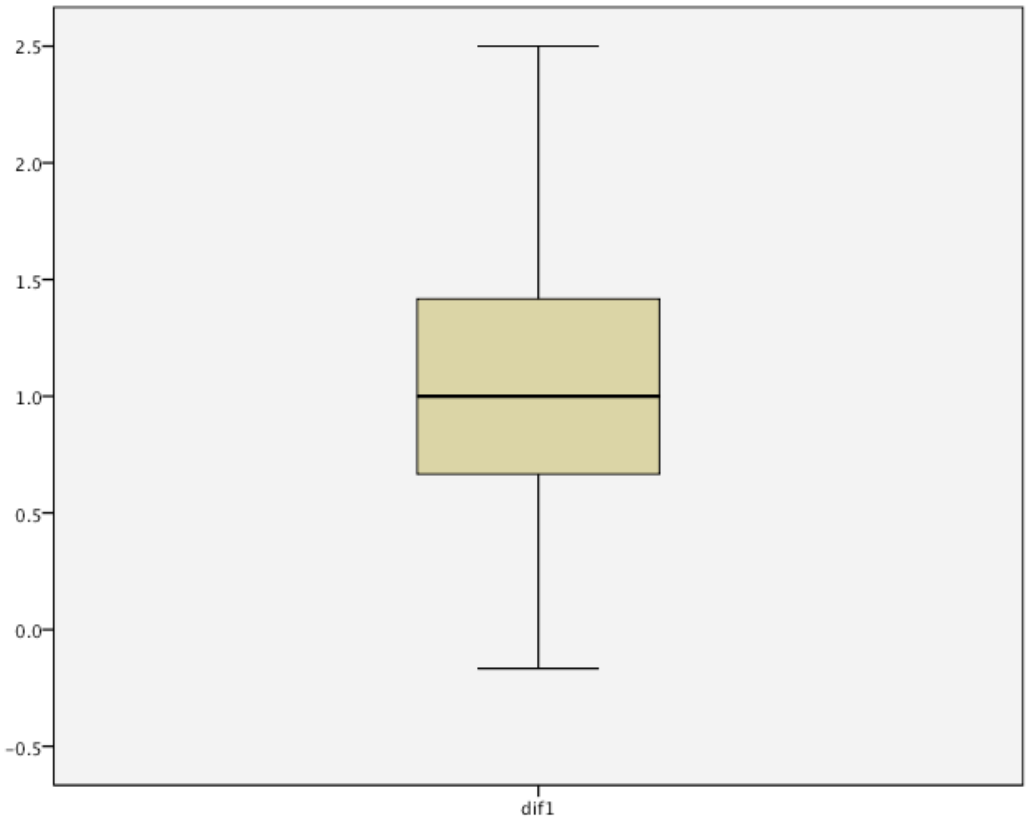
2) A categorical independent variable Assumption:

The study should have an independent variable being categorical with two related groups. This satisfied because we have two methods of teaching: face-to-face and blended-MOOC.

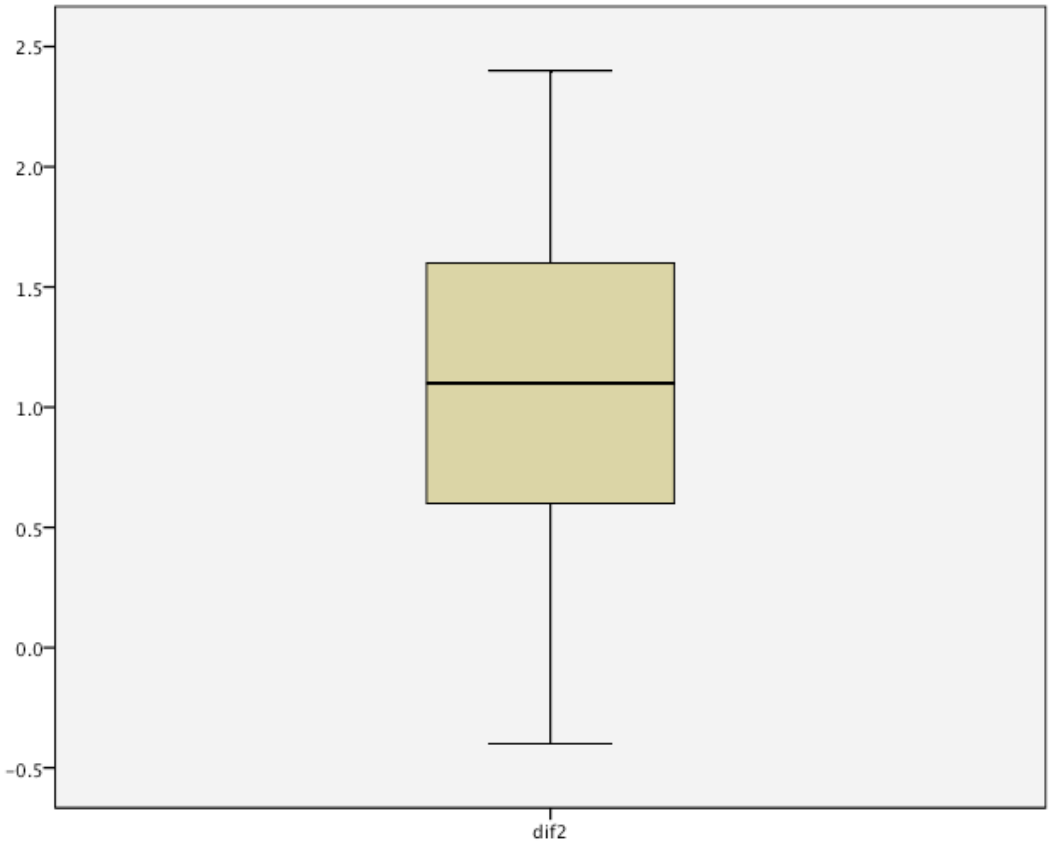
3) Outliers Assumption:

There were no outliers in the data, as assessed by inspection of a boxplot.

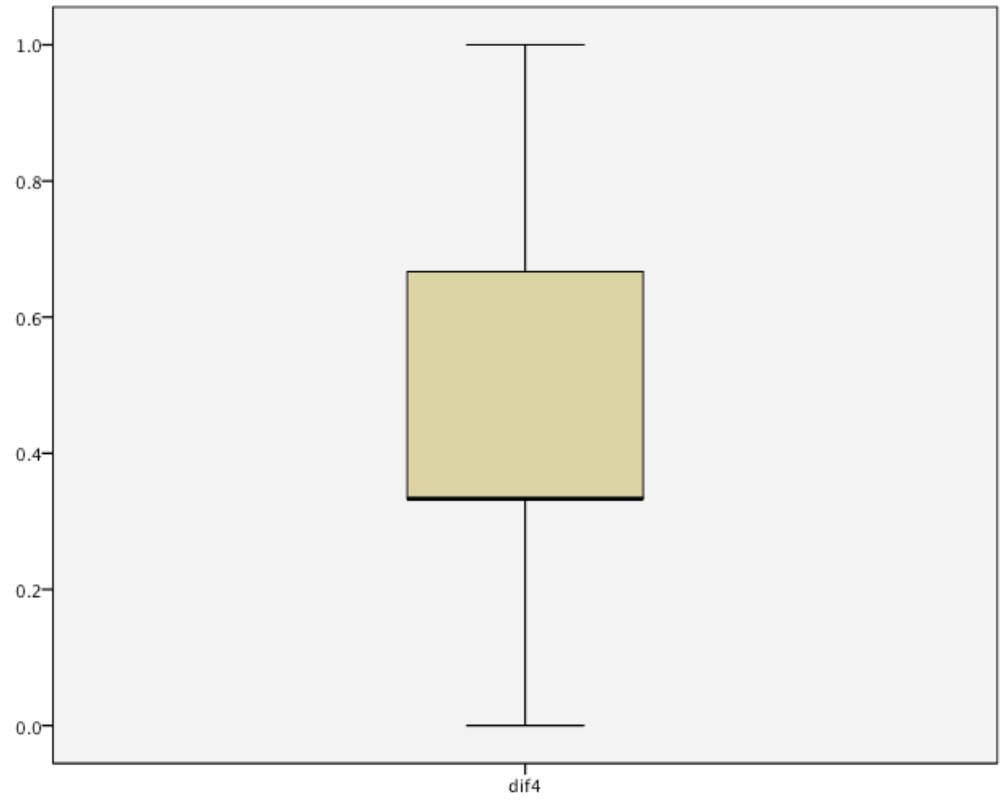
Reflective & Integrative Learning



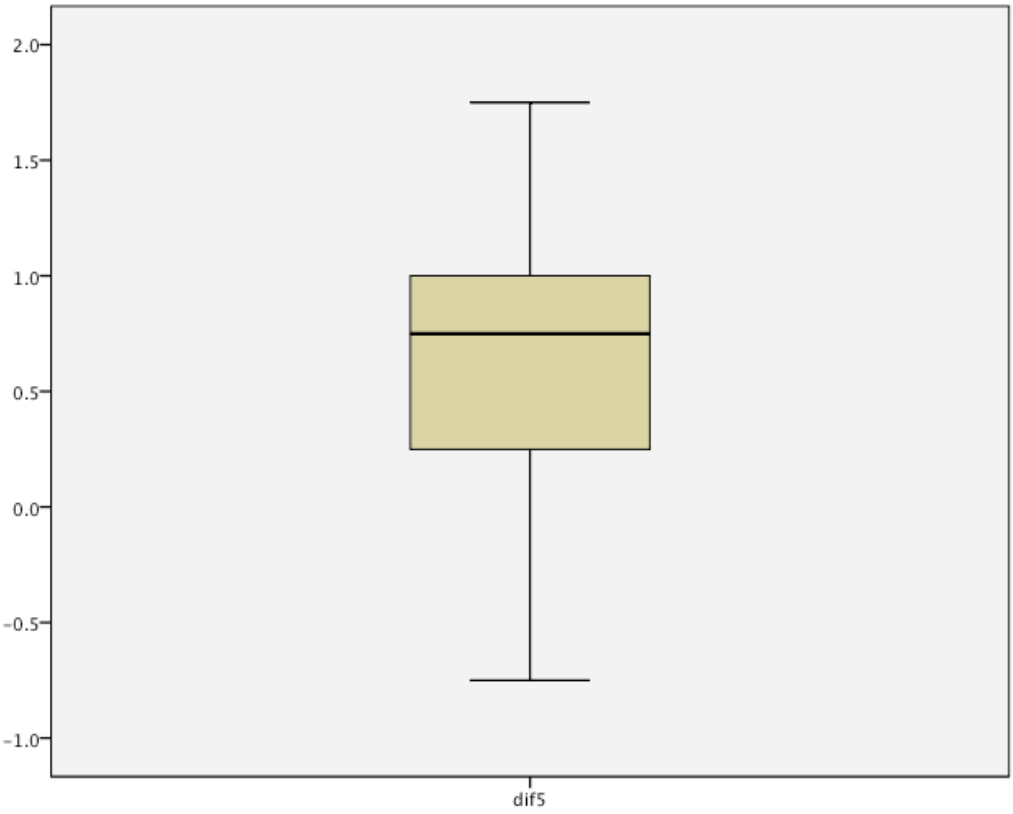
Higher-Order Learning



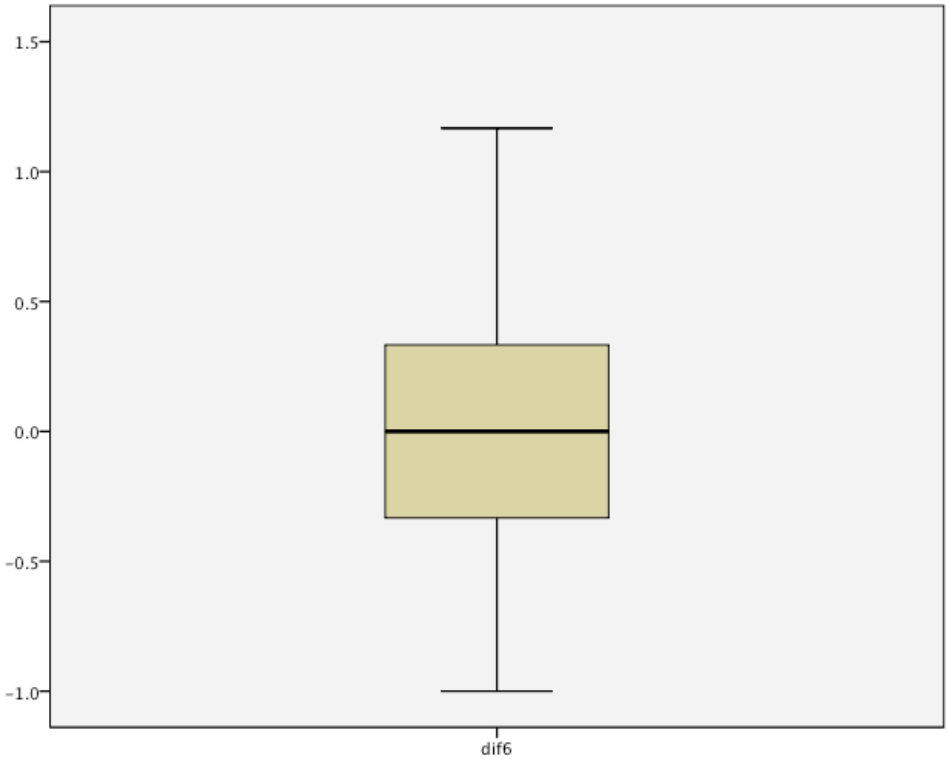
Learning Strategies



Collaborative Learning



Student-Staff Interaction



4) Normality Assumption

The difference scores for the face-to-face and blended-MOOC learning methods were normally distributed in all indicators except learning strategies and collaborative learning, as assessed by Shapiro-Wilk's test (see Table J-1).

Table J-1:Normality Test

Tests of Normality			
	Shapiro-Wilk		
	Statistic	df	Sig.
Reflective & Integrative Learning	.980	108	.098
Higher-Order Learning	.978	108	.067
Learning Strategies	.876	108	<0.001
Collaborative Learning	.966	108	.007
Student-Staff Interaction	.978	108	.067

Appendix K

ANOVA Assumptions

One-way ANOVA has six assumptions that need to be considered. These assumptions are:

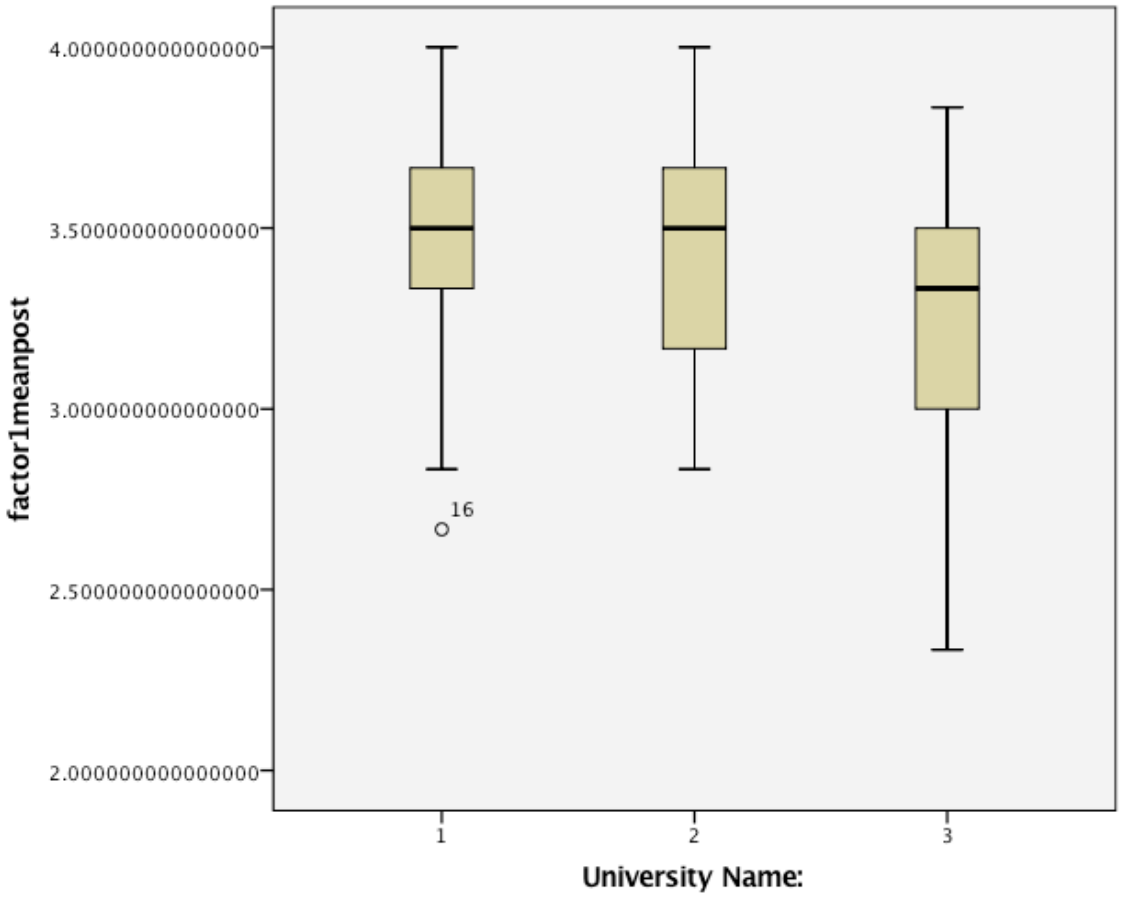
1. One dependent variable that is measured at the continuous level. (engagement indicators)
2. One independent variable that consists of two or more categorical, independent groups. (university)
3. Independence of observations, which means that there is no relationship between the observations in each group of the independent variable or between the groups themselves. (each university has its own observation)
4. There should be no significant outliers in the groups of your independent variable in terms of the dependent variable
5. The dependent variable should be approximately normally distributed for each group of the independent variable
6. The data should have homogeneity of variances (i.e., the variance is equal in each group of the independent variable)

The first three assumptions are related to the study design, while the others can be tested using SPSS software. Below the tests of the last three assumptions

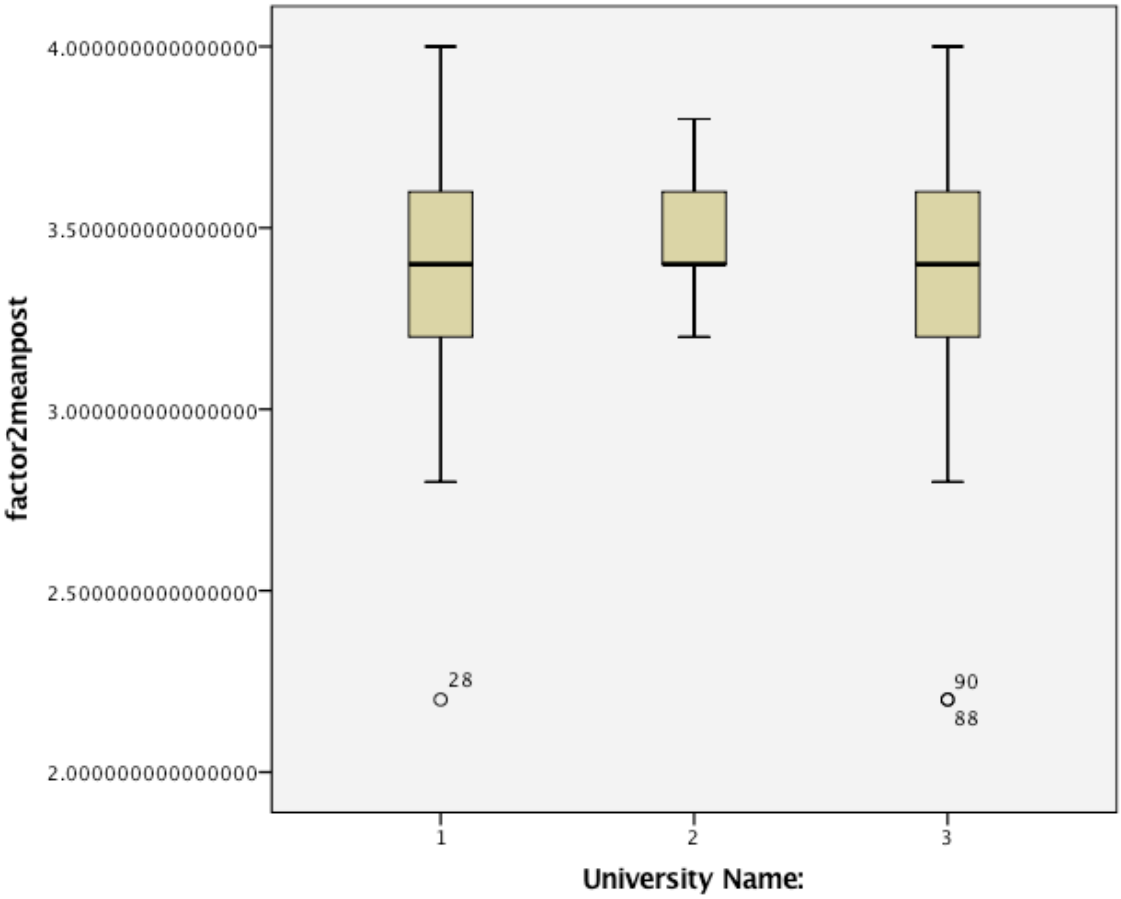
Outliers Assumptions:

There were a number of outliers in some indicators. as assessed by inspection of a boxplot. However, we kept the outliers as we had run a one-way ANOVA with and without the outlier(s). the conclusions were essentially the same.

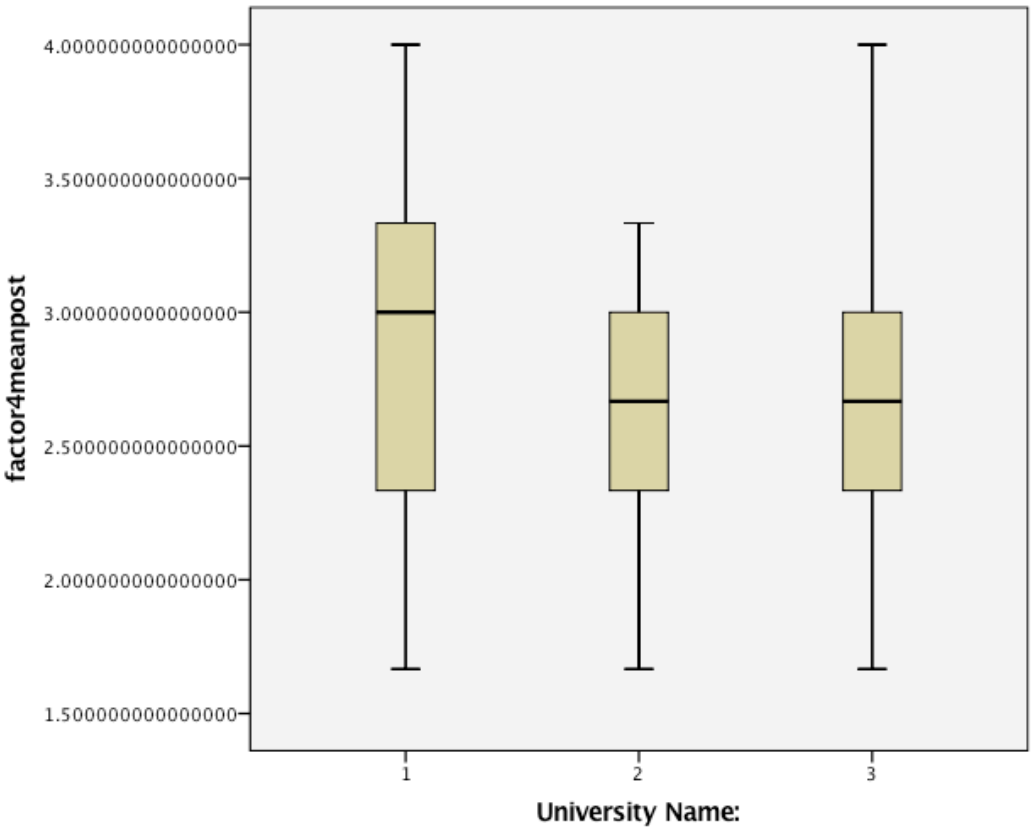
1. Reflective & Integrative Learning



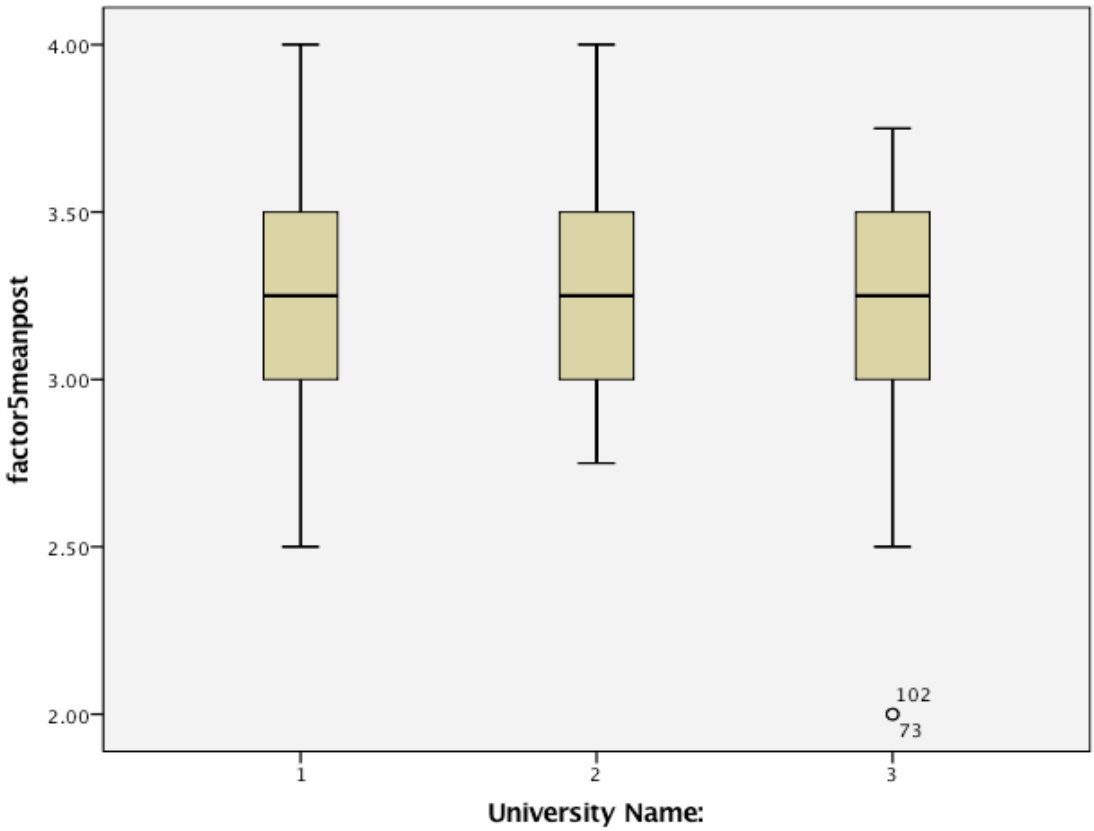
2. Higher-Order Learning



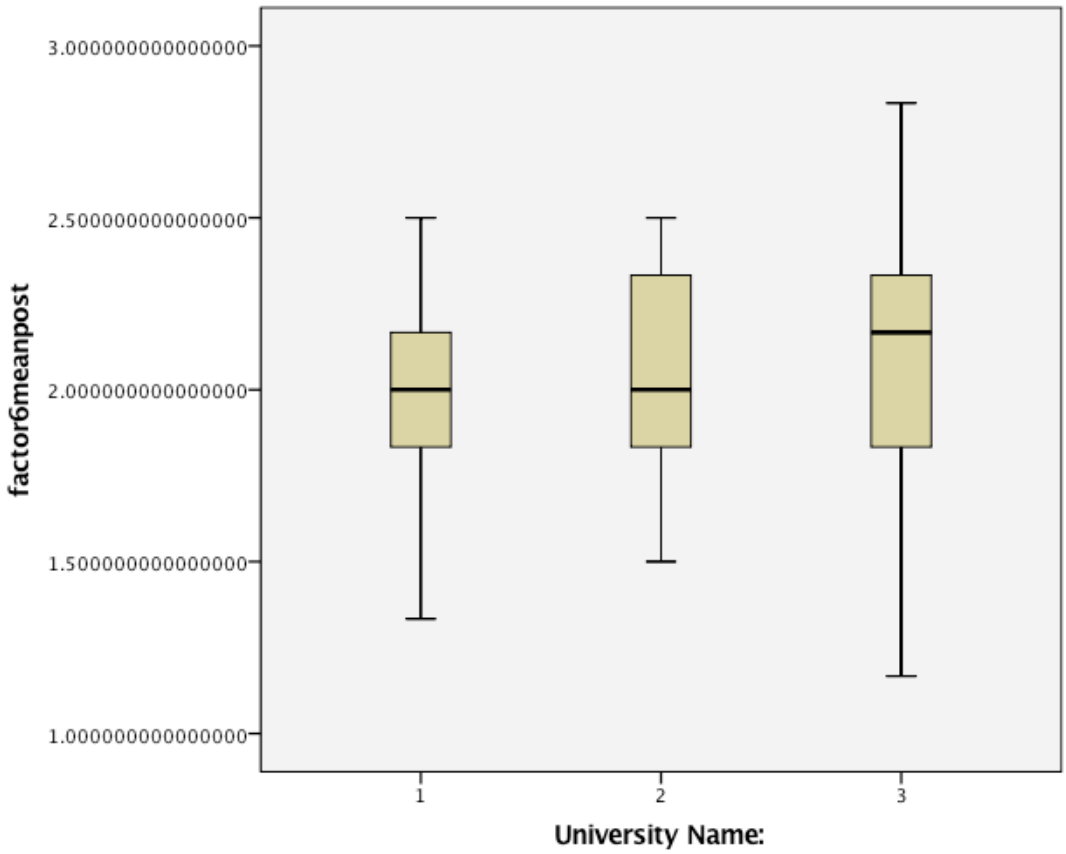
3. Learning Strategies



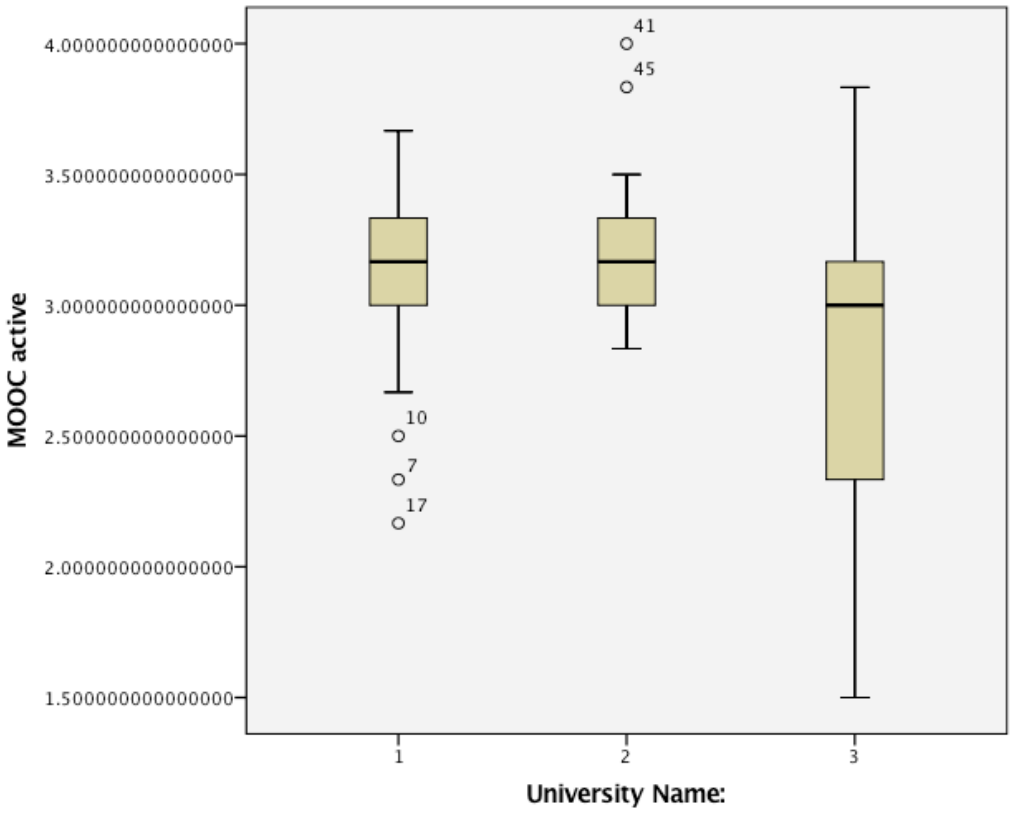
4. Collaborative Learning



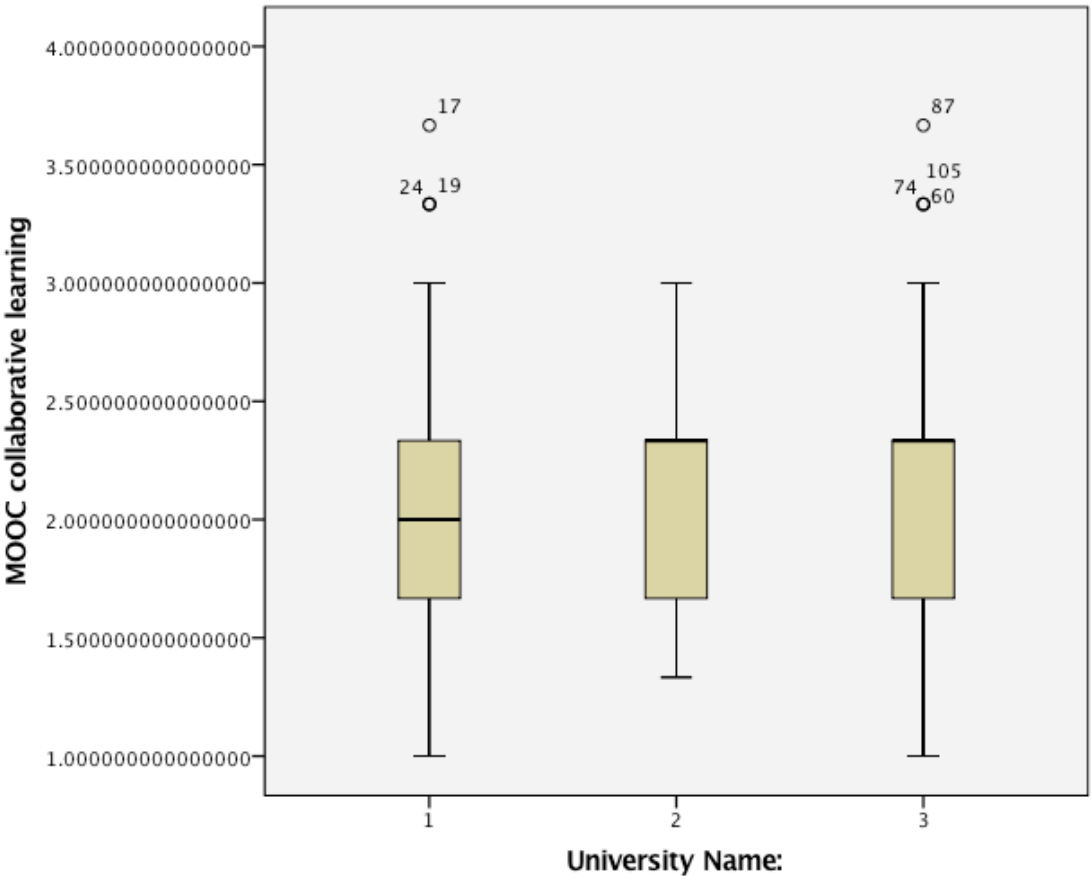
5. Student-Staff Interaction



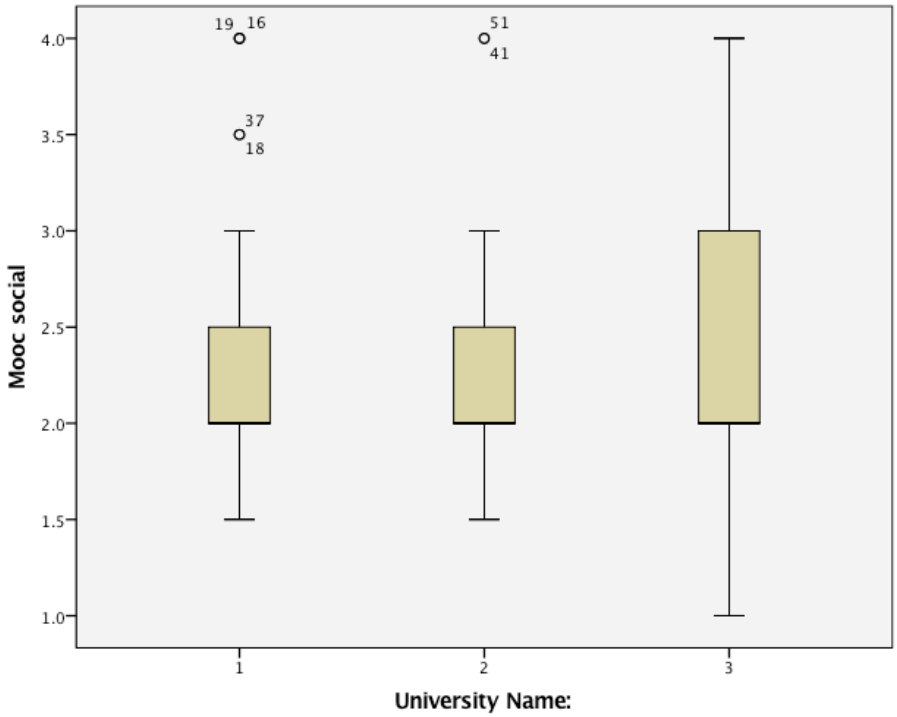
6. MOOC Active Learning



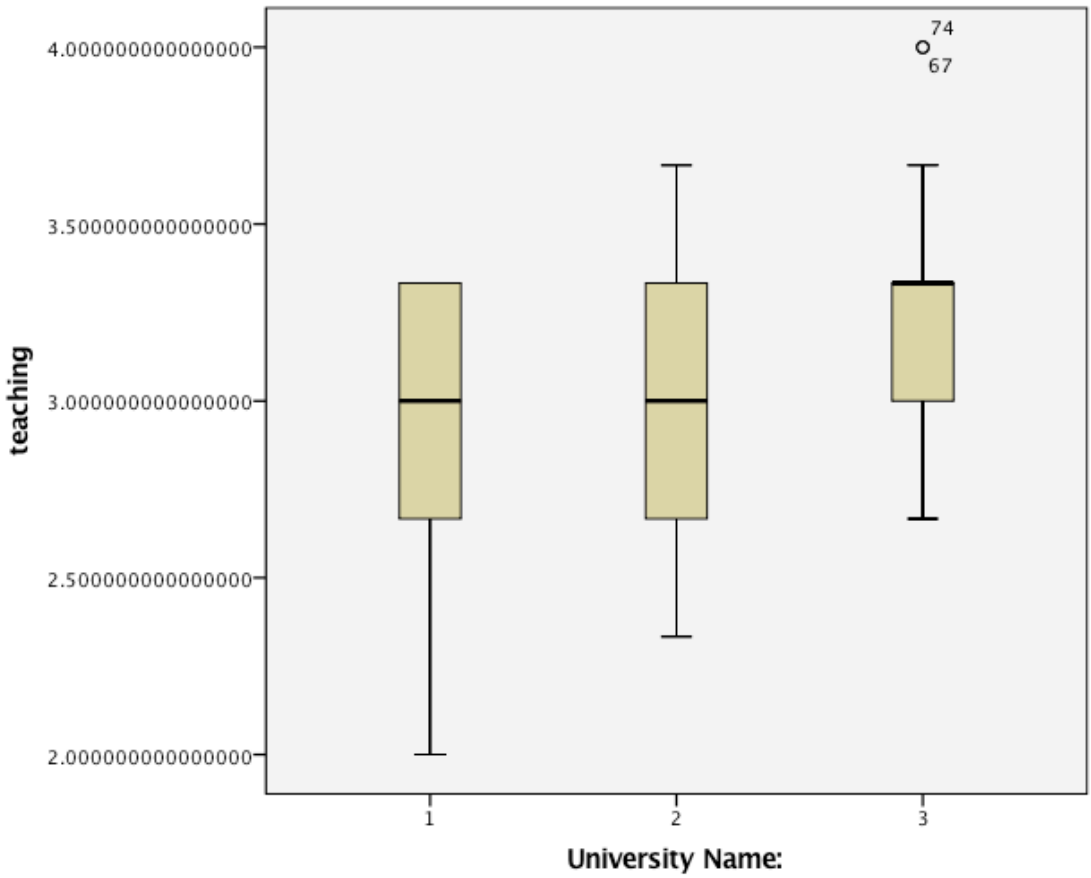
7. MOOC Collaborative Learning



8. MOOC Social Interaction



9. Teaching with MOOCs



Normality Assumption

Tests of Normality				
	University Name:	Shapiro-Wilk		
		Statistic	df	Sig.
Reflective and integrative learning	Imam	0.903	38	0.003
	Taif	0.929	21	0.129
	Khalid	0.937	49	0.011
Higher-order learning	Imam	0.912	38	0.006
	Taif	0.885	21	0.018
	Khalid	0.854	49	<0.001
Learning strategies	Imam	0.937	38	0.032
	Taif	0.918	21	0.081
	Khalid	0.94	49	0.014
Collaborative learning	Imam	0.949	38	0.081
	Taif	0.919	21	0.082
	Khalid	0.917	49	0.002
Faculty-student interaction	Imam	0.926	38	0.015
	Taif	0.94	21	0.217
	Khalid	0.964	49	0.142
MOOC active learning	Imam	0.953	38	0.111
	Taif	0.907	21	0.049
	Khalid	0.94	49	0.015
MOOC collaborative learning	Imam	.949	38	.082
	Taif	.931	21	.147
	Khalid	.946	49	.026
MOOC social interaction	Imam	0.844	38	<0.001
	Taif	0.759	21	<0.001
	Khalid	0.899	49	0.001
Teaching with the MOOC system	Imam	0.857	38	<0.001
	Taif	0.91	21	0.05
	Khalid	0.902	49	0.001

The one-way ANOVA is fairly "robust" to deviations from normality (Lix et al., 1996). In conclusion, non-normality does not affect Type I error rate substantially and the one-way ANOVA can be considered robust to non-normality (see Maxwell & Delaney (2004) for a good review)

Homogeneity Assumption

There was homogeneity of variances, as assessed by Levene's test for equality of variances in all indicators except in MOOC active learning ($p<.05$).

Test of Homogeneity of Variances				
	Levene Statistic	df1	df2	Sig.
Reflective and integrative learning	1.251	2	105	0.291
Higher-order learning	0.536	2	105	0.587
Learning strategies	3.035	2	105	0.052
Collaborative learning	0.034	2	105	0.967
Faculty-student interaction	0.279	2	105	0.757
MOOC active learning	11.372	2	105	<0.001
MOOC Collaborative learning	1.680	2	105	.191
MOOC social interaction	0.287	2	105	0.751
Teaching with MOOCs	2.231	2	105	0.113