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Assessment of Multimedia Based Blended Learning Engineering Courseware at An-Najah National University

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Abstract

This study aims to assess the impact of the blended learning approach on engineering education at An-Najah National University compared with traditional learning approach. This research has utilized the semi-experimental approach, and followed an integrative methodology.

Surveying 1 and Transportation Systems Engineering 1 courses from the Department of Civil Engineering were selected for assessment. Transportation Systems Engineering 1 was developed considering Moodle platform as a multimedia-based course in this study and taught utilizing blended learning approach, which was then assessed, while Surveying 1 was already developed and taught in two different ways for two different classes; utilizing blended approach for a class and traditional approach for the other, which were assessed in this research. This research classified the subject study into four cases, Surveying 1 class taught using the traditional approach and assessed after the first exam, Surveying 1 class taught using the blended learning approach and assessed after the first exam, Surveying 1 class taught using the blended learning approach and assessed after the second exam, and Transportation Systems

Engineering 1 class taught using the blended learning approach and assessed after the first exam.

The research examined the relations in four domains/areas which were: students' preferences and attitudes towards blended learning process, content, and interest, as well as their academic achievement. Three comparative assessments were conducted in order to examine these domains effects in blended learning experiments. In addition, specific hypotheses were identified and examined for the four studied cases. Hypotheses were tested the effects of gender, GPA, study level and secondary school examination variables on students' e-learning skills, preferences and attitudes, and academic achievements domains.

Questionnaires were designed and distributed to students of the two courses, and the results were analyzes utilizing SPSS. The outcome of the analysis reveals that there was a positive impact on students' academic achievement and their preferences in the course taught utilizing blended learning over that taught utilizing the traditional method. Neither students' preferences towards blended learning nor their academic achievements increased with time throughout the course studied. Also students' preferences towards blended learning hadn't increased through different study level, but there was a limited increase in third year students' academic achievement over second year students.

Some significant differences have been observed; there was a significant difference between students' academic achievement and their GPA for the traditional approach Surveying 1 class assessed after the first exam.

In addition, there was a significant difference between students' e-learning skills and their GPA, for blended approach Transportation Systems Engineering 1 class assessed after the first exam. On the other hand, there was a significant difference between students' preferences and their gender for blended approach Surveying 1 class, assessed after the second exam. Also there was significance difference between students' e-learning skills and their study level for blended approach Transportation Systems Engineering 1 class assessed after the first exam. Extending utilizing the blended learning approach to other engineering courses is recommended. There is a need to conduct further studies with larger groups of participants and more classes to examine whether the previous findings are confirmed.

Chapter One

Introduction

Chapter One

Introduction

1.1 Overview

Good engineering education systems aim at the formation of good engineers. The education process can be described as a transformation in which incoming students are ‘transformed’ into engineers. Over the last few decades, there has been a change in the positions engineers take. Engineers, after having obtained their degrees, are supposed to have sufficient academic qualifications to start their lifelong careers. The rapid changes in societies have also generated demand for more flexible engineers having many more qualifications than just a high level of technical or scientific specialization. These demands have led to an evolution in educational objectives. In the past, transferring of knowledge and specialist skills was emphasized. High-quality education was supposed to be guaranteed by the appointment of experienced specialists in the field (Rompelman, 1999).

Nowadays, universities tend to think in terms of much broader skills. One of such key skills is the ability to learn, not only during the time in college but also in the professional life. As a consequence, educational methods are under constant development. New forms are introduced, such as teamwork, problem-based learning, design education, blended learning, etc. (Rompelman, 1999).

E-learning education research and development now focuses on the inclusion of new technological features and the exploration of relevant software standards. Blended learning has become an increasingly popular form of e-learning, and is particularly suitable to the process of transitioning towards e-learning from traditional forms of learning and teaching (Rompelman, 1999). Blended learning is a term increasingly used to describe the way e-learning is being combined with traditional classroom methods and independent study to create a new and blended teaching methodology.

1.2 Problem Statement

There is an obvious recent re-orientation at An-Najah National University towards e-learning, especially blended learning. This orientation refers to the continues development in technology and the merging of technology in every life aspects. According to Palestinian Central Bureau of Statistics in their 2014 year book, 63.1% of the Palestinian families have computers while 48.3% families have internet service. At the same time, there is lack of studies in blended learning in higher education in Palestine, in general, and at the university, at specific, especially as related to engineering education.

Need arises to assess the attitudes and achievements of students who are being educated utilizing blended learning compared with those utilizing the traditional learning approach. This is of great relevance in order to adopt higher education policies regarding blended learning. This study will assist in having a closer look on the university's re-orientation in teaching and

learning of engineering, among other disciplines, through experiencing the development and evaluation of blended learning engineering courseware. This research will be considered as a case study through developing and assessing aspects related to blended learning, focusing on examining possible positive or negative impacts on student preferences and output of their scientific achievement.

1.3 Objectives of the Study

This study aims to assess the experience of the developing courses utilizing blended learning approach on engineering education at An-Najah National University compared with course utilizing traditional learning approach.

The study has the objectives to examine whether the blended learning experiment contributes to the preferences and attitudes of students towards process, content and interests, and their attainment for a sample of engineering education students, compared with students taking the same course but being taught utilizing the traditional learning approach, taught by the same instructor. Objectives include as well assessing whether students' inclinations and outcomes differ from a course with respect to the other, both being taught utilizing blended learning approaches, and for the same course at different times.

1.4 Methodology

The selected students studying two civil engineering courses will be the subject of this research. One of these, Transportation Systems Engineering 1, is a course that was designed and taught since 2003 utilizing multimedia

technologies, which is further developed into a blended learning courseware using Moodle during this research. The other is the basic Surveying 1 course, which was recently developed as a blended learning course. These latter is taught using two different ways of learning; the traditional and blended learning approaches.

On the other hand, the study illustrates three comparative assessments as follows:

1. A comparative assessment of how blended learning contributes to the academic achievement of the students, compared with those taught using traditional methods. It also presents how students perceive blended learning attractiveness, and examines students' preferences and attitudes towards blended learning.
2. A comparative assessment of students' preferences, as well as academic achievement for students being taught utilizing blended learning approach at different levels.
3. A comparative assessment of the changes of the preferences, and academic achievement with time for the same group of students taking the same course being taught utilizing the blended learning approach.

The methodology followed for the development of the blended learning course included transferring of the multimedia courseware and developing it into a blended learning course with specific intended learning objectives and upgraded material using a proper platform. The methodology then included assessing the impact of the blended approach, which could be

positive or negative, on student preferences and output of their scientific achievement.

This was implemented through the following procedures:

1- Literature review of recent development in blended learning education, including that An-Najah National University.
2- Identify factors that make differences in the education system, specifically factors related to blended learning.
3- Select the sample of courses and study classes to conduct the study on.
4- Design the questionnaire considering the targeted sample.
5- Collect data from students by distributing the questionnaire.
6- Analyze data collected through proper statistical computers packages such as SPSS.
7- Analyze and compare the results for the students in the classes subjected to the assessment.
8- Draw and discuss inferences from the results.
9- Identify conclusions and recommendations.

1.5 Research Hypothesis

To assess a sample of blended learning engineering courses, investigation on the relationship between students' responses, and the research variables are made. In order to check these relations, hypotheses are identified and examined considering the following four cases:

– The first case is the Surveying 1class taught using the traditional approach and assessed after the first exam.

- The second case is the Surveying 1class taught using the blended learning approach and assessed after the first exam.
- The third case is the Surveying 1class taught using the blended learning approach and assessed after the second exam.
- The forth case is the Transportation Engineering System 1 class taught using the blended learning approach and assessed after the first exam.

Hypotheses are tested to examine the effects of gender, GPA, study level and secondary school examination variables on students' e-learning skills, preferences (process, content and interest) towards blended learning approach, and their academic achievements.

1.6 Contents of the Thesis

In addition to this chapter, the thesis is comprised of four other chapters. Chapter 2 describes previous studies related to blended learning and related subjects. Chapter 3 presents and defines the selected research methodology. Findings and results provided in Chapter 4. Finally, Chapter 5 provides thesis conclusions and recommendations.

Chapter Two

Literature Review

Chapter Two

Literature Review

2.1 Overview

The rapid technological advancements and the introduction of Information and Communication Technologies (ICT) have permanently altered our economic, social, educational, professional and even personal lives. Our society is now being information-driven. As society is changing, our education methods cannot remain static but must be dynamic and responsive to the wider social environment. The education systems worldwide are undergoing enormous changes, as courses and programs are designed in new ways and with new educational content, which includes the most updated knowledge and sets a base for the easy incorporation of the future knowledge. Particularly, in the higher education area, it was characteristically stated that ‘integrating teaching, learning and technology is a mandate, not an option, and doing any less would border on professional irresponsibility’ (Kavadella et al., 2010).

2.2 Engineering Education

"Engineering education system that is highly adaptable to the demands of the future should be able to produce well-groomed professional engineers, able to work together efficiently in teams to identify and solve complex problems in industry, academe government and society" (Shekhar et al., 2011, p.1).

Given the rapidity of technological change, it is essential that the education system prepare students to function productively as engineers (whether in industry, government, or academe) over the full course of a career. Ideally, the engineering education obtained at the undergraduate level will be broad enough to provide a strong basis not only for a career in engineering but also for careers in other professions. In practice, the engineering education system has undergone only limited and sporadic changes and like all established enterprises, it resists large scale change (Shekhar et al., 2011).

Engineering education has undergone drastic changes in teaching methodology, content, delivery techniques and the method of evaluation in order to bring about an efficient, challenging system that would effectively offer challenging education to meet the educational needs of students and the stake-holder needs to retain them in the market.

The education system must continually change to reflect the emerging directions of the engineering profession and the evolving needs of the "customer" (engineering student). To this effect, the quality of services provided by the engineering education institutions need to be assessed from the student's point of view from time to time and changes made accordingly. Regardless of the type of service, consumers basically use the same criteria to assess quality (Parasuraman et al., 1985).

Education service quality has become a major issue in universities and has been extensively studied in recent years. Student satisfaction is a main symbol to measure the competitive advantage of the institution, which reflects students' recognition of service process and students' perspective

regarding the quality in the university to teach knowledge, science research and service to the community. A study on students' satisfaction is important not only to identify factors that can influence satisfaction level, but also help to improve the competitiveness of institution and the quality of teaching, help to promote the sustainable development of higher education, help to preserve the interest of students and help the management of the institution to establish their strategy (Kanchana and Triwanapong, 2011).

2.3 Information and Communication Technology in Education

Today, Information and Communication Technologies (ICT) take important roles in improving standards of humankind’s modern life. Effects of these technologies can be observed in many fields like engineering, applied sciences, life sciences, health sciences, social sciences, economy, and commerce in the life. Education is another field that ICT is substantially influenced. Information and communication technologies have been widely used in education since the inception of these technologies.

The advent of the modern knowledge society requires innovations and newer approaches in performing educational processes. By using information and communication technologies, remarkable improvement has been succeeded in education. While technology has the potential to create opportunities for transformative learning in higher education, it is often used to merely reinforce didactic teaching that aims to control access to expert knowledge. Educators, instead, should consider using technology to enhance communication and provide richer, more meaningful platforms for

the social construction of knowledge. By using technology to engage in shared learning experiences that extend beyond the walls of the classroom, it could create opportunities to develop the patterns of thinking that students need to participate in complex, real world situations (Rowe et al., 2013).

Bates and Sangrà (2011, p.4) are of the opinion that "radical change is needed in the design and delivery of teaching if Higher Education Institutions (HEIs) are to be “fit for purpose” for the 21st century". The fitness for purpose is an outcome of a careful balance between educational goals, learning outcomes, design of learning activities and appropriation of technologies to mediate the accomplishment of the task. This requires imaginative and creative use of Emerging Technologies (ETs) by both students and educators in order to bridge the current pedagogical expectations sandwiched between contextual constraints and concerns. This, of course, also presumes the understand of ETs meaning.

Although the term ETs may not have a universally accepted meaning, there seems to be some degree of agreement that educators are appropriating ETs to affect teaching practice. However, there remains a great deal of uncertainty and confusion about the actual meaning of ETs that are being used in these pedagogical practices (Siemens and Tittenberger, 2009; Veletsianos, 2010). Literature on a common understanding of ETs in the broader higher educational rather than disciplinary-specific context is also sparse (Veletsianos, 2010). There is an acknowledgement that there is a need to educate academics to use ETs and that the focus should be on

innovative pedagogies rather than the technologies themselves (Johnson et al., 2012).

According to Veletsianos (2010), ETs are "tools, concepts, innovations, and advancements utilized in diverse educational settings to serve varied education related purposes." This means that ETs is a very broad concept that can incorporate theories and concepts in addition to tools. Furthermore, Veletsianos (2010) sees ETs as rapidly changing and evolving organisms that go through hype cycles and transcend academic disciplinary boundaries. ETs are also not necessarily new technologies, as online gaming; virtual learning environments (VLE) and Twitter have been around for some time but may still be considered emerging in HEIs depending on how they are appropriated. Veletsianos (2011) also views ETs as those technologies that are not quite yet understood and that are as yet under-researched but that have the potential for transformative educational practice. Accepting Veletsiano's loose definition of ETs serves as a useful point of departure in exploring some of the observable effects of appropriating these technologies.

Some of the consequences for the improvement of higher education pedagogy through the use of ETs include the rise in personal learning environments (Martindale and Dowdy, 2010), a decrease in reliance on institutionally regulated learning environments (Lee and McLoughlin, 2010), the need for more integration of formal with informal learning (Dabbagh and Kitsantas, 2012); life-wide together with lifelong learning

(Barnett, 2010; Jackson, 2010, and 2011) and a demand from students to take more control of their learning (Johnson et al., 2010).

While these are desirable educational outcomes, the realization of these outcomes requires careful design of learning tasks (Herrington, Reeves and Oliver, 2010). For example, an increasing number of scholars have confirmed the pedagogical value of social networking (Konert et al., 2012; Rambe, 2012), but this does not mean all educational uses of social networking is transformative and will enhance student learning.

Thus the relationship between use of ETs and changing learning/teaching practice is non-trivial and not one to be taken for granted. Dabbagh (2005) indicated that meaningful learning and interaction, in a theory-based framework, involve three interrelated iterative components: the pedagogical models (i.e., modeling teaching with ETs through knowledge building communities), the learning strategies (i.e., focus on the practice of blogging, podcasting and writing collaboratively as opposed to merely creating an awareness of tools), and pedagogical tools (i.e., demonstrating affordances of technologies such as blogs, podcasts and wikis). Dabbagh (2005) contends that the increasing availability of technologies is creating new possibilities for using technologies, and as a consequence new pedagogical practices and social practices are continuously being transformed.

2.4 ICT and Pedagogical Theories

Behaviorism involves a leaner's framework as a solitary driver for understanding (Jones and Mercer, 2003), and knowledge is accomplished

as an intangible platonic shape. Behaviorism requires topic matter to be analyzed as specific associations, expressed as behavioral objectives. Thus, Instructional Systems Design can be categorized as a pedagogical theory derived from behaviorism. As a reaction to behaviorism, the concept of cognitivism emerged, which argue that learning employs the acquisition or restructuring of cognitive configurations (Ravenscroft, 2001). This assumption allows for conceptual principles and actions concerning informational structure of curriculum. Cognitive science input for Instructional Systems Design is demonstrated through computer tutors.

Furthermore, constructivism presumes that individual knowledge is an adaptive and dynamic process. This reality is persistently open to change, because current structure and connections are the foundation to which other knowledge structures are attached (Bednar et al., 2002). The increasing significance of this approach is recognized throughout ICT learning practices (McRobb, et al., 2007). Nevertheless, rising knowledge complexity, as well as the growth of educational networks, gives rise to social theory/social cultural as social and cultural dynamics are core issues in learning. This approach would argue that students join a knowledge-generating community in order to solve real problems as a component of their study. In a social constructivist environment, the lecturer will himself or herself be a learner together with his students, as the generic skills of collaboration, problem solving and creating new knowledge are important goals.

Siemens (2004) suggests connectivism as a novel learning theory. Connectivism is characterized by the amplification of learning, knowledge and understanding through the extension of a personal network. This theory embraces self-efficacy concerning personal knowledge management within educational environment.

Regardless of the technological progress, a common objective of all learning theories is to describe the effort needed in order to acquire knowledge. Cognitive, social-cultural and connectivism theories often focus on different aspects of learning but finally lead to the adoption of collaborative learning as the prevailing one (i.e., virtual learning environments are a typical example (Konstantinidis et al., 2010) through an evolutionary procedure. Collaborative learning theory preceded computers and is based on a combination of Piaget (1972) and Vygotsky (1962) theories, composing the relevant social and constructivist features (Dillenbourg et al., 1996; Scardamalia et al., 2006) in a form where two or more people learn or try to learn together.

The main objective of computer supported collaborative learning is to carry out communication among stakeholders (scholars and lecturers) and support social interaction (Dillenbourg and Traum, 1999). Collaborative procedures become feasible through collaborative learning networked environments that are designed for distributed and distance learning support (Anderson and Jackson, 2001). Furthermore, Shih and Yang, (2008) and Konstantinidis et al. (2010) proved that collaborative learning

can be empowered through the usage of 3D Virtual Worlds establishing a new e-learning tool.

2.5 Models of Learning

2.5.1 Traditional Learning

Traditional education, also known as conventional education or customary education, refers to long-established customs found in HEI that society has traditionally deemed appropriate. Some forms of education reform promote the adoption of progressive education practices, a more holistic approach which focuses on individual students' needs and self-expression. In the eyes of reformers, traditional lecturer-centered methods focused on rote learning (is a memorization technique based on repetition), and memorization must be abandoned in favor of student-centered and task-based approaches to learning (Beck, 2009, pp. 3-6).

Traditional educational programs and methods of instruction based on face-to-face lecturing have also been criticized for their ineffectiveness in helping students to develop leadership skills and abilities (Bridges and Hallinger, 1997; Costello, et al., 2002; Palmer and Major, 2004).

The traditional education was simple oral recitation. In traditional teaching, students read a textbook or listen to a lecture then studied and memorized the assignments at home. While the lecturer's primary activity was to give them a lecture and assigning exams (Beck, 2009).

This traditional approach also insisted that all students be taught the same materials at the same way; students that did not learn quickly enough

failed, rather than being allowed to succeed at their natural speeds (Beck, 2009).

2.5.2 E-Learning

The origins of the term e-learning is not certain, although it is suggested that the term most likely originated during the 1980's, within the similar time frame of another delivery mode online learning. While some authors explicitly define e-Learning, others imply a specific definition or view of e-learning in their article. These definitions materialize some thorough conflicting views of other definitions, and some just by simply comparing defining characteristics with other existing terms.

In particular, Ellis (2004) disagrees with authors like Nichols (2003) who defines e-learning as strictly being accessible using technological tools that are either; web-based, web-distributed, or web-capable. The belief that e-learning not only covers content and instructional methods delivered via CD-ROM, the Internet or an Intranet (Benson et al., 2002; Clark, 2002) but also includes audio- and videotape, satellite broadcast and interactive TV is the one held by Ellis. Although technological characteristics are included in the definition of the term, Tavangarian et al. (2004) as well as Triacca et al. (2004) felt that the technology being used was insufficient as a descriptor. Tavangarian et al. (2004) included the constructivist theoretical model as a framework for their definition by stating that e-learning is not only procedural but also shows some transformation of an individual's experience into the individual's knowledge through the knowledge construction process.

As there is still the main struggle as to what technologies should be used so that the term can be referenced, some authors provided either no clear definition or a very vague reference to other terms such as online course/learning, web-based learning, web-based training, learning objects or distance learning believing that the term can be used synonymously (Dringus and Cohen, 2005; Khan, 2001; Triacca et al., 2004; Wagner, 2001). What is abundantly obvious is that there is some uncertainty as to what exactly are the characteristics of the term, but what is clear is that all forms of e-learning, whether they are applications, programs, objects, websites, etc., can eventually provide a learning opportunity for individuals using technological means.

The term e-learning can be used as a general term to define audio–visual, interactive synchronous or asynchronous educational and instructional activities. In the literature, there are more specific, various definitions of e-learning (Akkoyunlu and Soylu, 2006). Clark and Mayer (2008) define e-learning as the learning activity that is achieved through the Internet, network, or just a computer. According to European Commission (2001), e-learning is defined as “using new multimedia technologies and the internet to improve the quality of learning by facilitating access to resources and services as well as remote exchanges and collaboration.” (Kose and Deperlioglu, 2010, p.2).

This is also the focus of Gallagher (2003) definition who describes e-learning as "the use of digital technologies to support and deliver some or all of the teaching and learning for a particular unit of study". According to

Higher Education Funding Council for England (HEFCE) (2005) e-learning is "any learning that uses ICT". HEFCE further emphasizes that "with this definition one has to ensure that there is confident use of the full range of pedagogic opportunities provided by ICT. For higher education this will encompass flexible learning as well as distance learning, and the use of ICT as a communication and delivery tool between individuals and groups, to support and improve the management of learning". The Organization for Economic Co-operation and Development (OECD) (2005) claims that e-learning refers to the use of ICT to enhance and/or support learning in tertiary education (Boezerooy, 2006).

And for the purpose of this study e-learning is defined as a simple way to provide more interactive and effective learning contents and ensure learning environments where students can take part in whenever they want. As a result of using multimedia technologies, e-learning is a popular and strong education method for today’s world.

2.5.3 Blended Learning

Blended learning can be considered as an innovative learning approach which takes advantages of both face-to-face learning and online learning practices, where it blends both learning patterns into a teaching model. Several researchers advocated the trend of blended learning. A fundamental view of blended learning shows that the online learning should be considered as a value-added component instead of a replacement of traditional classroom learning to better serve their students.

Blended learning is considered as a radical learning method in the innovative learning map and has many different definitions made in the literature. According to Singh and Reed (2001), blended learning is a learning approach including more than one delivery method used to optimize the learning outcome and cost of learning delivery.

Another definition of blended learning is the effective combination of different learning techniques, technologies, and delivery methods to meet specific communication, information needs, and knowledge sharing between learners. Briefly, it is also defined as an education model combining different types of traditional and distance education and making use of all technology types. Blended learning contains different types of learning strategies to ensure better teaching–learning experiences. For instance, the blend could be between any type of educational technology and face-to-face lecturer-led training. Nowadays, blended learning is actually associated with combining traditional education and e-learning activities. Blended learning incorporates different aspects of traditional education and e-learning to ensure an effective learning environment for students.

Garrison and Vaughan (2008) suggested that blended learning is at the center of an evolutionary transformation of teaching and learning in the higher education. The challenge of the higher education is to recognize the importance of blended learning and further redesign the learning experience in ways to enhance the traditional value of education.

2.5.3.1 Models of Blended Learning

The length of each learning model may vary according to the course design. The establishment of a balance between the face-to-face education and the online environment is a challenging process, depending on factors such as the instructional objectives, the characteristics of students, the condition of online resources and the trainer's experience.

Because of variety in blended learning model, Bersin (2004) has introduced two general approaches to be used. These approaches are named as: the program-flow model and the core-and-spoke model.

The program-flow model is a blended learning approach that includes a curriculum with several steps. In this model, students perform learning activities (step-by-step) in a predefined order. The model ends with a final step including an exercise or a test to evaluate students' learning process. Usually, this model is developed by replacing Face-To-Face (FTF) events with e-learning activities done by students on their own. The program-flow model is appropriate to use during the transition from FTF interaction to blended learning model.

Core-and-spoke model is a blended learning approach that consists of a primary approach and additional materials to support developed primary approach. Additional materials can be lesson contents, interactive tools, exercises, helpful resources, and tests. In core-and-spoke model, students can decide which additional material to use and it is not necessarily for all students to complete the given course at the same time. This feature of the model allows students to organize and execute their own learning process

through the course. So, core-and-spoke model is more effective when it is used for motivated and experienced students (Bersin , 2004 and Hansen , et al., 2006).

Blended learning also can take many forms, and accordingly various frameworks have been suggested in the literature to categorize them. First, blended learning can be designed and delivered at four levels: activity, course, program, and institutional (Graham, 2006).

Activity-level blends are typically not planned but occur during the training experience, such as deciding to use the Web for a supplemental activity after a FTF session or experience. Course-level blends are typically preplanned by the trainer or instructor, such as having some learners attends from remote regions using Web conferencing while others are presented live. In a program-level blend, an entire set of courses for a certificate or degree program has both an FTF and online experience or an online program has a residency component. Institution-level blend, an organization or institution decides how the blend will occur (Kim, et al. 2008).

In addition, blended learning models can be categorized according to how, what (the content), and where (a face-to-face classroom or online) the activities are organized, such as an anchor blend, a bookend blend, and a field blend (Rossett and Frazee, 2006).

In the anchor blend, the learning is started (i.e., anchored) from what the learners are familiar with–classroom instruction–and online instruction occurs after it. In the bookend blend, an online experience is wrapped

around an FTF one. Here, the learners might meet online for pre assessments, introductions, explorations, preliminary readings, or discussions prior to the start of the class. Typically the pre class online activities prepare learners for the FTF session. After the FTF instruction, there might be post assessments, online reflections, or explorations or the start of an online community where learners share their best practices. A key advantage of the bookend approach, it allows learners and lecturers to meet in multiple delivery formats, which can help learners engage in a richer learning environment (Kim, et al. 2008).

The field blend is less prescriptive since it entails using online resources where and when needed. For instance, someone being trained in a FTF classroom may access online materials on the job (i.e., on demand) when needed. As Rossett and Frazee (2006) point out, the field blend is the most learner centered and flexible of the three approaches. However, with the loss of structure, it may be the most difficult to plan for operation.

2.5.3.2 Studies on Blended Learning

Recently, more research has centered on student satisfaction with this type of learning as well as resulting in learning performance. Sikora and Carroll (2002) reported that students generally favor traditional-style classroom teaching over fully Web-based courses. In addition, Carr (2000) noted a decline in attendance in fully Web-based courses. Marino (2000) argued that students are required to play the role of independent and self-regulated learner to do well in fully Web-based courses, an expectation they cannot always live up to (Melton et al., 2009). Rossett and Frazee (2006) described

blended learning as a mixture of seemingly contradictory approaches, a combination of formal/informal, lecture/web-based components in which the learner finds themselves dependent on lecturer guidance and self-direction.

The quest for the most feasible learning/teaching tool continues as new combinations of technology and pedagogy are being developed and tested (Colesca et al., 2009). Orton-Johnson (2009) attributed some people's dislike for computer-based learning to a deep-rooted trust in traditional texts as an authentic, time-honored medium of knowledge transfer. Pereira et al. (2007) found that introduction of blended learning strategies had resulted in improved learning performance in terms of higher examination turnout, better grades and better exam pass rate among a group of freshmen biology majors taking the course 'human anatomy.'

In another study on the feasibility of blended learning, 56 undergraduate nursing students surveyed reported no significant difference in their learning motivation in face-to-face and web-based learning settings (Jang et al., 2006). This finding provides a persuasive argument to traditionalists that effective learning can take place in nontraditional learning environments. Schaber et al. (2010) proved that both classroom and blended learning formats are effective in enhancing learner's perceived understanding of affective content, although blended learning was proved more effective than classroom learning.

While there is much variation in blended courses (and in face-to-face courses as well), one finding that appears to be consistent is student and

faculty satisfaction with this modality. Both students and faculty are positive regarding the flexibility and convenience and the perceived increase in interaction they have with blended courses.

Students rate the quality of their blended experience as high as or higher than their face to face courses. They also report high satisfaction with instructor interaction. Course weaknesses often refer to problems with technology, including difficulty with course management systems (Waddoups and Howell, 2002). Researchers at Ohio State University surveyed 201 students from three universities about their experience in courses spanning the distance education continuum from completely face-to-face to completely online. What students indicated was that the intuitive structure of the course – clearly defined objectives, assignments, deadlines, and encouraging dialogue and interaction – was most important in satisfaction with the course (Stein, 2004).

Rovai and Jordan (2004, p.13) compared three education graduate courses-traditional, blended, and fully online—and found that students in the blended course measured highest in a sense of community, similar to those students in the face-to-face section, but higher than those in fully online section. They stated "since students in the blended course exhibited similar sense of community and variability as students in the traditional course, offering the convenience of fully online courses without the complete loss of face-to-face contact may be adequate to nurture a strong sense of community in students who would feel isolated in a fully online course".

Students in the blended courses described the benefits of the online portion of the course which allowed them the freedom to perform some of the course instruction at their own flexibility, a feature important for these students, many of whom needed to work. However, many of them also mentioned the value of the face-to-face component which they felt helped them both academically and in building professional relationships and a strong sense of community. In addition, some students in the fully online course misread the instructor's comments as being "sharp and frank" while students in the blended and fully online courses did not convey such impressions, possibly because of the opportunity for face-to-face discussions which allowed everyone to become acquainted.

For the most part, faculty report that student performance in blended courses is as good as, or in some cases better, than face-to-face. The Pew Grant Program in Course Redesign found improved student learning in 19 out of 30 projects with 11 having no significant difference from face to face sections (Waddoups and Howell, 2002). O'Toole and Absalom (2003) found students in the blended format, accessing both online resources and attending lectures, performed better than students who attempted to perform without attending lectures. They claimed that the lecture provides high motivation for students to maintain progress, thus equating to higher students achievement.

2.5.3.3 Advantages and Disadvantages of Blended Learning Approach

Literature has addressed the advantages and the disadvantages of both online learning and classroom learning. An innovative blended learning

model combined the practices of both face-to-face learning and online learning. So, advantages and disadvantages are also combined in a designed blended learning model.

Blended Learning Advantages and Opportunities

Blended learning has many advantages and opportunities that allow lecturers and students to have more meaningful teaching–learning experiences and improve education process provided. Major advantages and opportunities of blended learning model can be listed as follow briefly (Smith, 2010):

- Blended learning provides a strong and effective socialization process with face-to-face interaction.
- Students' academic achievements can be improved with teaching–learning systems using blended learning model.
- Students' dropout rate can be diminished with the support provided by instructor and learning system.
- Blended learning provides a flexible education model that can be applied to students with different learning styles and levels.
- Blended learning allows cost savings and minimizing time away from the job and travel/classroom/lecturer expenses.

Blended Learning Disadvantages and Challenges

Beside many advantages blended learning has within it, it has potent disadvantages and challenges (Learning Technology Center, 2009):

- Lecturers must make the transition from lectures and presentation to a more student-centered active learning. This needs rethinking of

course design making integration between the online and face-to face activities.

- The new learning environment needs adopting new approaches to teaching, i.e., lecturers need to learn how to facilitate online discussions and small group activities.
- Lecturers must take care not to overload themselves and their students. Managing the dual learning environment is an obstacle, i.e., meet both FTF and online discussion groups.
- Lecturers must be prepared to help students understand their active role in the blended learning, and be prepared to offer strategies for trouble-shooting new course technologies, which considered time consuming at the initial stage.
- High initial costs for preparing multimedia content materials.

2.6 E-learning Platforms Models

New technologies (the internet) provide lecturers of universities with many interesting tools that can be used to improve the teaching– learning process. The usefulness of these tools makes important for lecturers to have more information about the advantages and possibilities of using technology in the classroom (Kaminski, 2005), as well as about the results derived from their application.

Besides the fact that the internet is a vast source of information, there are some specific web based applications that are conceived to be used as a teaching resource. These applications (often called e-learning platforms) allow lecturers to provide the students with material of different sorts, as

well as to interact with them in real-time. They also allow lecturers to follow the evolution of the learning process and to know the performance of each student in specific tasks.

Some examples of commercial systems are Blackboard and Top Class, while some examples of free courseware systems, such as Moodle becomes nowadays one of the most commonly used free learning management systems enabling the creation of powerful, flexible and engaging online courses and experiences. In the next subsection, Moodle is introduced.

2.6.1 Overview on Moodle

Moodle has been used as a LMS platform for sharing useful information, documentation, and knowledge management in research projects, yielding important benefits to the researchers (Uribe et al., 2007).

The transition from commercial LMS to open-source systems (such as Moodle) is a growing trend. The spread of these online technologies has been widely analyzed at faculty level. The following statistics about Moodle reveals the success of the platform around the world (Moodle Statistics, 2014):

1. Moodle is fully support Arabic language beside another 90 languages.
2. More than 55,008 sites use it.
3. More than 70,354,720 users used Moodle.
4. More than 7,555,988 courses are performed.

Moodle is a course management system able of handling a large number of courses and users, as it occurs with a university center. It is freely provided

as Open Source software under the GNU Public License, and it can be installed on computers running PHP, with SQL database support, as MySQL. A typical Moodle installation is made up of three elements: a directory for the PHP files constituting the source code of the application, another one with files containing data about courses and users, and a database which defines the different objects that integrate the system.

Moodle basic organizational unit is the course, which is acceded through a web page. A course is organized into sections that may correspond to topics or weeks, appearing in the middle column of the page. In each section, it is possible to include different resources and activities. The last ones will be assigned as home or class works to be developed by the students. At both sides of the page may appear other elements, the blocks, containing different shortcuts or control elements. Users are another essential Moodle object. They can enroll in the different courses as administrators, lecturers or students. Each role is defined by its capabilities in a certain context, that is, the set of privileges when performing certain actions.

2.6.2 Moodle Capabilities

Moodle provides a lot of information about the student's usage of the platform and also about their performance. This information can be obtained for a single person, for an entire group of people or even for all the students at a global level.

On an individual basis, the lecturer can know all the activity carried out by each student in the platform: number of visits, time spent doing each task, scores, etc. This information can be retrieved numerically or graphically.

Numeric information can be retrieved both within the platform itself or downloaded in a file suitable to be used with a spreadsheet application (i.e., Microsoft Excel). This feature allows the lecturer to extract useful information about the course. One interesting capabilities of Moodle is the fact that it has some tools that make possible to give the students support and help while they carry out the activities proposed.

2.7 E-Learning at Palestinian Universities

The rationale for incorporating e-learning into the Palestinian higher education is compelling. The implementation of a comprehensive e-learning program in Palestinian universities provides a practical solution to the many challenges facing the higher education in the country: travel restrictions, arbitrary curfews, indiscriminate checkpoints and frequent closures make movement between and within the West Bank, Jerusalem and the Gaza Strip extremely difficult and consequently "limit both staff and student mobility and lead to disruption of courses" (Mitchell, Basiel, and Commins, 2006).

2.7.1 General Overview of E-learning at the Palestinian Universities

The endeavors to develop and implement e-learning programs at the Palestinian universities and institutions of higher education are still bounded with various barriers and obstructions. A large segment of Palestinian educators and students alike are still cautious in their approach to e-learning education. This is evidenced by their resistance to change and reluctance to attempt new teaching/learning methodologies that do not

align with a traditional classroom setting. Forming a partnership type of relationship between lecturers and their students where students take an active role in the learning process is not a common practice at the universities (Kayed, 2013). Other barriers to the integration of e-learning into higher education in Palestine include:

- Palestinian universities lack proper infrastructure, financial resources and human capital needed to integrate e-learning into their teaching/learning programs (Mitchell, Basiel, and Commins, 2006; World Bank, 2006).
- Palestinian universities, by-and-large, resemble larger traditional high schools where students are expected to attend lectures and be tested accordingly to assess their recollection of transmitted information. Students enrolled in e-learning courses at some Palestinian universities are arguably disadvantaged compared with both attending traditional institutions and those pursuing on-line learning at renowned institutions of higher education: they neither have the advantages of face-to-face education nor the benefits and advantages attributed to e-learning (Kayed, 2013).

2.7.2 Studies on E-Learning in Palestine

Many researchers at Palestinian universities have been conducting research on e-learning in the past few years. The resulting researches indicate that there are noticed considerable trends towards implementing new strategies in order to upgrade university education in Palestine.

The preliminary findings of the work of Shraim (2010) in his research "Factors Affecting Adoption of E-learning Paradigm: Perceptions of Higher Education Instructors in Palestine" indicate positive attitudes to embark on e-learning initiatives. Shraim conducted interviews with different teaching staff at Birzeit University from a cross section of different academic programs. This research further demonstrated that individual characteristics and technological factors have a significant influence on instructors to adopt e-learning. However, organizational factors were found to be the most significant determinant for adopting e-learning.

The findings of Arman (2010) from Palestine Polytechnic University study titled "e-learning Materials Development: Applying and Implementing Software Reuse Principles and Granularity Levels in the Small" suggests reusing of existing e-learning materials is beneficial in improving developers of e-learning materials productivity.

The study of Adas and Abu Shmais (2011), which was titled "Students' Perceptions Towards Blended Learning Environment Using the OCC", was conducted on students taught English Language at An-Najah National University. The study concluded that in general the students' attitudes towards blended learning were positive in terms of the three domains; process, content, and ease of use of computer and OCC. Moreover, it reflected the students' internet and IT skills and interests due to internet availability and accessibility.

In addition, Hijjawi (2013) found that to have a self-reliant student, it's not enough to implement ICT. It is necessary to change the educational paradigm and shift from a teaching-centered model to learning-centered one as indicated in her study "Towards the Autonomisation of University Student: Evaluation of Palestinian University Students' Perception and Practice of ICT in Foreign Languages' Learning", implementation in Birzeit and An-Najah National universities.

The study of Shaqour (2014), which was titled "Faculty Members' Views towards Blended Learning, the Case of An-Najah National University", revealed that using blended learning is beneficial and assisted lecturers in their performance. Participants' practices were different using this approach, compared to face-to-face teaching. It also showed that it was worth spending time and effort implementing blended learning as this approach affected learning outcomes positively.

On the other hand, Arafat (2014) made research at An-Najah National University on Moodle effects on student's academic achievements of student who studied Chemistry 1 course using Moodle. The researcher found that there is significance difference between experimental and control groups in the final grade of the courses, for experimental group.

Salha (2014) also made research at An-Najah National University on Moodle effects on student's academic achievements of student who studied Mathematics and Learning Methods 1 course using Moodle. The researcher found that there is no significance difference between experimental and control groups in the final grade of the courses but he recommended

making additional testing considering other variables like desires and motivation.

In addition, the study of Al-Tell and Affouneh (2014), which was titled "Students' Attitudes and Challenges toward the Experience of E-Learning at An-Najah National University", found that students have positive attitude toward the e-learning/blended approach.

2.7.3 E-Learning at An-Najah National University[1]

An- Najah National University is one of the Palestinian universities which has benefited from e-learning activities utilized in adopting blended learning approach.

An-Najah National University started the blended learning path in 1999, when the first course on blended learning was developed through a fund by UNESCO and The European Commission (Abu-Eisheh, Abaza, and Awartani, 2003). In 2004 the university started to use OCC (Online Course Container) version 1. In the year 2007, it also used SCROM (Sharable Content Object Reference Model) which is a set of technical standards developed for e-learning software products.

In an interview with Dr. Saida Affouneh, Director of e-learning Center, she explained the development of e-learning at the university. In 2007, a new project was implemented, in which three Palestinian universities An-Najah, Birzeit and Al Quds universities had cooperated. The project was implemented through a grant from the Quality Improvement Fund (QIF), funded by the World Bank, which aimed to generate new LMS model of e-

[1] Dr. Saida Affouneh / e-learning center.

learning, which was the Moodle platform. Twelve courses were developed at An-Najah National University. These courses were developed from different specialization at the university by a team of lecturers, and these specializations were engineering, information technology and educational science faculties. This project was completed in 2009, and the developed courses were transferred to OCC. Utilization of OCC continued from 2009 until now. As Moodle platform was adopted by the university in 2011, working on Moodle besides OCC was the policy of the university. Moodle is more acceptable and useful in the learning process at the university. Integration between Zajel and Moodle was adopted in the year 2014.

2.7.4 E-learning Center

In implementing the University Strategic Plan of 2011-2015, the Center of Electronic Learning was founded to contribute in the achievement of the first objective of that plan, which is to develop higher education and reinforce it in all domains. A number of other university strategic plan objectives emerged from the first objective, which focused on the importance of employing technology in the teaching/learning process, and development of the academic process management through the implementation of technology as a means for reinforcing education (An-Najah National University, 2014).

The center’s vision is formulated stating "to arrive to a high -quality education in both learning and teaching, in order to achieve the best educational, training, and social outcomes to be able compete with the

higher education institutions and the local, global, and knowledge communities".

The center’s mission state that "An-Najah National University seeks to design and develop high-quality, combined courses, to improve the outcomes of education, by developing the lecturers and the students competency, providing supporting and funding projects for it, and conducting supporting experimental, evaluation, processional, and survey research, to finally arrive to people who are capable of producing knowledge and applying it to obtain a better life".

The objectives of the center include:

- To improve the environment of electronic learning in the university faculties and academic programs.
- To develop the students and lecturers skills in the field of e-learning.
- To spread the culture of electronic education.
- To produce high-quality combined courses.

E-Learning center at the development, examination and measuring impact stage which depend on continuing trained the lecturers in parallel with course developing and activating. Courses are chosen depending on every department’s selection, obligatory and optional courses were chosen. Improvement for developing of e–learning at An-Najah National University is continued through developing courses over all faculties and delivering training courses on Moodle and educational design methods to lecturers.

E-Learning center holds many activities such as workshops, evaluation and training courses, in addition to providing assistance to lectures in the production of their blended learning courses.

The following statistics describe the activities of the center from its establishment till the end of November 2014.The number of training courses held reached 49. The faculty members who participated in these workshops reached 422. On the other hand, 575 courses were developed, 228 were blended which considered fully developed courses, while 347 were enabled which include resources supporting the traditional courses. Figures 1 illustrate the numbers of developing courses and their classification according to the faculty. The number of learners who used Moodle was 15,438 and the number of lectures who delivered courses reached 242. In addition 57 online exams were conducted and the daily moves estimated between 30,000-35,000 moves.

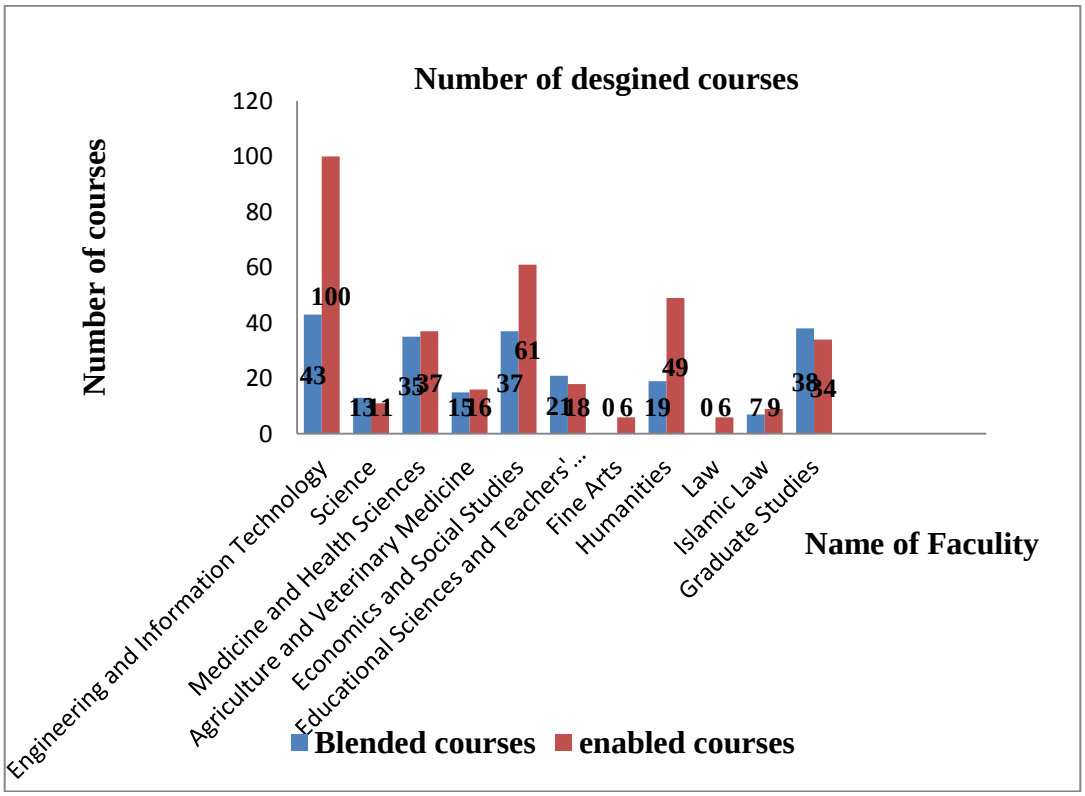

Figure 1: Number of designed courses and their classifications according to the faculty.

Source: e-learning Center, An-Najah National University, 2014

Chapter Three

Methodology

Chapter Three

Methodology

3.1 Overview of the Proposed Approach

This research has utilized the semi-experimental approach, and followed an integrative methodology. There have been two phases in this research; development and assessment of a multimedia-based blended learning engineering course. The development was made on Transportation Systems Engineering 1 course during the second semester of the academic year of 2013/2014. Assessment was made for two courses, Transportation Systems Engineering 1 course during the second semester, and Surveying 1 course during the first semester of the academic year 2013/2014 which was already developed on Moodle. Both courses were taught in the Department of Civil Engineers at Faculty of Engineering and Information Technology at An-Najah National University.

3.1.1 Development Phase

Development phase was applied on Transportation Systems Engineering 1 course, taught by three different faculty members. The blended course is considered as an extension of the development of Transportation Systems Engineering 1 course, which was authored as a multimedia course during the years 1999 - 2003 by An-Najah National University team of three faculty members. This was supported by UNESCO and The European Commission (Abu-Eisheh, Abaza, and Awartani, 2003).

Before further developing Transportation Systems Engineering 1 course in this study, it was taught by some faculty members in a traditional way, using OCC (Online Course Container) to provide students with the materials of the course, while others taught it using the multimedia courseware developed about ten years ago.

In this research, the Transportation Systems Engineering 1 course was developed and adopted as a multimedia-based blended learning course. In order to perform development of the course, a powerful tool was needed. This tool was chosen to be Moodle software that has been recently selected accepted by the university as the development platform for blended learning courses. Moodle facilitates communication and interaction with the students, as well as the delivery of information to them and receiving their feedback.

The Transportation Systems Engineering 1, which has been developed as part of this research utilizing Moodle as the learning tool, considered, in part, adopting of the material already developed using the previous multimedia developed version of the course. Other major introduced additional features have been including the addition of objectives for each chapter and section, adding relevance text, videos and still pictures. In addition the new material have included useful links, assignments which can be downloaded by the students and where they can upload their answers, in addition to online exams (covering part of the exams) which were applied using Moodle. Finally forums were added for discussion

between the lecturers and the students and between among the students themselves, for some specific relevant raised issues.

Moodle (Modular Object Oriented Developmental Learning Environment) was the platform chosen to facilitate this research as the university had decided to use it for developing e-learning courses. Moodle is an open source learning platform which has been used widely in universities around the world, Figures 2 and 3 show the portal of Moodle for the two courses considered in this research.

Figure 2: Transportation Systems Engineering 1 Course Portal developed on Moodle.

Source: Moodle.najah.edu, 2014

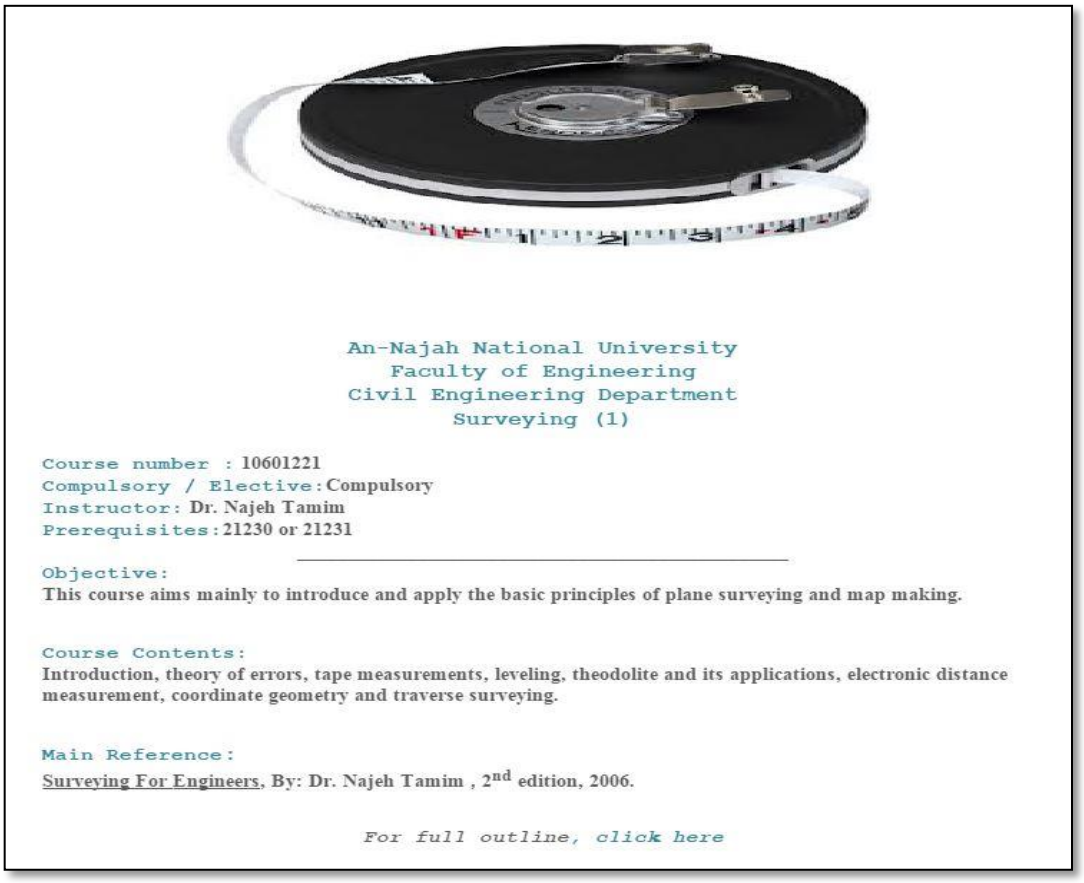

Figure 3: Surveying 1 Course Portal developed on Moodle.

Source: Moodle.najah.edu, 2014

The researcher had assisted in the transformation of the Transportation Systems Engineering 1 course material into Moodle. Students were given the ability to login to the Moodle platform. Once logged in, they can access the following:

- Course outline, which can be considered as the introductory course document. It has a number of purposes; providing students with information about the course they need to know such as course name, number, perquisites, contents, objectives, learning outcomes and competences, the instructors of the course, the text book and

references, assessment criteria and the course plan defining weeks for each chapter and when the exams will be held.

- Intended Learning Outcomes (ILO's), which are statements of what students are expected to be able to achieve as a result of engaging in the learning process (studying the course).
- Topics, each topic contains one chapter according to the course outline, and each chapter or topic is described by a brief overview through the introduction, objectives and the plan of the chapter. Each chapter has sections and subsections. These sections and subsections in general have text, still pictures, animated pictures, videos and sounds, as well as forums and homework.
- Assignments, which allow lecturers to post assignments and collect work students homework, review them and provide feedback including grades. The work students submit is visible only to the lecturer and not to the other students unless a group assignment is selected.
- Forums, where Moodle allows initiating discussions among the participants (including with the lecturer and among the students themselves). In addition, the lecturer can send personal messages to users. This tool has proven to be very useful for students, as they can comment or ask questions to their lecturer and to other students in order to clarify specific aspects of the tasks they are performing.

- Online exams, where the first and second exams were partially developed using Moodle which was used as an important assessment tools for students achievement.

3.1.2 Assessment Phase

The assessment phase was performed for the two courses; Surveying 1 and Transportation Systems Engineering 1. Questionnaires were prepared and distributed or posted online to the students in these courses. In addition to personal information and computer and internet literacy, student's preferences, attitudes, and output of their academic achievement were targeted to be measured for these courses using the questionnaire.

The questionnaires results were utilized for conducting comparative assessment among students in three ways:

- The first in assessing changes of students' preferences and attitudes towards four domains, content, process, interests, and academic achievement with time for the students taking the same course being taught utilizing the blended learning approach.
- The second in assessing the differences in students' preferences and attitudes towards four domains, content, process, interests, and academic achievement for those taught using blended learning approach compared with those taught using the traditional learning approach for the same course.
- The last comparative assessment is in assessing students' preferences and attitudes towards four domains, content, process, interests, as well as academic achievement for students being taught utilizing

blended learning approach for different courses taught at different levels.

Surveying 1 was taught by the same faculty member during the first semester of the 2013/2014 year. He taught two sections, one was arranged to be using blended learning, while the other was using the traditional way, in order to compare the outcomes. The two classes were given the same material and information through different supportive tool; in the first class, the students were taught using the blended learning approach considering Moodle tool, while in the second, students were taught using traditional approach, considering the OCC, which is only a course container. Multimedia was the main form of knowledge given to Moodle section students including videos, text, and animated and still pictures.

The students of the two sections were requested to fill a questionnaire after the first exam, while only blended learning students filled the questionnaire again after the second exam in order to examine whether there were differences for this group through time.

The other course was Transportation Systems Engineering 1. It was taught by three faculty members during the second semester of the 2013/2014 year. They taught four sections, all using the blended learning approach and Moodle as supported online tool, which had been used to develop the course itself in this research. Multimedia was the main form of knowledge given to students, which included videos, text, and animated and still pictures. This had considered and utilized the multimedia material prepared during the years 1999- 2003 by the faculty members, which was further

developed and modified according to the new course plan. The questionnaire was distributed after the first exam for the four classes and then analyzed.

3.2 Research Tools

In order to achieve the aim of this research, relevant research tools were used. These tools played a major role in facilitating the procedures of the research, whether in collecting, analyzing or communicating data.

- **Interviews**

Interviews were conducted with a number of experts in education and e-learning to get in depth knowledge about Moodle and blended learning and to get feedback on the initial design of the questionnaire intended to be used in the study.

Despite there were several approaches to interviews according to Kajornboon (2005), which include structured interviews, semi-structured interviews, unstructured interviews and non-directive interviews, unstructured interviews were conducted to get a deeper investigation and to shed more light on the data that was collected by the questionnaire. Such interviews are characterized of their flexibility, where these are open and differ from one to another (Kajornboon, 2005). Seven interviews were conducted with the experts at An- Najah National University as presented in the following Table (1).

Table 1 : List of experts at An-Najah National University who were interviewed

#	Expert name	Expert position
1	Dr. Ali Habaib	Assistant Vice President For Academic Affairs, and Associate Professor of Education
2	Dr. Saida Affouneh	e-learning Center Director
3	Dr. Sameer Abu-Eisheh	Professor in Civil Engineering Department
4	Dr. Najeh Tamim	Associate Professor in Civil Engineering Department
5	Dr. Abdulkareem Ayoub	Assistant Professor at the Faculty of Economic and Social Studies
6	Eng. Arij Abu-Obaid	e-learning center staff
7	Mr. Musab Miari	e-learning center staff

- **Questionnaire**

A questionnaire is a research mechanism designed with the objective to obtain information regarding how certain people (the students in this research) feel about specific issues, which are related to blended learning in this course.

Four questionnaires were designed for the two classes of Surveying 1 and Transportation Systems Engineering 1. The four questionnaires statements differed in their contents formulation according to the course or to the time it which they were distributed to the students. The questionnaires were refined based on interviews made with faculty members from An-Najah National University.[1] A previously designed questionnaire on multimedia learning, developed for the transportation multimedia courseware in 2003/2004 was a good reference to design these research questionnaires.

[1] Prof. Sameer Abu-Eisheh, Dr. Saida Affouneh, Dr. Ali Habaib , Dr. Najeh Tamim.

The questionnaire was designed and classified into four domains, personal information, computer and e-learning skills, preferences and attitudes towards blended learning process, content and interests and academic achievement domains.

Personal information domain consists of four main variables which were, gender, GPA, study level, and school secondary examination. The computer and e-learning skills domain consists of statements about using Moodle or OCC as supportive learning tools. The third was preferences and attitudes towards blended learning domain; it discussed and compared the effects of traditional and blended learning approaches on students' desire, motivations, and outcomes according to the process, content and interests. Statements were also discussed in depth the types of multimedia used for blended learning students. The last category was academic achievement, which included questions on assessment effects of using Moodle and personal efforts on the student exams output. An open-ended question at the end of the questionnaire–was included to ask the students on their suggestions and recommendations

3.3 Data Analysis and Testing

Data analysis was conducted on the collected questionnaires, whether manually or online through Google Drive. The submitted online filled questionnaire were automatically stored in a database in the Google Drive itself, and then exported to the SPSS program. The manually filled questionnaires were entered to the SPSS program directly. The overall data

were then analyzed. On the other hand, interviews were analyzed directly, notices were written down as interviewees given his / her opinions.

Descriptive and inferential analyses were conducted. Descriptive analysis was used as the representation of the means, frequencies or percentages, while inferential analysis was used to test the research hypothesis by using One Way ANOVA tests. The existence of statistical differences in relation with preferences, attitudes and scientific attainment were examined through statistical hypothesis testing.

A statistical hypothesis test is considered as a method of inferential statistics using data from a scientific study. In statistics, the result would be called statistically significant if it has been predicted as unlikely to have occurred by chance alone, according to a pre-determined threshold probability, the significance level. These tests were used in determining what outcomes of a study would lead to the rejection of the null hypothesis for a pre-specified level of significance. This can help to decide whether results contain enough information to cast doubt on conventional wisdom, given that conventional wisdom has been used to establish the null hypothesis. Therefore, when there is a significant difference, other post-hoc tests were conducted to understand these differences.

❖ **Descriptive Analysis**

Descriptive tests quantitatively describe the main features of a collection of information (Mann, 1995), or the quantitative description itself, with the aim to summarize a sample (Dodge, 2003). Simple descriptive analysis was used in this research, such as finding the means of the sample, percentages,

frequencies and standard deviations which measured the amount of variation or dispersion from the average.

❖ **Statistical Inference**

Statistical inference is the process of drawing conclusions from data that are subject to random variation, inferential statistics are based on the concept of using the values measured in a sample to estimate/infer the values that would be measured in a population, the major tests were made in this research are described as the following:

- Differences between means (t-test) which are considered as a statistical hypothesis test in which the test statistics followed a student's t-distribution if the null hypothesis was supported. It can be used to determine if two sets of data were significantly different from each other, and can be most commonly applied when the test statistic would follow a normal distribution.
- Analysis of variance (ANOVA) which is a collection of statistical models used to analyze the differences between groups means and their associated procedures (such as "variation" among and between groups). ANOVA provides a statistical test of whether or not the means of several groups are equal, and therefore generalizes the t-test to more than two groups. As doing multiple two-sample t-tests would result in an increased chance of committing a statistical type I error (which occurs when the null hypothesis (Ho) is true, but is rejected), ANOVA is useful in comparing (testing) three or more means (groups or variables) for statistical significance.

- Post-hoc analyses consisted of looking at the data -after the experiment has concluded- for patterns that were not specified a priori. In practice, post-hoc analyses were usually concerned with finding patterns and/or relationships between subgroups of sampled populations that would otherwise remain undetected and undiscovered. Post-hoc tests greatly expand the range and capability of methods that could be applied in exploratory research.
- Fisher's Least Significant Difference (LSD): This technique was developed by Fisher in 1935 and is used most commonly after a hypothesis in an analysis of variance (ANOVA) test, is rejected. A significant ANOVA test only reveals that not all the means compared in the test are equal. Fisher's LSD is basically a set of individual t-tests, differentiated only in the calculation of the standard deviation. In each t-test, a pooled standard deviation is computed from only the two groups being compared, while the Fisher's LSD test computes the pooled standard deviation from all groups - thus increasing power. Fisher's LSD does not correct for multiple comparisons.

Chapter Four
Findings and Results

Chapter Four

Findings and Results

4.1 Overview

This chapter presents and discusses the findings from the questionnaires. The SPSS program was used to analyze the data from the questionnaire by using independent samples t-test and one-way ANOVA test. When there were significant differences, the researcher conducted another post-hoc test, specifically, the LCD test (Least Significant Difference), to understand the differences between the surveyed students due to specific independent variable (Hilton and Armstrong, 2006).

In order to assess and compare among students desires, preferences and academic achievement, descriptive and inferential analyses were conducted on the collected data. Descriptive analysis was used as the representation of the percentages and means, while inferential analysis was used for hypothesis testing by using One Way ANOVA tests (Sawyers, 2007). The existence of statistical differences between gender, GPA, study level and secondary school examination variables and e-learning skills, preferences and attitude toward blended learning, and academic achievements were examined through statistical hypothesis testing.

As mentioned in the methodology chapter, this research requires collecting of data form students to assess their preferences and attitudes toward blended learning process, content and interests, and their academic

achievement related to blended learning, compare and capture changes in these, and conduct proper analysis.

Data were collected from students after the first or second exams by filling a designed questionnaire manually or online using Google Drive.

4.2 Data Analysis

Data analysis will be utilized for conducting comparative assessment among students in three ways; the first in assessing changes of students attitudes towards four domains, content, process, interests, and academic achievement with time for the students taking the same course being taught utilizing the blended learning approach, and the second in assessing the differences in students attitudes towards two domains interests and academic achievement for those taught using blended learning approach compared with those taught using the traditional learning approach for the same course. The third comparative assessment will be in assessing student's attitudes towards the same four domains of content, process, interests, and academic achievement for students being taught utilizing blended learning approach for different courses taught at different levels.

Seven unstructured interviews were conducted as a secondary and supplementary tool to the questionnaire with the experts at An- Najah National University. More information was obtained from the interviews that reflected the real situation of the blended learning at An- Najah National University, details about using Moodle and about questionnaire design. Interviews were analyzed directly, notices were written down as interviewees give his/her opinions.

4.2.1 Descriptive Analysis

Questionnaires were analyzed by different statistical tools. The distribution of the targeted sample in four cases based on courses, teaching method and time will be presented here in order to give general background of the samples distribution.

The four cases are:

- First case: students in the traditional class studying Surveying 1 course who were assessed after the first exam.
- Second case: students in the blended learning class studying Surveying 1 course who were assessed after the first exam.
- Third case: students in the blended learning class studying Surveying 1 course who were assessed after the second exam.
- Forth case: students in the blended learning class studying Transportation Systems Engineering 1 course who were assessed after the first exam.

4.2.1.1 Sample Distribution

The sample distribution for the four cases, based on gender, study level, secondary school examination, and students' GPA, is illustrated hereafter.

The sample size is described in the Table (2).

Table 2: Sample size description

Course name	Method of teaching	Assessed time	Sample specialization	Sample size
Surveying 1	Traditional	After first exam	Building engineering	47
Surveying 1	Blended	After first exam	Civil engineering	43
Surveying 1	Blended	After first exam	Civil engineering	43
Transportation Systems Engineering 1	Blended	After second exam	Civil engineering	93

First: Distribution of the study samples according to gender

Sample distribution for the two courses according to gender is elaborated in Table (3). In Surveying 1, traditional teaching class, students are approximately equally distributed across gender, while Surveying 1 and Transportation Systems1 blended learning classes, male are the majority.

Table 3: Distribution according to gender.

Case		Gender		Total
		Male	Female	
Traditional Surveying 1 class, after first exam	Number	21	26	47
	Percentage	44.7%	55.3%	100%
Blended Surveying 1 class, after first exam	Number	30	13	43
	Percentage	69.8%	30.2%	100%
Blended Surveying 1 class, after second exam	Number	30	13	43
	Percentage	69.8%	30.2%	100%
Blended Transportation 1 class, after first exam	Number	68	25	93
	Percentage	73.1%	26.9%	100%

Second: Distribution of the study sample according to study level (year)

Sample distribution for the two courses according to study level (year) is shown in Table (4).

Table 4: Distribution according to study level (year).[1]

Case		Study level (year)					Total
		First	Second	Third	Fourth	Fifth	
Traditional Surveying 1 class, after first exam	**Number**	-	28	15	3	1	47
	Percentage	-	59.6%	31.9%	6.4%	2.1%	100%
Blended Surveying 1 class, after first exam	**Number**	2	28	6	7	-	43
	Percentage	4.7%	65.1%	14%	16.3%	-	100%
Blended Surveying 1 class, after second exam	**Number**	1	31	5	6	-	43
	Percentage	2.3%	72.1%	11.6%	14%	-	100%
Blended Transportation 1 class, after first exam	**Number**	-	-	86	7	-	93
	Percentage	-	-	92.5%	7.5%	-	100%

Surveying 1 course is offers for both civil engineering and building engineering students. It is usually offered at the second year of their study level according to study program of the department. According to the questionnaire results shown in Table (4), traditional Surveying 1 students, who are building engineer students, are concentrated in the second year with a percentage of 59.6% and then third year with a percentage of 31.9% of total. On the other hand, students in blended learning Surveying 1 course are civil engineers students concentrated in the second level year with percent ranges between (65%-70%).[2]

On the other hand, Transportation Systems Engineering 1 students are concentrated in the third level year with high percent of about to 92.5% as

[1] The sample population of blended learning Surveying 1 after first and second exams are not exactly the same students, as the 43 students who filled the questionnaire in each case could differs a little due to absence of few students during the experiment.

[2] The sample population of blended learning Surveying 1 after first and second exams are not exactly the same students, as the 43 students who filled the questionnaire in each case could differs a little due to absence of few students during the experiment.

their study program offers this course for civil engineering specialization only in the third year.

Third: Distribution of the study sample according to secondary school exam

Sample distribution for the two courses according to the results of the secondary school examination is shown in Table (5). Most students in the two courses are located in the (90%-95%) category with percent between (50%-60%), which is considered normal as most of the accepted student in the faculty usually have mark above 90%.

Table 5: Distribution according to secondary school examination[1]

Case		Secondary School Examination				Total
		80%-85%	85%-90%	90%-95%	> 95%	
Traditional Surveying 1 class, after first exam	Number	4	7	25	11	47
	Percentage	8.5%	14.9%	53.2%	23.4%	100%
Blended Surveying 1 class, after first exam	Number	6	8	25	4	43
	Percentage	14%	18.6%	58.1%	9.3%	100%
Blended Surveying 1 class, after second exam	Number	6	7	23	7	43
	Percentage	14%	16.3%	53.3%	16.3%	100%
Blended Transportation 1 class, after first exam	Number	4	7	55	26	93
	Percentage	4.3%	7.6%	59.8%	28.3%	100%

Fourth: Distribution of the study sample according to GPA.

Sample distribution for the two courses according GPA is shown in the Table (6).

[1.] The sample population of blended learning Surveying 1 after first and second exams are not exactly the same students, as the 43 students who filled the questionnaire in each case could differs a little due to absence of few students during the experiment.

Table 6: Distribution according to GPA[1]

Case		GPA				Total
		2-2.5	2.5-3	3-3.5	> 3.5	
Traditional Surveying 1 class, after first exam	Number	26	10	9	1	47
	Percentage	56.5%	21.7%	19.6%	2.2%	100%
Blended Surveying 1 class, after first exam	Number	19	18	5	1	43
	Percentage	44.2%	41.9%	11.6%	2.3%	100%
Blended Surveying 1 class, after second exam	Number	24	11	7	1	43
	Percentage	55.8%	25.6%	16.3%	2.3%	100%
Blended Transportation 1 class, after first exam	Number	14	34	35	10	93
	Percentage	15.1%	36.6%	37.6%	10.8%	100%

In the Surveying 1 class, most of the students, whether in the blended or traditional classes, have GPA in the (2-2.5) and (2.5-3) categories, but most of the students in the Transportation Systems Engineering 1 have GPA in the (2.5-3) and (3-3.5) categories.

Calculating the average of GPA for the students in each case gives the following results:

- Surveying 1 traditional course students: 2.59
- Surveying 1 blended first exam students: 2.61
- Surveying 1 blended second exam students: 2.58
- Transportation Systems Engineering 1 course students: 2.97

It noticed that students in the Surveying 1 course, whether in the blended or traditional classes, have very close average GPAs of about 2.6. Therefore,

[1] The sample population of blended learning Surveying 1 after first and second exams are not exactly the same students, as the 43 students who filled the questionnaire in each case could differs a little due to absence of few students during the experiment.

even though the students in the traditional class were building engineering students, and those in the blended learning class were civil engineering students, they are considered similar groups in terms of their overall academic achievement. On the other hand, students in the Transportation Systems Engineering 1 course had the higher GPA with an average of 2.97.

4.2.1.2 Questionnaire Domain Analysis

In this section, the preferences and attitudes of students were classified into three domains (interests, content and process). In addition, there was a fourth considered domain, which is the academic achievement domain. The four domains were analyzed and compared according to the cases.

Most of questions were designed based on Likert scale. Questions in the Likert format are analyzed in each questionnaire. Likert scale ranges from 1 (strongly disagree) to 5 (strongly agree). Accordingly, averages are classifying into five intervals ranging from very low to very high extents of application (Ismael, 2012). The intervals are determined as indicated in Table (7).

Table 7: Interval Classification

Classification	Intervals
Very low	1.0-1.8
Low	1.8-2.6
Moderate	2.6-3.4
High	3.4-4.2
Very high	4.2-5.0

Source: Ismael (2012)

In Table (7) there are five intervals corresponding to classification of very low to very high extent of application. The degrees that these intervals are

based on were calculated by subtracting the range of response 1 (strongly disagree) from that of 5 (strongly agree), and dividing the result by 5, is the number of intervals, led to ranges being calculated as [(5-1)/5] =0.8 (Ismael, 2012).

The analysis in this research considers three comparisons, the first comparing students who studied the same course utilizing blended learning with time. The second between students taught in two different ways, blended and traditional learning. And the third comparison made between students in different study level utilizing different blended learning courses. As stated earlier, in the class taught using the traditional method, OCC is used for contact and delivery of information to the students, where in the classes taught using blended learning approach, Moodle is used for this purpose. In addition, the questionnaires were designed for Surveying 1 course slightly different from those for Transportations System1 as the topics and material were not the same. However all questionnaires were directed towards the same objective of assessing the blended learning experience through measuring students preferences, attitudes, stimulation and motivation.

Questionnaire analysis reveals some important characteristics about student for each case study. Table (8) shows average, standard deviation, and percentage for about students Moodle awareness. While Table (9) describes average, standard deviation, and percentage for students studying style.

Table 8: Moodle awareness according to the cases.

Characteristic	Traditional Surveying 1 class, after first exam			Blended Surveying 1 class, after first exam			Blended Surveying 1 class, after second exam			Blended Transportation 1 class, after first exam		
	Average	Percentage	S.D	Average	Percentage	S.D	Average	Percentage	S.D	Average	Percentage	S.D
Prior awareness of Moodle	1.50	50%	0.50	1.40	59.5%	0.49	1.37	62.8%	0.48	1.16	83.7%	0.37
Prior experience in Moodle	1.62	37.8%	0.49	1.60	39.5%	0.49	1.55	44.2%	0.50	1.25	47.7%	0.43
Use of Moodle in other courses in the current semester	1.89	10.9%	0.31	1.83	16.3%	0.37	1.72	27.9%	0.45	1.47	52.2%	0.50

Table 9: Studying styles of the students according to cases.

Characteristic	Traditional Surveying 1 class, after first exam			Blended Surveying 1 class, after first exam			Blended Surveying 1 class, after second exam			Blended Transportation 1 class, after first exam		
	Average	Percentage	S.D	Average	Percentage	S.D	Average	Percentage	S.D	Average	Percentage	S.D
Spend allocated study time using the textbook	2.39	100%	0.74	2.30	95.3%	0.88	2.39	97.7%	0.79	2.42	88.0%	0.95
Spend allocated study time using Moodle	-	-	-	3.20	53.5%	0.83	3.32	51.2%	0.74	2.61	81.5%	0.84
Spend 1hr/week study course using book.	1.21	78.3%	.41	1.25	74.4%	.44	1.39	60.5%	.49	1.35	64.1%	.48
Spend 1hr/week study course utilizing Moodle.	-	-	-	1.81	18.6%	.39	1.79	20.9%	.41	1.42	57.6%	.49
Utilize face-to-face discussion groups.	1.5	50%	.50	1.48	51.2%	.50	1.44	55.8%	.50	1.52	47.3%	.50
Utilize online discussion groups.	-	-	-	1.86	14%	.35	1.95	4.7%	.21	1.8	19.8%	.40
Visit frequently the lecturer during office hours.	4.06	60.9%	.87	3.44	34.9%	.82	3.58	27.9%	.73	3.18	59.5%	.77

Moodle awareness according to the cases is clarified in Table (8). Students in the third year level course, Transportation Systems Engineering 1, had greater awareness of Moodle prior to this study, reaching about 84 percent compared with those of the second year level course, Surveying 1, where prior awareness ranged from about 50 to 60 percent. There have been continuous short training sessions for the university students organized by the e-learning Center on the use of Moodle as a learning tool by the university e-learning center. On the other hand, prior experience in using Moodle varied from about 48 percent for Transportation Systems Engineering 1 students, compared with that ranging from about 38 to 44 percent for Surveying 1 students. In addition, the experience in using Moodle through current semester, Transportation Systems Engineering 1 was subjected to courses utilizing Moodle with 52 percent, while Surveying 1 ranged from about 11 to 28 percent only.

The studying styles of the students participating in the experiments are summarized in Table (9). As indicated, the students allocated specific time to study the course considering the Moodle, except the students in the class taught considering traditional learning who alternatively had access to the course material though the OCC as illustrated above, which includes the textbook. On the other hand, an increasing number of students taught considering blended learning were spending specified time to study the course considering Moodle, which reached about 82% for the Transportation Systems Engineering 1 students, compared with about 51 to 54 percent for the Surveying 1students. In addition, Transportation Systems

Engineering 1 students utilizing online discussion group with percent reaches 20, compared with 5 to 15 percent for Surveying 1 students, while students in all cases utilizing face-to-face discussion group with 47 to 56 percent.

Finally, and for the same Surveying 1 course, more students being taught considering traditional learning visit frequently their lecturer during office hours, reaching about 60% of students, compared with about 28 to 35% of the students taught considering blended learning. This is as expected that less students in the classes taught considering blended learning have frequent visits to the lecturers during the office hours, where they have more dependency on themselves and have opportunities to study the material online thus reduce the need to visit the lecturers. This was not the same for students in the upper level Transportation Systems Engineering 1 course who visits lecturers with percent reaches 60.

An analysis was conducted to examine the relations in four domains/areas as presented in Tables 10, 11 and 12. These domains are describes as following:

1. Students' attitudes towards blended learning processes. This domain includes questions directed to the student taught using the blended learning approach examining the attitudes of the students with regard to four questions. These include questions such as the appropriateness of display of course material in traditional means synchronously with the use of multimedia to illustrate material concepts in a blended learning approach. In addition, the easiness in accessing the material on Moodle

and the efficiency of student time with no need for frequent face-to-face discussions.

2. Students' attitudes towards blended learning contents. This domain includes questions which were also directed to the students taught using the blended learning approach examining the attitudes of the students with regard to five questions. These include questions such as those related to the attitudes towards display of material in multimedia form compared with traditional means of display, the role of multimedia used in blended learning in achieving the course objectives and increasing learning interests, and the additional sources of material used by lecture.

3. Students' interests towards blended learning experiment. This domain includes questions which were directed to all the participating students, whether taught using the blended learning or traditional approaches, examining their interests with regard to four questions. These include questions such as those related to the interests of blended learning approach to better utilize the available class time, Inquire more about material aspects, and the interests of students to register in blended learning courses.

4. Students' academic achievement. This includes examining the academic achievement in terms of the attained final course grade, as a measure of outcome of students. This is applied to all the participating students, whether taught using the blended learning or traditional approaches.

The results are summarized for the whole set of relevant domains to compare the three cases as follows:

1. Blended Learning Surveying 1 Course after First and Second Exams.

The first comparison is conducted among the students (of the same class) who had been taught the same course Surveying 1, but about 6 weeks apart, once after the first exam and then after the second exam. The comparison would measure if there are differences in the domains considered for the same teaching approach (blended learning) with time.

Table (13) presents a comparison and testing whether if there is any significant difference in the four domains. The results show that there is no significant difference at significance level of $\alpha = 0.05$ regarding students' attitudes towards blended learning processes, contents, interests or achievements at different times where students were progressing towards the completion of the course.

Table 10: Students' attitudes towards blended learning processes.

Process	Blended Surveying 1 class, after first exam			Blended Surveying 1 class, after second exam			Blended Transportation 1 class, after first exam		
	Average	S.D	level[7]	Average	S.D	level	Average	S.D	Level
The process of synchronously displaying multimedia material along with traditional learning is appropriate.	4.47	0.80	Very High	4.25	0.81	Very High	3.84	1.02	High
Direct studying of multimedia material is suitable without lecturer instruction.	2.20	0.91	Low	2.37	1.00	Low	2.48	1.16	Low
The process of accessing multimedia material does not involve difficulties.	3.09	1.16	Moderate	2.88	1.11	Moderate	3.48	1.18	High
The learning process using blended learning approach makes more efficient use of student time with no need for frequent face-to-face discussions.	2.95	1.09	Moderate	3.06	1.20	Moderate	3.06	1.14	Moderate
Total average	**3.17**	**0.56**	**Moderate**	**3.14**	**0.54**	**Moderate**	**3.21**	**0.57**	**Moderate**

[7] Level of students averages according to Likert scale and classification.

Table 11: Students' attitudes towards blended learning content.

Content	Blended Surveying 1 class, after first exam			Blended Surveying 1 class, after second exam			Blended Transportation 1 class, after first exam		
	Average	**S.D**	**level**[8]	**Average**	**S.D**	**Level**	**Average**	**S.D**	**level**
Multimedia content preferred over traditional content.	3.04	1.23	Moderate	2.83	0.95	Moderate	2.93	1.26	Moderate
Multimedia content utilizing Moodle increases the interests to learn.	3.34	1.08	Moderate	3.32	1.12	Moderate	3.06	1.16	Moderate
Multimedia content utilizing Moodle achieves course objectives.	3.85	0.78	High	3.60	0.95	High	3.82	0.96	High
Multimedia content is Comprehensive, clear and sequential display as in the course plan.	3.86	0.86	High	3.93	0.76	High	3.81	0.98	High
The blended learning content allows more access of educational resources.	3.53	0.98	High	2.51	0.93	Low	3.72	0.99	High
Total average	**3.52**	**0.62**	**High**	**3.44**	**0.57**	**High**	**3.44**	**0.74**	**High**

[8] Level of students averages according to Likert scale and classification.

Table 12: Students' interests towards blended learning experiment.

Interests	Traditional Surveying 1 class, after first exam			Blended Surveying 1 class, after first exam			Blended Surveying 1 class, after second exam			Blended Transportation 1 class, after first exam		
	Average	**S.D**	**level**[9]	**Average**	**S.D**	**Level**	**Average**	**S.D**	**level**	**Average**	**S.D**	**level**
Student prefers blended learning as it allows for better utilization of lecture time	2.71	1.24	Moderate	3.60	1.04	High	3.63	1.08	High	3.45	1.15	High
The Student prefers presenting the course material through multimedia as it makes him inquire more on various material aspects.	2.71	1.14	Moderate	3.79	0.94	High	3.74	0.90	High	3.37	1.12	Moderate
The Student prefers blended learning as it makes him more motivated to learn depending on himself.	3.63	1.14	High	3.76	1.15	High	3.81	0.73	High	3.38	1.01	Moderate
Given the opportunity to choose, the Student would prefer to register in the class which utilizes blended learning.	2.93	1.2	Moderate	3.3	1.33	Moderat	3.47	1.17	High	3.12	1.26	Moderate
Total average	**3.00**	**0.63**	**Moderate**	**3.61**	**0.79**	**High**	**3.65**	**0.73**	**High**	**3.34**	**0.95**	**Moderate**

[9] Level of students averages according to Likert scale and classification.

Table 13: Comparison between students' attitudes and achievements after first and second exams for Surveying 1 course taught using blended learning approach.

Class	Blended Surveying 1 class, after first exam				Blended Surveying 1 class, after second exam				t-statistics	df[10]	Significance
Domain	Average	level	Number	S.D	Average	Level	Number	S.D			
Attitudes towards blended learning process	3.17	Moderate	41	0.56	3.14	Moderate	43	0.54	0.250	82	.803
Attitudes towards blended learning content	3.52	High	42	0.62	3.44	High	43	0.57	0.619	83	0.537
Interests towards blended learning experiment	3.61	High	43	0.79	3.65	High	41	0.73	0.240	82	0.810
Achievements, Exam grade	2.95	Moderate	43	1.15	3.02	Moderate	42	1.17	0.027	83	0.078

[10] Degrees of freedom.

It is noticed that students agree moderately for the blended learning processes domain whether after first or second exam, while they highly agreements for multimedia content of material domain for both cases. In addition, their interests are high for both cases, which are considered normal, when students are satisfied of content and processes of the experiment their interests will be high for blended learning. On the other hand, the results of exams are moderate whether for the first or the second exams.

Other important questions as the willingness to register in blended learning classes are investigated at the end of questionnaire. The results from the questionnaire related to such question are highlighted as shown in Table (14). The answer to the question if the students prefer to extend the experiment to other courses indicates high averages, whether after the first or second exams. Other question, In case students have the choice to register in the coming Surveying 2 course, the class with blended learning approach would be chosen. This indicates that students' interests confirm with what is describes above; that blended learning experiment meets students expectations.

Table 14: Trends towards blended learning experiment.

Common questions	Blended Surveying 1 class, after first exam			Blended Surveying 1 class, after second exam		
	Average	S.D	level	Average	S.D	level
Extend Moodle experience in engineering and information technology faculty.	3.74	1.25	High	3.60	1.04	High
Studying next Surveying 2 course utilizing blended learning approach is preferred.	3.30	1.34	M	3.58	1.15	High

2. Traditional and Blended Learning for Surveying 1 Course.

The Second comparison is conducted among the students who had been taught the same course Surveying 1, but with two different ways of teaching, once utilizing the traditional approach while the second utilizing the blended learning approach. Table (15) presents a comparison and testing whether if there is any significant difference in the preference domain as well as academic achievement after the first exam.

The results show that there is significant difference at significance level of $\alpha = 0.05$ regarding the students' interests towards blended learning, where students in the blended learning class prefer to study using the blended learning approach, which can be considered normal that these students have experienced blended learning in this course .Also their prior awareness and experience of Moodle are higher comparing with traditional. In addition, students taught utilizing blended learning spend time using Moodle in their studying styles which wasn't the case for students taught utilizing the traditional learning approach.

On the other hand, there is also a strong difference in the students' achievements based on the final grade reaches about 10 marks, where the results of the students being taught considering blended learning are better than those being taught considering traditional learning. This agree with Pereira et al. (2007) study who found that introduction of blended learning strategies had resulted in improved learning performance in terms of higher examination turnout, better grades and better exam pass rate.

This confirms that there is considerable effect of blended learning approach on students' interest who studies this course utilizing blended learning approach over students who study this course utilizing the traditional approach. In addition academic achievement of students study utilizing blended learning increased.

On the other hand, students in the traditional case know about the blended learning course content have passion and took a look on the material and sources allowed to their blended learning partners as shown in Table (16).

Table 15: Comparison between students' interests and achievements for Surveying 1 course taught using traditional and blended learning approaches.

Class	**Traditional Surveying 1 class, after first exam**				**Blended Surveying 1 class, after first exam**				**t-statistics**	**df[11]**	**Significance**
Domain	**Average**	**Level**	**Number**	**S.D**	**Average**	**Level**	**Number**	**S.D**			
Interests towards blended learning experiment	3.00	Moderate	46	.63	3.61	High	43	.79	4.0404	87	**0.0001**
Achievements, Final grade[12]	58.9	-	49	16.2	68.3	-	46	9.6	3.4123	93	**.001**

[11] Degrees of freedom.
[12] Didn't follow Likert scale.

Table 16: Traditional students knowing about blended class.

Traditional Surveying 1 class, after first exam	Average	S.D	Level
There is another class using Moodle.	4.26	0.85	Very High
Checking multimedia content for blended learning class.	2.43	1.04	Moderate

3. Blended Learning Transportation Systems Engineering 1 Course and Surveying 1 Course.

The third comparison is conducted among the students who had been taught different courses Surveying 1 and Transportation Systems Engineering 1, with the same way of teaching utilizing blended learning approach at different levels, both were measured after the first exams. The comparison would measure the four domains for Surveying 1 students who were mostly at their second year compared with those for the Transportation Systems Engineering 1 students who were generally at their third year.

Table (17) presents a comparison and testing whether if there is any significant difference in the four domains. The results show that there is no significant difference at significance level of $\alpha = 0.05$ for all domains, including the students' achievements.

It is noticed that students agreed moderately for processes domains whether for Surveying 1 or Transportation Systems Engineering 1, while high average for multimedia content of material domain for both cases. On the other hand, the interests of Surveying 1 case were higher than Transportation Systems Engineering 1, but with no big difference as there

is no significance at $\alpha = 0.05$. The decrease of preferences could be referred to the low satisfaction of online exams which is offered for Transportation Systems Engineering 1 case only as shown in Table (18). On the other hand, the final grade achievements results of exams were higher for Transportation Systems Engineering 1 case.

Table 17: Comparison between students' attitudes and achievements for Surveying 1 and Transportation Systems Engineering 1 courses taught using blended learning approach.

Class	Blended Surveying 1 class, after first exam				Blended Transportation 1 class, after first exam				t-statistics	df[13]	Significance
Domain	**Average**	**Level**	**Number**	**S.D**	**Average**	**Level**	**Number**	**S.D**			
Attitudes towards blended learning process	3.17	Moderate	41	0.56	3.21	Moderate	90	0.57	0.3745	129	0.7087
Attitudes towards blended learning content	3.52	High	42	0.62	3.44	High	85	0.74	0.6034	125	0.5473
Interests towards blended learning experiment	3.61	High	43	0.79	3.34	Moderate	90	0.95	1.6150	131	0.1087
Achievements, Final grade[14]	68.3	-	46	9.60	72	-	45	11.9	1.6342	89	0.1058

[13] Degrees of freedom.
[14] Didn't follow Likert scale.

Table 18: Attitudes towards online exams for Transportation Systems Engineering 1

Online exams	Average	S.D	Level
Online-based exam is better than paper-based exam.	2.32	1.25	Low

4.2.1.3 Academic Achievement Results Analysis

Surveying 1 students in both classes had the same GPA of about 2.6 but students who studied in the blended learning class got higher final grades, about 10 marks, compared with students who studied in the traditional way. For the blended learning class, the average was 68.3% where for traditional course total average was 58.9%. Both did the same exams (first, second and final) on paper, and none of them used online exams as part of their evaluation. These results agreed with Gynther (2005), were the grades from the exam showed that, the results were better than those of the students in the traditional course.

Transportation Systems Engineering 1 students who all studied this course using blended learning approach, did parts of their first and second exams online in Moodle. The average grade of first exam was 71% where the average grade of second exam was 69%. The online part of the exam accounted for 36% of the total exam grade; in the first exam 148 students were tested and in the second 147 students were tested. The results of their online part of these exams are shown in the Figures 4 and 5. On the other hand, their final grade result was 72%.

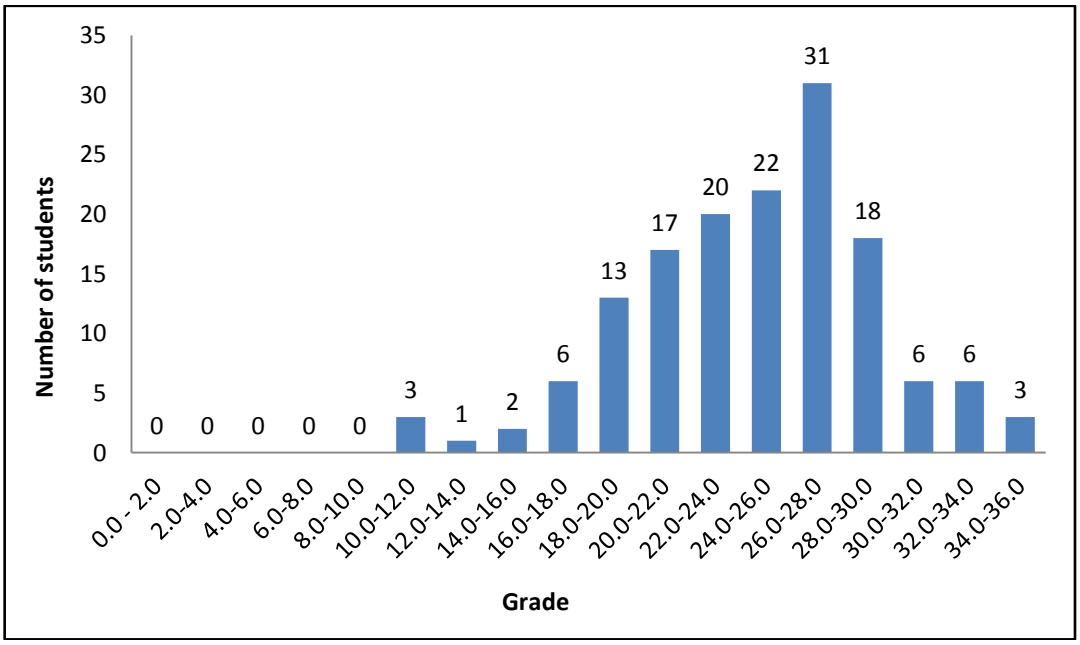

Figure 4: First online exams results of Transportation Systems Engineering 1.

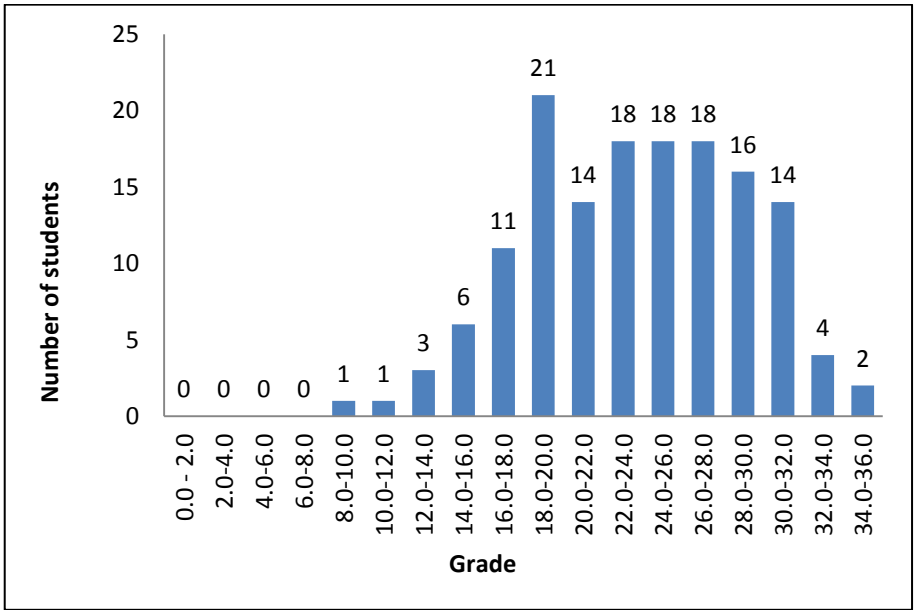

Figure 5: Second online exams results of Transportation Systems Engineering 1.

4.2.2 Inferential Analysis

Testing Hypothesis

To assess the multimedia-based blended learning engineering courses, investigation is made about the relationship between main domains related

to blended learning and key research variables. In order to examine these relations, specific hypotheses are identified and examined for the four studied cases as mentioned before in this chapter.

Hypotheses tested the effects of gender, GPA, study level and secondary school examination variables on students' e-learning skills, preferences and attitudes, and academic achievements domains.

Two statistical tests are used to test the hypotheses, the independent t-test, also called the two sample t-test or student's t-test, which is an inferential statistical test that determines if two sets of data were significantly different from each other, and the one-way analysis of variance (ANOVA) which provides a statistical test of whether or not the averages of several groups are equal, and therefore generalizes the t-test to more than two groups. The ANOVA test tells whether there is an overall difference between the groups, but it doesn't tell which specific groups differ. One way to do this is to use a post-hoc test, for example, the Fisher's Least Significant Difference (LSD) test.

Hypothesis Related to Gender:

H1o: No statistically significant differences at $\alpha = 0.05$ in students e-learning skills can be attributed to students' gender.

H2o: No statistically significant differences at $\alpha = 0.05$ in students preferences towards blended learning approach can be attributed to students' gender.

H3o: No statistically significant differences at $\alpha = 0.05$ in academic achievements of students can be attributed to students' gender.

Hypothesis Related to GPA:

H4o: No statistically significant differences at α = 0.05 in e-learning skills of students can be attributed to Students' GPA.

H5o: No statistically significant differences at α = 0.05 in students preferences towards blended learning approach can be attributed to Students' GPA.

H6o: No statistically significant differences at α = 0.05 in academic achievements of students can be attributed to Students' GPA.

Hypothesis Related to Study Level:

H7o: No statistically significant differences at α = 0.05 in e-learning skills of students can be attributed to students' study level.

H8o: No statistically significant differences at α = 0.05 in students preferences towards blended learning approach can be attributed to students' study level.

H9o: No statistically significant differences at α = 0.05 in academic achievements of students can be attributed to students' study level.

Hypothesis Related to School Secondary Examination:

H10o: No statistically significant differences at α = 0.05 in e-learning skills of students can be attributed to students' secondary school examination.

H11o: No statistically significant differences at α = 0.05 in students preferences towards blended learning approach can be attributed to students' secondary school examination.

H12o: No statistically significant differences at α = 0.05 in academic achievements of students can be attributed to students' secondary school examination.

1. Hypothesis Related to gender

Independent samples t-test is made to test the hypothesis related to gender for all considered. These hypotheses were H1o, H2o and H3o. Table (19) presents the averages of the students' genders, while Table (20) presents the significance resulted from t-test.

From the Table (20) it is noticed that there are no significant differences at α = 0.05 for students e-learning skills, preferences and academic achievements directions according to gender for all cases except those in Blended Surveying 1 class, after **second** exam. So, H2o: No statistically significant differences at α = 0.05 in students preferences towards blended learning approach can be attributed to students' gender is rejected. The difference related to males as they have the higher average as shown in Table (19).

On the other hand, hypotheses H1o (No statistically significant differences at α = 0.05 in students e-learning skills can be attributed to students' gender) can't be reject for all cases, H2o (No statistically significant differences at α = 0.05 in students preferences towards blended learning approach can be attributed to students' gender) can't be reject for all cases except those in Blended Surveying 1 class, after second exam , H3o (No statistically significant differences at α = 0.05 in academic

achievements of students can be attributed to students' gender) can't be reject for all cases.

Results related to academic achievements agree with of Algadiri (2006), who found that there was no statistically significant difference between female students and male students with respect programming achievement. However, such results didn't agree with the results of Al- bashaireh (2011) study, which showed that there are significant differences at ($0.05 \leq \alpha$) in the achievement of student's studying science attributed to the students' gender, in favor of females' students. Also the study of Coldwell et al. (2008) found that a relationship did exist between gender and academic achievement with women outperforming men. This difference is statistically significant and confirms that female students did indeed perform better than their male counterparts in the online course.

Table 19: Averages of the student gender according to t-test for the four cases.

Domain	Gender	Traditional Surveying 1 class, after first exam	Blended Surveying 1 class, after first exam	Blended Surveying 1 class, after second exam	Blended Transportation 1 class, after first exam
e-learning skills	**Male**	1.550	1.516	1.516	1.424
	Female	1.580	1.458	1.346	1.120
Preferences	**Male**	3.035	3.521	3.510	3.321
	Female	2.970	3.303	3.174	3.267
Academic Achievement	**Male**	2.285	2.800	2.896	2.593
	Female	2.720	3.307	3.307	2.600

Table 20: Significance of the domains according to gender.

Significance level				
Class / **Domains**	**Traditional Surveying 1 class, after first exam**	**Blended Surveying 1 class, after first exam**	**Blended Surveying 1 class, after second exam**	**Blended Transportation 1 class, after first exam**
e-learning skills	0.821	0.713	0.250	0.137
Preferences	0.730	0.185	**0.04**	0.741
Academic Achievement	0.198	0.188	0.302	0.980

2. Hypothesis Related to GPA

One way ANOVA test was made to test the hypotheses H4o, H5o and H6o which is related to GPA for all considered cases.

Table (21) presents the significance levels. It could be noticed that significance level is 0.018 for traditional Surveying 1 class, tested after first exam which is less than 0.05 for academic achievement domain, thus the null hypothesis H6o (No statistically significant differences at $\alpha = 0.05$ in academic achievements of students can be attributed to Students' GPA) rejected. Post hoc test was used to determine the source of differences as stated in Table (22). It is clearly indicated that there is a significant difference between GPA and academic achievements of students who have the GPAs in the (3-3.5) category. This is considered normal as the higher GPA students achieved the higher marks in their exams, including that for the case considered. This result agreed with by Ramist (1984) and Willingham and Breland (1982), who concluded that GPA is one of the best predictors of college grades.

Also it noticed that significance level is 0.04 for blended Transportation Systems Engineering 1 class first exam for e-learning skills, thus the null hypothesis H4o (No statistically significant differences at $\alpha = 0.05$ in e-learning skills of students can be attributed to Students' GPA) rejected. It is clearly indicated that there is a significant difference between GPA and e-learning skills of students who have the GPAs in the (2-2.5) category as clarified in Table (23).

On the other hand, H4o and H6o hypotheses are can't be rejected for other cases. In addition, H5o (No statistically significant differences at $\alpha = 0.05$ in students preferences towards blended learning approach can be attributed to Students' GPA) can't be rejected for the four cases as there no significant difference.

Table 21: Significance levels of the domains according to GPA.

Significance level				
Class / **Domains**	**Traditional Surveying 1 class first exam**	**Blended Surveying 1 class first exam**	**Blended Surveying 1 class second exam**	**Blended Transportation 1 class first exam**
e-learning skills	.121	.790	.971	**.040**
Preferences	.619	.525	.596	.822
Academic Achievement	**.018**	.597	.351	.186

Table 22: Post Hoc Tests (LSD), Multiple Comparisons for Academic Achievement domain related to traditional Surveying 1 class assessed after first exam according to their GPA.

Multiple Comparisons							
LSD Traditional Surveying 1 class first exam							
Dependent Variable	**(I)GPA**	**(J)GPA**	**Average Difference (I-J)**	**Std. Error**	**Significance level**	**95% Confidence Interval**	
						Lower Bound	**Upper Bound**
Academic Achievement	2-2.5	2.5-3	.32308	.38716	.409	-.4583-	1.1044
		3-3.5	-1.02137-*	.40240	.015	-1.8334-	-.2093-
	2.5-3	2-2.5	-.32308-	.38716	.409	-1.1044-	.4583
		3-3.5	-1.34444-*	.47806	.007	-2.3092-	-.3797-
	3-3.5	2-2.5	1.02137*	.40240	.015	.2093	1.8334
		2.5-3	1.34444*	.47806	.007	.3797	2.3092

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

Table 23: Post Hoc Tests (LSD), Multiple Comparisons for e-learning skills domain related to blended Transportation Systems Engineering 1 class assessed after first exam according to their GPA.

Multiple Comparisons							
LSD Blended Transportation 1 class first exam							
Dependent Variable	**(I) GPA**	**(J) GPA**	**Mean Difference (I-J)**	**Std. Error**	**Sig.**	**95% Confidence Interval**	
						Lower Bound	**Upper Bound**
e- learning skills	**2-2.5**	2.5-3	.27706*	.10833	.012	.0617	.4924
		3-3.5	.21429*	.10740	.049	.0008	.4278
		> 3.5	.37302*	.14511	.012	.0846	.6614
	2.5-3	**2-2.5**	-.27706-*	.10833	.012	-.4924-	-.0617-
		3-3.5	-.06277-	.08241	.448	-.2266-	.1010
		> 3.5	.09596	.12772	.454	-.1579-	.3498
	3-3.5	**2-2.5**	-.21429-*	.10740	.049	-.4278-	-.0008-
		2.5-3	.06277	.08241	.448	-.1010-	.2266
		> 3.5	.15873	.12694	.214	-.0936-	.4110
	> 3.5	**2-2.5**	-.37302-*	.14511	.012	-.6614-	-.0846-
		2.5-3	-.09596-	.12772	.454	-.3498-	.1579
		3-3.5	-.15873-	.12694	.214	-.4110-	.0936
*The mean difference is significant at the 0.05 level.							

3. Hypothesis Related to Study Level

One way ANOVA test is made to test the hypotheses H7o, H8o and H9o which are related to study level for all the considered cases.

Table (24) presents the significance level. It could be noticed that significance is .034 for Blended Transportation Systems Engineering 1 class assessed after first exam which is less than 0.05, thus the null hypothesis H7o (No statistically significant differences at $\alpha = 0.05$ in e-learning skills of students can be attributed to students' study level) is rejected. Transportation Systems Engineering 1 class distributes in two groups of study level only, third and fourth level, post hoc test cant' be performed so the higher average of the two groups which is the fourth year is the level make the significant, as shown in Table (25). This is considered normal as the higher level has the higher e-learning skills. H7o can't be rejected for the other three cases, while H8o (No statistically significant differences at $\alpha = 0.05$ in students preferences towards blended learning approach can be attributed to students' study level) and H9o (No statistically significant differences at $\alpha = 0.05$ in academic achievements of students can be attributed to students' study level) can't be rejected for all cases even traditional or blended learning one.

Table 24: Significance levels of the domains according to study level.

Significance level				
Class / **Domains**	**Traditional Surveying 1 class first exam**	**Blended Surveying 1 class first exam**	**Blended Surveying 1 class second exam**	**Blended Transportation 1 class first exam**
e-learning skills	.613	.735	.986	**.034**
Preferences	.815	.722	.636	.934
Academic Achievement	.260	.864	.410	.862

Table 25: Descriptive of el-learning skills according to blended Transportation Systems Engineering 1 class assessed after first exam.

Level	Number	Average	S.D
Third	85	1.1882	.32711
Fourth	6	1.5000	.54772

4. Hypothesis Related to School Secondary Examination

One way ANOVA test was made to test the hypotheses H10o, H11o and H12o. Table (26) presents the significance level. It could be noticed that there are no significant differences for all cases the three hypothesis, H10o (No statistically significant differences at $\alpha = 0.05$ in e-learning skills of students can be attributed to students' secondary school examination), H11o (No statistically significant differences at $\alpha = 0.05$ in students preferences towards blended learning approach can be attributed to students' secondary school examination) of students can be attributed to students' secondary school examination) and H12o (No statistically significant differences at $\alpha = 0.05$ in academic achievements of students

can be attributed to students' secondary school examination) as $\alpha > 0.05$.The three hypotheses can't be rejected for all the considered cases.

Table 26: Significance of the domains according to school secondary examination.

Significance level				
Class / **Domains**	**Traditional Surveying 1 class first exam**	**Blended Surveying 1 class first exam**	**Blended Surveying 1 class second exam**	**Blended Transportation 1 class first exam**
e-learning skills	.754	.723	.152	.629
Preferences	.347	.971	.762	.971
Academic Achievement	.432	.957	.883	.434

Chapter Five

Conclusions and Recommendations

Chapter Five

Conclusion and Recommendations

5.1 Summary

This research presents the case study of the development and assessment of blended learning in engineering education at An-Najah National University.

After reviewing recent literature on blended learning, and therefore identifying factors that make differences in blended learning education, two courses offered by the Department of Civil Engineering and taught at different levels were selected as the study case; Surveying 1 and Transportation Systems Engineering 1. The Transportation course was developed as a multimedia-based course considering Moodle platform taught utilizing blended learning approach, which was then assessed, while Surveying 1 was already developed and taught in two different ways, blended and traditional methods, and later assessed. This research classified the study into four cases, Surveying 1class taught using the traditional approach and assessed after the first exam, Surveying 1class taught using the blended learning approach and assessed after the first exam, Surveying 1class taught using the blended learning approach and assessed after the second exam, and Transportation Systems Engineering 1 class taught using the blended learning approach and assessed after the first exam.

Questionnaires were designed and distributed to students of the two courses. The results were analyzes utilizing SPSS.

The research examined the relations in four domains/areas which were: students' preferences and attitudes towards process, content and interest towards blended learning, as well as their academic achievement. Three comparative assessments were conducted in order to examine these domains effects in blended learning experiments as follows:

1. A comparative assessment of how blended learning contributed to the academic achievement and preferences of the students, compared with those taught using traditional methods.
2. A comparative assessment of students' preferences, as well as academic achievement for students being taught utilizing blended learning approach at different levels.
3. A comparative assessment of the preferences, and academic achievement with time for the same group of students taking the same course being taught utilizing the blended learning approach.

In addition, specific hypotheses were identified and examined for the four studied cases. Hypotheses tested the effects of gender, GPA, study level and secondary school examination variables on students' e-learning skills, preferences and attitudes, and academic achievements domains.

5.2 Conclusions

The outcome of the analysis reveals that there is a positive impact on students' academic achievement and their preferences in the course

taught utilizing blended learning over that taught utilizing the traditional method.

The results reveal that the students' academic achievement, as well as, their preferences, differ significantly for students taught the same course between those utilizing traditional and blended learning approaches. The study indicates that the overall averages for students' preferences for all blended learning domains; content, process and interests ranged between moderate and high for two studied cases, comparing between students taught the same course utilizing blended learning approach with time, and comparing between students taught utilizing blended learning different course at different student level. There are no significance differences of students' preferences for these two cases and, as well as, students' academic achievement.

On the other hand, some significant differences are founded at this research. There is significance difference between students' academic achievement and their GPA for traditional Surveying 1 class assessed after first exam. In addition, there is significance difference between students' e-learning skills and their GPA also for blended Transportation Systems Engineering 1 class assessed after first exam. On the other hand, there is significant difference between students' preferences and their gender for blended surveying 1 class, assessed after second exam. Moreover, there is significant difference between students' e-learning skills and their study level for blended Transportation Systems Engineering 1 class assessed after the first exam.

Moodle can be considered a strong learning management system adopted by the university; it has a lot of advantages as it helps the students in their educational process, allows for better utilization of lecture time, makes students inquire more on various material aspects and makes them more motivated to learn depending on themselves.

Based on the results of this study, it could be concluded that development of engineering education course considering blended learning approach, and utilizing as a development platform, along with good lecturer delivery methods, yield better students attitudes and academic achievements.

5.3 Recommendations

To improve blended learning approach at the university and to enhance students' learning abilities and attractiveness, the followings are recommended:

- Lecturer should enhance the quality of the material content and process uploaded on Moodle, to keep pace with student aspirations and satisfaction.
- Lecturer should encourage and motivate their students, in order to enhance their roles and engagements in blended learning approach, through more participating in online discussion groups, and more utilization of multimedia material, and even in proposing multimedia material to be posted.

- Proper training is recommended to increase student's awareness and unsure participating in activities such as forums which lead to the success of blended Learning approach.
- Extend blended learning approach to other courses in the Engineering and Information Technology faculty and other faculties in the university.
- It is recommended to conduct similar studies with larger groups of participants and more classes should be examined to confirm the previous findings.

Students in the open-ended question asked in the questionnaire suggested to have more effective uses of discussion forums between students themselves and with the instructors.

Students recommended concentrating on the multimedia (especially videos) side of the course over the text, and providing the recorded courses for the lectures. They also proposed to enhance the infrastructure within the university and to re-arrange the computers in the classrooms to enhance learning and to provide a fair vision for everyone. They also proposed to reduce the number of students in each class which can provide better communication and understanding for the course.

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Annex

Questionnaire

جامعة النجاح الوطنية

كلية الدراسات العليا

استبيان حول تجربة التعليم المدمج باستخدام برنامج المودل

عزيزي المتعلم / المتعلمة في مساق هندسة نظم المواصلات (1) ، تحية طيبة وبعد : تقوم الباحثة ولاء غسان الجوهري و تحت اشراف الأستاذ الدكتور سمير أبو عيشة بإعداد رسالة ماجستير بعنوان

Development and Assessment of a Blended Learning Multimedia Based Engineering Course

تهدف هذه الدراسة الى تقييم تجربة التعليم المدمج (الالكتروني والوجاهي) في مساق هندسة نظم المواصلات (1) في كلية الهندسة كحالة دراسية باستخدام برنامج المودل. لذا يرجى التكرم بالمساعدة في جمع البيانات الخاصة بالبحث من خلال اجابتكم على أسئلة الإستبيان أدناه، علماً أنه سيتم معاملة البيانات بسرية تامة ولأغراض البحث العلمي فقط. لتستطيع تقديم المعلومات المرجوة لزم توضيح المقصود ببعض المصطلحات التالية :

- التعليم المدمج : هو التعليم الذي يدمج بين التعليم التقليدي والتعليم الالكتروني.
- التعليم الوجاهي: هو التعليم التقليدي وجهاً لوجه.
- الوسائط المتعددة تتضمن: الصورة والفيديو والأشكال المتحركة.
- المواد المستعملة: يقصد بها الروابط والنصوص والوسائط المتعددة.

شاكرين لكم حسن تجاوبكم .

المحور الأول: المعلومات الشخصية

الجنس : ذكر أنثى

المستوى (السنة الدراسية) : 1 2 3 4 5

معدل الثانوية العامة : (85-80) (90-85) (95-90) (95 □)

المعدل التراكمي : (2.5-2) (3-2.5) (3.5-3) (3.5 □)

- يتم حضور المحاضرات الوجاهية للمساق بنسبة:

(100-90)% (90-80)% (80-70)% (70-60)% (60% >)

- يتم متابعة المواد الالكترونية للمساق الموجودة على المودل بنسبة:

(100-90)% (90-80)% (80-70)% (70-60)% (60% >)

المحور الثاني : معلومات حول استخدام الحاسوب والانترنت

	الفقرة	نعم	لا
1	يتوفر لدي في البيت جهاز حاسوب .		
2	أستطيع استخدام جهاز الحاسوب.		
3	يتوفر لدي في البيت خدمة الانترنت .		
4	أستطيع استخدام خدمة الانترنت.		
5	لدي معرفة سابقة ببرنامج المووديل.		
6	استخدمت المووديل في مساق أو أكثر من قبل.		
7	استخدم المووديل في مساق أو أكثر خلال الفصل الحالي، إضافة الى مساق هندسة نظم المواصلات (1).		
8	تم تدريبي على استخدام برنامج المووديل.		
9	تم تزويدي بمعلومات واضحة ومكتوبة لاستخدام برنامج المووديل.		
10	واجهت صعوبة في استخدام برنامج المووديل.		
11	أمضي على الأقل ساعة أسبوعياً لهذا المساق في استخدام برنامج المووديل.		
12	أمضي على الأقل ساعة أسبوعياً في دراسة هذا المساق من الكتاب المقرر.		
13	أقوم بمشاركة دراسة هذا المساق في مجموعات دراسية وجاهية.		
14	أقوم بمشاركة دراسة هذا المساق في مجموعات دراسية باستخدام المووديل.		

	الفقرة	بعد كل محاضرة	عند التحضير لحل الوظائف	عند الامتحان	لا أقوم بذلك
1	أقضي وقتاً مخصصاً لمطالعة المادة المقررة باستخدام **المووديل.**				
2	أقضي وقتاً مخصصاً لمطالعة المادة المقررة باستخدام **الكتاب المقرر.**				
3	أراجع مدرس المساق في الساعات المكتبية.				

- اذا كان الجواب لا يتم مراجعة المدرس، ما السبب :

المحور الثالث:الاتجاهات (الرغبات ، الدافعية، المخرجات)

	الفقرة	موافق جداً	موافق	محايد/ لا رأي	غير موافق	غير موافق بشدة
1	أجد أن طريقة العرض بالوسائل التقليدية جنبا الى جنب مع العرض باستخدام الوسائط المتعددة ملائم.					
2	أعتقد أن التصفح المباشر للمادة المقررة باستخدام المودل من قبل الطالب دون شرح المدرس لها ملائم.					
3	أفضل عرض المادة بالوسائط المتعددة على الوسيلة التقليدية.					
4	أفضل عرض المادة بالتساوي بين الوسائط المتعددة والوسيلة التقليدية.					
5	أرى أن العلاقة بين النص مقارنة بالوسائط المتعددة متساوية.					
6	أرى أن للوسائط المتعددة باستخدام المودل دور في الرغبة في التعلم في هذا المساق.					
7	ساهمت المواد المستعملة (مثال: الفيديو) عن طريق المودل بتحقيق أهداف المساق.					
8	يظهر أن المواد المستعملة شاملة/ واضحة/متسلسلة وفق خطة المنهج.					
9	أتاح لي المودل الاطلاع على مصادر متتعدة استخدمها المدرس في مادته التعليمية .					
10	واجهت مشكلات في فتح محتويات المواد التعليمية.					
11	أشارك في جلسات مناقشة وجاهية بشكل مستمر.					
12	أشارك في جلسات المناقشة الالكترونية المتوفرة على برنامج المودل.					
13	أرى أن الامتحانات الالكترونية أفضل من الامتحانات الورقية.					
14	أرى أن توزيع الامتحانات متوازنة بين الالكترونية والورقية .					
15	أتاح لي المودل القيام بالواجبات بشكل أكثر فائدة وتعليمية.					
16	أعتقد أن عرض المساق باستخدام الوسائط المتعددة يجعل هناك مجالا أفضل لاستغلال وقت المحاضرة.					
17	أعتقد أن عرض المساق باستخدام الوسائط المتعددة يجعل هنالك مجالا أفضل للاستفسار					

	عن جوانب المادة المختلفة.					
18	أعتقد أن عرض المساق باستخدام الوسائط المتعددة يجعل هناك مجالا أفضل من للتأمل بشكل منفرد في جوانب المادة المختلفة.					
19	أوصي بتعميم التجربة على مساقات أخرى في كلية الهندسة.					
20	لو أتيح الخيار لي مرة أخرى، لاخترت تعلم هذا المساق عن طريق التعليم المدمج.					
21	لو أتيح الخيار في مساق هندسة نظم المواصلات (2)، لاخترت تعلم هذا المساق عن طريق التعليم المدمج .					

- رتب تفضيلك لطرق عرض المادة :

☐ الوسيلة التقليدية

☐ الوسائط المتعددة

☐ الاثنين معا جنبا الي جنب

- رتب تفضيلك لنمط الوسائط المتعددة الذي تعتقد أنه أكثر تأثيرا وفائدة :

☐ النص

☐ الصورالثابتة

☐ الصور المتحركة

☐ الفيديو

☐ كلها مجموعة متكاملة

المحور الرابع: التحصيل العلمي

- كان لاستخدام الموودل اثر ايجابي على التحصيل العلمي في الامتحان الثاني :

☐ اوافق بشدة ☐ موافق ☐ محايد ☐ معارض ☐ معارض بشدة

- كانت دراستك الشخصية للمادة الأثر الاكبر على التحصيل العلمي في الامتحان الثاني:

☐ اوافق بشدة ☐ موافق ☐ محايد ☐ معارض ☐ معارض بشدة

- كنت أتوقع نتيجتي في الامتحان الثاني :

☐ (%60 >) ☐ (%70-60) ☐ (%80-70) ☐ (%90-80) ☐ (%90<)

- و كانت النتيجة:

☐ (%60 >) ☐ (%70-60) ☐ (%80-70) ☐ (%90-80) ☐ (%90<)

المحور الخامس: مقترحات

اذا كان لديك أي مقترحات أو اضافات لتطوير وتحسين هذه التجربة يرجى التكرم باضافتها هنا

جامعة النجاح الوطنية
كلية الدراسات العليا

تقييم مساق هندسي مدمج مستند إلى الوسائط المتعددة في جامعة النجاح الوطنية

إعداد
ولاء غسان الجوهري

اشراف
أ.د. سمير عبد الله أبو عيشة

قدمت هذه الاطروحة استكمالا لمتطلبات الحصول على درجة الماجستير في الادارة الهندسية بكلية الدراسات العليا في جامعة النجاح الوطنية في نابلس، فلسطين
2015

تقييم مساق هندسي مدمج مستند إلى الوسائط المتعددة في جامعة النجاح الوطنية

إعداد

ولاء غسان الجوهري

إشراف

أ.د. سمير أبو عيشة

الملخص

تهدف هذه الدراسة إلى قياس أثر التعليم المدمج على التعليم الهندسي مقارنة بالتعليم التقليدي وذلك في كلية الهندسة وتكنولوجيا المعلومات في جامعة النجاح الوطنية. ويتبع هذا البحث منهجية تكاملية مستخدماً المنهج شبه التجريبي. ولقياس هذا الأثر تم اختيار مساقي هندسة نظم المواصلات 1 ومساحة 1 اللذين يقدمهما قسم الهندسة المدنية، حيث تم تحضير مساق هندسة نظم المواصلات 1 باستخدام الموودل كنظام تعليمي مفتوح المصدر كمساق مستند الى الوسائط المتعددة، وتم تدريسه كمساق مدمج، بينما تم تحضير مساق مساحة 1 باستخدام الموودل سابقاً وتم تدريسه بطريقتين؛ طريقة التعليم المدمج وطريقة التعليم التقليدي.

وتم تقييم المساقين وقياس التغيرات والتأثيرات على توجهات الطلاب وتحصيلهم العلمي وفق أربع حالات دراسية وهي: مساق مساحة 1 دُرس باستخدام الطريقة التقليدية وتم قياس الأثر بعد الإمتحان الأول، ومساق مساحة 1 دُرس باستخدام طريقة التعليم المدمج وتم قياس الأثر بعد الإمتحان الأول، ومساق مساحة 1 دُرس باستخدام طريقة التعليم المدمج وتم قياس الأثر بعد الإمتحان الثاني، ومساق هندسة نظم المواصلات 1 دُرس باستخدام طريقة التعليم المدمج وتم قياس الأثر بعد الإمتحان الأول. وتمت دراسة توجهات وتفضيلات الطلبة بتجاه التعليم المدمج كمضمون ومحتوى ورغبة، بالإضافة إلى تحصيل الطلاب العلمي. ولقد استخدمت أدوات البحث من إستبانات ومقابلات لتقييم التجربة، بينما وظفت الوسائل الاحصائية المتعددة مثل برنامج التحليل الإحصائي SPSS لتحليل هذه الإستبانات. وقد تم وضع فرضيات تقيس أثر جنس المبحوث ومعدله التراكمي ومستوى السنة الدراسية ومعدل الثانوية العامة على ثلاثة متغيرات وهي: المهارات الإلكترونية للطلبة وتوجهاتهم تجاه التعليم المدمج وتحصيلهم العلمي.

وتتلخص نتائج الدراسة بوجود فروق بين طلاب التعليم المدمج وطلاب التعليم التقليدي لصالح التعليم المدمج بالنسبة للتحصيل العلمي والتوجهات لهذه التجربة. كما وجد فروق إحصائية ما بين التحصيل العلمي والمهارات الإلكترونية للطلاب ومعدلهم التراكمي. ومن جهة أخرى وجدت فروقات ما بين المهارات الإلكترونية للطلاب والسنة الدراسية لصالح طلاب السنة الرابعة، كما كانت هناك فروقات ما بين توجهات وجنس الطلبة فقد فضل الذكور أكثر من الإناث طريقة التعليم المدمج. ومن جهة أخرى، وجد أن اعتماد الموودل من قبل جامعة النجاح الوطنية كنظام لإدارة التعليم قد عاد بالفائدة الكبيرة على المعلمين والمتعلمين في تسهيل وتطوير العملية التعليمية.

وقد تضمن البحث عدة توصيات أهمها توسيع تطوير مساقات مدمجة في مجالات الهندسة مستندة إلى الوسائط المتعددة، وتدريب المتعلمين حول كيفية الإستفادة من هذه المساقات من خلال التعلم الالكتروني. كما توصي الدراسة أيضاً بتعميم هذه التجربة على كليات الجامعة الأخرى، والقيام بالمزيد من الأبحاث المتعلقة بموضوع التعليم المدمج في جامعة النجاح على عينات دراسية أكبر.