Design and Implementation of Project-Based Flipped Classroom: A Case Study of IT Students

Mobina Beheshti

Submitted to the
Institute of Graduate Studies and Research
in partial fulfillment of the requirements for the degree of

Master of Science
in
Information and Communication Technologies in Education

Eastern Mediterranean University
September 2016
Gazimağusa, North Cyprus

Approval of the Institute of Graduate Studies and Research

Prof. Dr. Mustafa Tümer
Acting Director

I certify that this thesis satisfies the requirements as a thesis for the degree of Master of Science in Information and Communication Technologies in Education.

Assoc. Prof. Dr. Ersun İşçioglu
Chair, Department of Computer and Instructional Technology Teacher Education

We certify that we have read this thesis and that in our opinion it is fully adequate in scope and quality as a thesis for the degree of Master of Science in Information and Communication Technologies in Education.

Assoc. Prof. Dr. Ersun İşçioglu
Supervisor

Examining Committee

1. Assoc. Prof. Dr. Ersun İşçioglu

2. Asst. Prof. Dr. Fahme Dabaj

3. Dr. Fatma Tansu Hocanin

ABSTRACT

The general consensus is that higher education organizations should support learners to be prepared for future learning in their educational life as well as their lives beyond the university. The project-based flipped classroom provides learners with a learner-centered approach and self-directed education using the online educational materials. Furthermore, it enhances the engagement and interaction of students with their peers and teachers. The main objective of this research is to investigate the students' perceptions toward a novel learning method, named as project-based flipped classroom. The study designed and implemented a project-based flipped classroom for IT students at Eastern Mediterranean University. Moreover, the study is designed based on the triangulate research method. Total 30 under-graduate students participated in this study. Data were accumulated with close-ended questions and open-ended questions during this study. The collected data were analyzed with the descriptive analysis method. Negative and positive opinions of the students on project-based flipped classroom were assessed. The student's achievement of this instructional method was found to be high. They expressed that educational environment is a rich environment where they were positively affected by their computer-based communication, working in a group, managing time and tasks in order to achieve their success.

Keywords: Learning management system (LMS), project-based learning, flipped classroom, project-based flipped classroom

ÖZ

Yüksek eğitim organizasyonlarının; öğrencilerin hem gelecekteki eğitimine, hem de üniversitenin ötesinde, gelecekte onları bekleyen yaşam şartlarına hazır olmaları için olanak sağlama gerekliliği konusunda genel bir fikir birliği mevcuttur. Proje tabanlı dönüştürülmüş sınıf modeli, öğrencilere öğrenci tabanlı yaklaşım ve kendi kendilerini yönetebilecekleri bir eğitim olanağı sağlamaktadır. Buna ilaveten, öğrencilerin arkadaşları ve öğretmenleri ile olan iletişimini ve bağını güçlendirmelerine de olanak sunmaktadır. Bu araştırmanın esas amacı, öğrencilerin 'proje tabanlı dönüştürülmüş sınıf modeli' ismindeki öğrenme yöntemi ile ilgili görüşünü incelemektir. Bu çalışma, Doğu Akdeniz Üniversitesi'nde okumakta olan Bilgi Teknolojisi öğrencileri için proje tabanlı dönüştürülmüş sınıf modeli tasarlamış ve bu model, üçgenli araştırma yöntemine dayanarak oluşturulmuştur. Bu araştırmaya, toplam 30 tane lisans öğrencisi katılmıştır. Veriler, açık ve kapalı uçlu sorular aracılığı ile toplanmıştır. Elde edilen veriler, niteleyici analiz yöntemi ile analiz edilmiştir. Öğrencilerin, proje tabanlı dönüştürülmüş sınıf modeli ile ilgili olumlu ve olumsuz fikirleri değerlendirilmiş ve bu öğretim yöntemindeki başarı yüksek bulunmuştur. Öğrenciler, eğitim ortamının bilgisayar tabanlı iletişimden olumlu bir şekilde etkilenebildikleri, grup olarak çalışabildikleri ve aynı zamanda vakit ve görev taksimatını başarılı bir şekilde yerine getirebildikleri zengin bir ortam olduğunu belirtmişlerdir.

Anahtar Kelimeler: Öğrenim İdare Sistemi (ÖİS), proje tabanlı öğrenme, dönüştürülmüş sınıf, proje tabanlı dönüştürülmüş sınıf modeli

DEDICATION

To My Family

ACKNOWLEDGEMENT

I am very thankful to all the people who have helped along the way and contributed to the progress of my study. In particular, I would like to show my gratitude to my supervisor, Assoc. Prof. Dr. Ersun İşçioglu for his continuing guidance, understanding, encouragements, and patience. I would like to thank to my dear friends Maryam, Danial and Huriye for their support and contributions. Thank you for believing in my research and supporting me. My thanks also go to my jury members, Asst. Prof. Dr. Fahme Dabaj and Dr.Fatma Tansu Hocanin. Finally, my deepest thanks go to my beloved parents for their unconditional support and love through my study and life.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

PBL	Project-Based Learning
FC	Flipped Classroom
LMS	Learning Management Systems
PBFC	Project-Based Flipped Classroom

Chapter 1

INTRODUCTION

The history of learning theory can be traced back to ancient Greece, where the modern history of learning psychology dates back to the end of the 19th and the beginning of the 20th century. Learning primary interest was purely based on behavior which developed the psychology of learning as 'behaviorism' (Gropper, 1987).

The aim of instruction for behaviorism is to extract the desired knowledge from learners who are shown by a target motivation, provide a situation for learners to prompt along with their goal stimuli concurrently, and then provide a learning environment for learners in order to give desired response, to practice on their motivation and goal and to obtain strengthen in their responses (Gropper, 1987).

The principle of behaviorism cannot describe the high level skills or those levels that require profound process sufficiently (Schunk, 1991). Therefore, at the end of 1950s, theory of learning initiated to get away from the behavior models. This was the way of utilization to a method which is based on learning theories from the sciences of cognition. The shift from the orientation of behavior to cognitive orientation has made a similar shift from operating the materials to be shown by an educational system procedure to leading learner processing and interaction with the educational design system procedure (Merrill, Kowalis, & Wilson, 1981).

The theory of cognitive learning focuses on the perception of students' learning processes and considers the problems of how information is obtained, structured, stored, and extracted by the mind. Hence, learning is concerned with *what* learners know and *how* they learn it rather than *do* (Jonassen, 1991).

Although the goal of both theories defined above is to interact and deliver knowledge in the most effective and efficient manner (Bedner et al., 1991), the theories of behaviorism indicate that educators have to provide an educational environment, hence, learners responds correctly to the obtainable goal.

On the other hand, cognitive theories stress on creating meaningful information and guiding learners, structuring and relating new data to existing information in memory. The instruction must depend on learners' existing mental schema, and be more efficient (West, Farmer, & Wolff, 1991). The assumption of these two learning theories' philosophies is principally objectivistic; which is: the universe is actual and external to the learners.

The aim of education is to design the structure of the learners' world (Jonassen, 1991). There are some questions that have been raised by current cognitive theories, and its basic objectivistic hypothesis and so more constructivist methods are starting to be accepted, understood and learned: knowledge "is an action of how the individual makes the definition from their experience" (p. 10).

Constructivism is not an entirely new method of learning. It contains many roots in the psychological and philosophical perspectives (Perkins, 1991). However, in recent years, constructivism has become a "hot" topic as it has initiated to obtain more

attention in many disciplines, comprising instructional design. The theory of constructivism is equated learning by making meaning from experience (Bednar et al, 1991).

Although constructivism is defined to be a branch of cognitivism (both imagine of learning as a mental functionality), it identifies itself from theory of traditional cognitive in some methods. Constructivists point out that behavior is determined situationally (Jonassen, 1991b). This learning theory does not share with cognitivists and behaviorist the thought that knowledge is independent in mind and can be designed for learners. Furthermore, the constructivist' perspective does not admit the hypothecation that form of learning can be recognized by the context and content of learning independently (Bendar et al., 1991).

Jonassen (1991b) has stated three stages of knowledge-learning (introductory, advanced, and expert) and he argues that the environment of constructive learning is very effective for the phase of advanced learning where misunderstandings can be obtained through the initial stage, discussed, and if needed removed or modified.

Constructivism method is divided into a few groups, such as radical constructivism, critical constructivism, social constructivism and etc. Radical constructivism is relies on the assumption which is in the head of a person, the topic does not have any alternatives; it is the basis of the person's experience. Critical constructivism adds a dimension of critical assessment and educational improvement to the instructional process. This method contains the utilization of communicative behavior that explains the circumstances of creating dialog by focusing on the mutual understanding among teachers and learners (Jonassen, 1991a).

On the other hand, the social constructivism is the important dimension of constructivism domain. The social constructivism would be considered as a "strong" form of constructivism, emphasizing all four of the epistemological tenets. However, social constructivists generally downplay the mental construction of knowledge not because social constructivists do not believe in mental construction, but because it is seen as relatively trivial and emphasizes on the co-construction of meaning within a social activity. In this sense, social constructivism is more concerned with meaning than structure (Pitchard, 2009a).

The majority of learning is not taking place in school; any social communication with any person will lead to learning. Hence, interaction and discussion between groups, teachers, pupils or pairs is crucial for the effective development and improvement of learning. Moreover, educators provide learners with feedback in order to correct the errors, and also students give feedback to their instructors by specifying their classifications and misconceptions (Pitchard, 2009b).

The main issues can be defined with these key words "constructivism," "learner-centered," and "problem-based." The learner centered approach is dependent on the user-centered, one which focus on designing a modern interface, and it is mostly conducted by problem-based method, where the issues are close and related to the learners' interest and needs. The problem-based method is the most effective approach in learners' motivation, interaction and discussing their problems provides them with a solid conceptual understanding (Jonassen, 1991a).

In the setting of traditional teaching, learners are forced to passively sit when educators deliver courses. Therefore, many teachers will become dissatisfied with this method.

In the traditional classroom, the interaction is much different than the interaction in distance education or e-learning lectures. This difference is due to the educational tools which are used in those courses. The component which is utilized as an educational medium in a traditional classroom is important as in the web-based or online lectures (Allen et al, 2004).

Recently, several studies are carried out based on Project Based Learning (PBL) which enables students to learn around the project. The PBL is a systematic teaching method that engages students in a collaborative and sustained real world examination. This method comprises authentic questions and complex tasks which are organized as driving questions, so students need to participate in diverse tasks in order to address these questions (Moursund, 1999).

Furthermore, according to the PBL handbook definitions, for instructors, projects are complicated steps, designed according to the challenging queries, which provide learners with problem solving, design, decision making, or activities of investigation. Students will be given the chance to work individually over a specified time and finish it as a real product (Jones, Rasmussen, & Moffitt, 1997; Thomas, Mergendoller, & Michaelson, 1999).

Ljung and Blackwell (1996) defined the PBL OMEGA. The study is carried out for at-risk teens that incorporate both traditional face-to-face learning with PBL learning. The result shows a positive impact of using this method. All the learners had passed their mathematics, US history and English courses. However, the researchers fail to cater adequate information in order to give permission for assessing the definition or implication of the results.

In addition, Shepherd (1998) presented that PBL learning can also have a positive result on learners' achievement of critical thinking skills. He described a project about 6 countries' housing shortage, so learners were responsible to solve it within a 9-weeks period of time. Even though, this study has applied to a small group of learners (20 and 15 students in a control group and experimental group, respectively), he found a considerable rise on the critical thinking skills of the experimental group compared to the control group. Moreover, the confidence and learning of the experimental students were increased, according to the outcome of the 9-weeks project.

There are different descriptions toward lack of universally admired method or theory of PBL instruction which has led to a big diversity of PBD study and activity developments. This diversity shows some difficulties. For example, Tretten and Zachariou (1997) indicated in their research report about PBL in different classrooms, that the diverse practices under the label of PBL study makes it hard to evaluate what is not PBL, what is PBL, and what you are assessing is related with a "real project".

Although, the teachers may understand and act as a provider in PBL learning classroom, success cannot be obtained at the end. Moreover, in the course, learners have control of their own studying and activities in the class. This method of teaching contributes to the students' self-esteem that gives them responsibility to assess their own ideas. This responsibility makes a challenge about PBL learning in the loss of their self-motivation, deadlines and individual study. Furthermore, conducting these individual projects makes learners spend considerable effort due to lack of interaction (Gülbahar& Tinmaz, 2014).

Today, a distance education is used widely around the world and it is available in many forms which reduce the space and time limits in traditional courses (Verduin & Clark, 1991). Generally, interaction in the distance education is crucial and acknowledged, and its concept has been explored and focused by many research (Billings, Connors, & Skiba, 2001; Boyle & Wambach, 2001; King & Doerfert, 2000; Meyen & Lian, 1997; Moore & Kearsley, 1996; Muirhead, 2001a, 2001b; Sherry, 1996; Tuovinen, 2000; Wagner, 1994).

Despite the fact that e-learning or online learning provides many advantages that has been adopted in education, it also contains some disadvantages (Collins et al. 1997; Scott et al. 1999; Lewis, 2000; Marc, 2002; Almosa, 2002; Dowling et al, 2003; Klein and Ware, 2003; Hameed et al, 2008). The main drawback of e-learning is the entire absence of vital learner interactions, among learners and between educators and learners (Young, 1997; Burdman, 1998).

Hence, educational learning model caters instructors with generating modified e-learning processes based on some instructional goals and on the learners' needs. This approach of instruction is called blended learning. The blended learning approach is a combination of both traditional and e-learning education which mixtures various activities, self-based learning, online learning and face-to-face classroom (Osguthorpe & Graham, 2003). This method provides opportunities for learners to meet their educators in a face-to-face learning area, asking questions, involving in discussion and exchanging information with their instructors (Perez, 2011).

Besides, students need to work on their tasks in a specified period of time for carrying out research, gain information, and solve the project questions (Jones, Rasmussen, &

Moffitt, 1997; Thomas, Mergendoller, & Michaelson, 1999). Currently, instructional approaches in higher education comprise using blended learning methods through which students may receive a traditional face to face education in class along with activities which are required to be completed outside of the class, facilitated through technological resources.

Reflecting this is the rise of the "Flipped Classroom" which is also called inverted classroom (Lage & Platt, 2000). The flipped model is an educational strategy which substitutes the traditional lesson-in-class practice for an assignment model with learning activities assigned to be done out of class. These days, the majority of the students studying in flipped classroom method are those in post-secondary level comprising undergraduate, graduate, and professional levels (Mok, 2014). A report has been received from students that they are in favor of flipped learning environment. It has been observed that graduate students had more positive attitudes regarding peer cooperation in the flipped classroom approach and also they were more confident as they were more likely to take possession of their learning (Strayer, 2012).

In addition, Lage, Platt, and Tregalia (2000), who were the first people to apply the flipped approach, argued that students in the economics lecture believe that they learned better by using this method than traditional lecture approach. They liked the hands-on method and also the group work, interactions with their group members and other students, hence found it more convenient to ask their questions in the flipped class.

Furthermore, Kaner and Fiedler (2005) implemented flipped method in a course of software testing. The course materials provided in an online form and the class time

designed for other activities such as presentation, problem solving and group discussion.

In other research, Day and Foley (2006) applied flipped classroom method in human and computer interaction course which was divided in two parts comparing traditional teaching and flipped classroom teaching approach. They implemented small scale in a quasi-experimental scheme. As a result, students in the flipped classroom approach section studied and learned better than the traditional method section.

Moreover, the flipped classroom method was also applied by Benthany (2012) at the faculty of Biology and Science, Genetic Diseases students. He found out that the students' attitudes toward using this teaching method were quite positive. The students had been motivated to come to the class during lecture time.

There is a variety of models for implementation of the flipped classroom approach (Tucker, 2012). The research review shows that nowadays, this method of teaching is in a stage of motivation and students thought that doing is more significant rather than knowing, so learning is a process of trial and error (Frand, 2000). In addition, researchers have found that the class strategies which are associated with flipped classroom may better provide learners when teachers are available to lead the process and also help the students while they are involved in the learning activities.

Apart from the studies above, another study was carried out and applied the flipped classroom model in the Information Systems department at Cyprus International University, in N. Cyprus.

This research was aimed at facilitating engagement among learners, and also provides an interactive learning environment for the first year students along with their teachers. The result shows that the flipped classroom method had a significant impact on student engagement, interaction and also individual learning by using various online materials (Nat, 2015).

Although, there are many researches, as mentioned, some in the literature above, which have designed and implemented both projects-based learning and flipped classroom instructional methods separately in various learning environments, there is no specific research, which designed and implemented both methods at the same time as a Project-Based Flipped Classroom (PBFC) learning approach, particularly in Cyprus, hence, this research is aimed at catering an alternative learning environment as Project-Based Flipped Classroom at Eastern Mediterranean University in N. Cyprus, in order to find the learners' problems wit6h this approach and examine the learners' perceptions.

1.1. Purpose of the study

The proposed study is set to design and implement a Project-Based Flipped Classroom (PBFC) learning environment, in order to assess the students' perceptions about project-based flipped classroom as well as LMS (Moodle) learning system, which is the vehicle of the course.

1.2. Research questions

In order to reach the goals above, this study seeks to answer the questions listed below:

1. How to design and implement a project based flipped classroom?
2. What are the students' perceptions towards learning in the use of project based flipped classroom?

i. What are the students' perceptions about the cons of using project-based flipped classroom?

ii. What are the students' perceptions about the pros of using project based flipped classroom?

iii. What are the gender differences on students' perceptions about project-based flipped classroom?

3. What are the students' opinions towards using the Moodle learning system?

i. What are the problems of using Moodle learning system from the students' point of view?

ii. What are the students' opinions towards using the Moodle learning system, depending on the gender?

4. From the students' point of view, how do the learning experiences differ in the traditional classroom compared to the flipped classroom settings?

1.3. The Significance of the study

This study, an alternative learning environment, planned to design and implement the Project Based Flipped Classroom (PBFC) teaching method, in order to assess the students' perceptions about project-based flipped classroom as well as LMS (Moodle) learning system, which is the vehicle of the course.

In addition, this research considers the students' perception about this newly developed method of teaching in order to make progress to the students' learning skills by providing features such as having collaboration in a group, having more freedom to study, and also receiving help from their peers, teacher or assistant, inside and outside of the class.

1.4. Limitations

The limitations of this study are as follows:

- Registered students in the Cryptography and Network Security class undergraduate program in the department of IT (Information Technology) at Eastern Mediterranean University, N.Cyprus.
- This study is implemented and applied for one semester (Fall) from 2015 to 2016.

1.5. Definitions of Key Terms

- **Project Based Learning:** It is a systematic teaching method that students learn around the project. They obtain information and skills by studying over a specified period of time, in order to examine problems, making decisions and then answering a complex problem with their peers or individually (Jones, Rasmussen, & Moffitt, 1997).
- **Flipped Classroom:** The flipped model is an instructional environment where the traditional activities like studying the course materials which were done in the class will be done outside of the class, and the class activities traditionally finalized outside of class like assignment, solving problems, or homework will be solved in the class with their peers and the teacher (Bergman and Sams, 2007).

Chapter 2

LITERATURE REVIEW

2.1. History of learning

The American philosopher and physician William James, who has been at the very initial stage of mental process study, pointed out that psychology was the ‘science of mental life’ where the research of the human behavior, human mind and particularly the learning research began to grow.

Learning is about something in which we have all participated and of which we all have understanding. The participation comprises a wide range of settings, both informal and formal, from the relative limits of classroom to wide open spaces of the corner-side or the countryside where an opportunity to talk directly to deeper perceive of some subjects.

Furthermore, learning is not exclusive to the area of an instructional system. It begins long before school, carries on after school and quickly happens in parallel along with school, in various settings and methods. Moreover, the proceeds of learning have been explained and described in various methods by many researchers over many years.

Learning primary interest was purely based on behavior which developed the psychology of learning as ‘behaviorism’. The behaviorism quickly developed through the 20th century. Shuell (Schunk, 1991) stated that “learning includes an enduring

alternation in behavior or in a way to behave in a given fashion that delivers results by some forms of experience or practice" (p. 2). Hence, behaviorism links learning with changes in the method or rate of observable performance and is accomplished by a proper result in a specific environment.

2.2. Behaviorism, Cognitivism and Constructivism

The principle of behaviorism cannot describe the high level skills or those levels that require profound process sufficiently (Schunk, 1991). Therefore, at the end of 1950s, theory of learning initiated to get away from the behavior models. This was a way of utilization of a method which is based on learning theories from the sciences of cognition. Educators and psychologist started to emphasize clearly again on observable behavior and stressed instead more complicated processes in cognition such as thinking, solving problems, language, formation of concern, and processing of information (Snelbecker, 1983).

The cognitivism like behaviorism, gives stress to the role that environmental conditions play in learning facilities. Due to the emphasis on the structures of mentality, theories of cognitive learning are typically more appropriate for describing complicated learning forms than those perspectives of behavior (Schunk, 1991).

The majority of psychologists think of the mind as a tool of reference to the real universe. The constructivists believe that the mind sieves information from the universe to generate reality (Jonassen, 1991). Factors of both environment and learner are very important to constructivist, because it is the particular communication between two variables which make knowledge.

As one moves along the behaviorist, cognitivist, and constructivist sequence, the concentration of education moves from educating to learning, from the transfer of facts passively and procedures of the active application issues.

The perspectives of both cognitivist and constructivist is the learner being involved actively in the process of learning and still the constructivist looks at the learner as more than an active information processor; the learner overcomes the complicated details and interprets the given information (Duffy & Jonassen, 1991). From the learners' perspectives this means that: the aims of learning are not pre-defined nor is instruction pre-structured.

Obviously, the constructivism's focus is on making cognitive tools that reflect the perception of the culture and are used as well as the experiences and intuition of individuals. There is no need for fixing the acquisition, abstract or detail, the main factor to get successful, meaningful, and learning is comprised within three important factors: activity (exercise), concept (information), and culture (context) (Brown et al., 1989).

The designer of constructivism dedicates methods of instruction that will help learners in actively discovering complicated areas/subjects and transfer them into thinking as a skilled user of that domain. Hence, the instructions' aspect is left to the textbook, lecture and training and practice in the form of traditional education (Norman & Spohrer, 1996).

The social communication in any place with any person will lead to learning, so learning is not taking place only in school. An effective learning comprises of

interaction and discussion between groups, teachers, pupils or peers, in order to develop and improve the learning (Pritchard, p. 46, 2009). This interaction between learning and teaching requires the teacher to design an educational environment, and learners to study the content and obtain knowledge. Learners are able to ask an inquiry, share their ideas or be disagreeing with an opinion toward discussion, conversation, discourse, and debate which are the main activities in learning.

As a result, learners will be catered with feedback from their instructors in order to solve the misconceptions. Hence, the issues can be defined in some terms as "problem-based", "learner-centered" and "constructivism".

2.3. Project-Based Learning

One of the most important methods of teaching is project-based approach. This method provides students with interaction, motivation and a solid understanding towards their problems. However, each problem requires significant time to allow learners to study and discover the important components. Hence this method is known as the weakest approach in solving a huge range of problems and in making the ability to utilize the skills automatically and without cognitive effort. Moreover, the educational aspect of this method is left to the textbook, lecture and training and practice in the form of traditional education (Norman & Spohrer, 1996).

In the setting of traditional teaching, the learner's focus is set on the wrong track of taking notes rather than perceiving the concept and discovering new ideas. Also, most of the learners' activities comprise to the presentation task only while teachers are delivering knowledge in a specified time of the lecture (Mirza, 2012).

2.4. Distance Learning

The advances in technologies have brought novel method of education as distance education. Distance education is the typical form of learning for those people like homeworkers, employees who do not want to go to school. This method of instruction is beneficial for learners, because it makes learning available for them all day, providing them with a great control through their learning schedules. However, the disadvantage of this instructional method was a lack of interaction between learner and instructor.

Consequently, online learning or e-learning as the recently improved version of distance education released to provide access to educational opportunity, connectivity, flexibility and ability to promote varied communications for learners. This novel method not only covers content and educational approaches delivered via internet, intranet, CD-ROM, but also comprises videotape and audio, interactive TV, satellite broadcast is the one maintained by Eliss (Benson et al., 2002; Clark, 2002). Online learning needs adjustments by lecturers as well as learners for effective communications to happen.

The communication in online learning is often replaced interaction in classroom with discussion boards, synchronous chat, electronic bulletin boards, and e-mails. The important elements in the online course design are student-to-instructor and student-to-student interactions (Fulford & Zhang, 1993; Kumari, 2001; Sherry, 1996) because learners enjoy and experience reciprocal interdependence “community sense”, make a “trust sense”, and share aims and standards (Davies & Graff, 2005; Rovai, 2002).

However, one of the pros of e-learning is the lack of interaction among students and teachers and so lack of motivations, and also the e-learning software and tools are not designed properly to pedagogy. Therefore, these tools are left to the learners to be utilized (Govindasamy, 2002). So, researchers generated modified method of e-learning teaching as a blended learning teaching approach. This method is an integration of both traditional and e-learning teaching approach that provide students with activities, individual-based study, face-to-face classroom and online learning. In addition, this instructional method not only incorporates coaching, self-help and training, but also includes more management, admitting that human development is an eternal process which experience is gained while doing the work (Davies, 2003).

2.5. Flipped Classroom

Recent researchers show us that one of the main factors of teaching efficiently is student engagement and this engagement is significant for learning (Barkley, 2010; Coates, 2006). Bryson and Hand (2007) were also supporting this idea that students would like to engage through learning if they are supported by instructors who are creating a learning environment, challenge higher order thinking and demand high results.

Hocking et, al. (2008) suggested that students who are interested to engage deeply ask questions, conjecture, reflect, assess and make connections between ideas, whereas those who are not interested to engage seem to learn by taking a surface approach in copying out notes, concentrating on facts which are fragmented and then jumping to conclusions. Hence, many new instructional methods are starting to be used.

Recent researches on ICT cater teachers and learners with an environment and consist of enhanced learning technologies in order to improve the instructing and educating process. The concepts of the novel educational method like flipped classroom approach is the outcome of the improved technology. There are many studies which present that 'hybrid' and 'blended' terms are interchangeably utilized, while the 'flipped' term is indiscernible than 'inverted' term.

The researcher Margulieux et al. (2014) had analyzed a sample of former descriptions of the terms in the literature, and he noted that hybrid and blended courses systematically define the teaching location and delivery medium respectively, whereas flipped and inverted courses systematically define educational type and location.

The educational design defined as a learner obtains instruction in the class or in a non-traditional format, delivery medium defined as the one who delivers the education to the learners by a person or technology and the education type defined as if the learner obtains the contents or applies the learning content activities (Margulieux et al., 2014). The flipped and inverted terms are broadly admitted as a blended instructional method (Johnson, 2012; Strayer, 2012; Margulieux et al., 2014). Johnson (2012) stated that the flipped classroom approach is a model of blended learning which is flipped and so students have an access to the content outside of the classroom. Afterwards, they use lecture time for discussion, clarifying the conception of the content.

Furthermore, Carpenter and Pease (2012, p. 37) indicated that flipping defines an instructional approach in which students watch the online lectures at home or any place outside of the class, whereas the lecture time is spent on class activities. Hence, the instructors are free from front-of-class teaching and do more work with every student

either individually or in groups. In addition, Graham (2006) defines the past, present and future procedures of traditional teaching, and blended teaching approach in Figure1. The author indicates that in the past, the considered teaching environment was divided as both using diverse audiences and media.

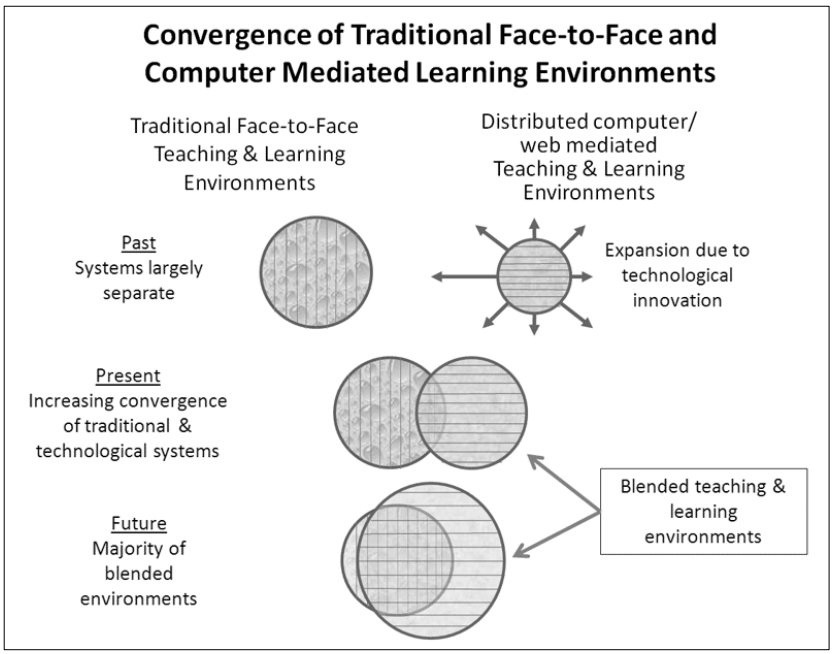

Figure 1: The advanced merging of traditional teaching and distributed environments that allows the development of blended learning systems (Graham, 2006).

The educational environment should be a place to improve student engagement in the class activities such as class discussion, solving problems and homework and also boost student control and choice, and so, decrease the students' failure and help them obtain higher marks when teachers use an active instructional approach in the class (Zimmerman, 2002; Freeman et al., 2014). The best description for active teaching is any activity that makes learners work and think about the activities they should do (Bonwell & Eison, 1991, p. 2). Prince (2004) argues about the efficiencies of active learning by indicating "defining an activity in the class that can outstandingly enhance information or recall" (p.5).

Instructional organizations are adopting the flipped classroom approach in order to address that online learning affects the learners and instructors through the university, so to make more active learning environments. The students' activity in the class is required in order to comprehend the concept of the subject. Therefore, teachers are playing a fundamental role in the development of the community of the class that supports learning and experience of the class that lead to comprehension (Carpenter & Pease, 2012). Butt (2014) argued that flipped classroom method is one of the methods that is possible to use for instructional activity on what learners actively do. This method of teaching provides an active engagement environment for learners with the instructional materials right into the classroom as bringing more passive activities outside of the classroom (Butt, 2014).

The diagram below (Figure 2.) illustrates a model of the flipped classroom for universities. This model contains four dimensions relevant to the locations, time, and student actions. As discussed in the literature, students are expected to study the online materials before each class, participate in the class activity and discussion, consider their understanding after each class and try to make contact with their teacher or classmates if they need. The chance of communicating with classmates and teachers not only increase their engagement, but also increase their motivation.

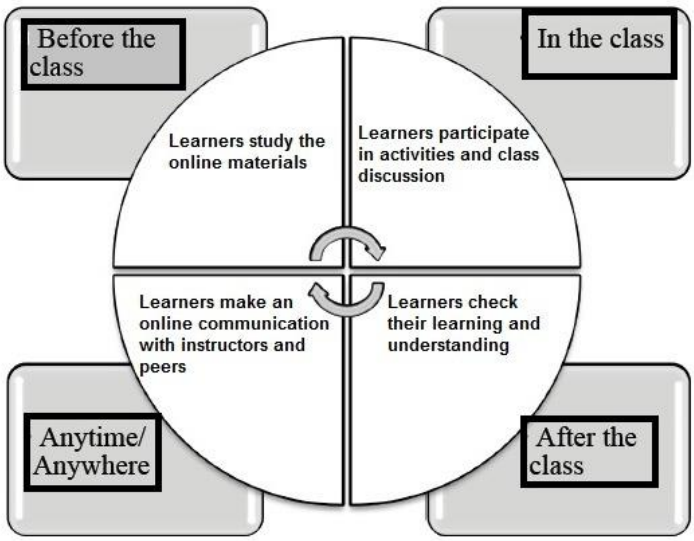

Figure 2: A flipped classroom approach design

This model is an innovative educational approach that develops learners' reflective engagement, concentrating on learner-centered education and recently has become one of the most standard trends of teaching adopted. It puts the responsibility for the education path in the hands of learners. Moreover, based on the principle of the flipped classroom, work typically done as a project or assignment at home is better than in class with guidance or lecturers (Kong and Song, 2015).

Students have stated that they were delighted the increased attention of teacher availability and individual attention in the flipped classroom (Schultz et al., 2014; Pierce & Fox, 2012). They also have reported that while they were using the flipped classroom, they could review the course materials easily. However, there has been no research on integration of project-based learning and flipped learning teaching method.

Besides, most of the research carried out on the flipped classroom has occurred using learners in post-secondary college, undergraduate or professional/graduate programs. There is only one study conducted so far about the impact of the flipped classroom for secondary school students. This research was done on AP Chemistry students (Schultz

et al., 2014). The following description is about the key research carried out on the flipped classroom.

A report has been received from students that they are in favor of flipped learning environment. Tune et al (2013) specified that graduate students of physiology were in favor of the learning environment which was made for discussion in the class period, in a flipped classroom. It has been observed that graduate students had more positive attitudes regarding peer cooperation in the flipped classroom and also they were more confident as they were more likely to take possession of their learning (Mok, 2014; Strayer, 2012). Students stated that they were delighted by the increased attention of teacher, availability and individual attention in the flipped classroom (Schultz et al., 2014; Pierce & Fox, 2012). They also reported that while they were using the flipped classroom, they could review the course materials more easily.

Furthermore, the graduate students of physiology and the AP high school students in Chemistry had positive attitudes regarding the ability of easy access and review of course materials and provided videos (Schultz et al., 2014; Tune et al., 2013). In addition, undergraduate students in Engineering stated that they studied outstandingly less in the flipped classroom comparing to traditional classroom (Mason et al., 2013).

Undergraduate students in Nursing felt that traditional classroom required less work than flipped classroom teaching technique (Misildine et al., 2013) while physiology graduate students felt that the amount of study they had to do in flipped classroom approach was worth more than 1 credit (Tune et al., 2013).

With regards to the performance of students, Nursing and Management undergraduate students, veteran & pharmacy students and graduate physiology students all stated statistically remarkable growth in scores of multiple choice exams when comparing the traditional classroom with flipped classroom teaching techniques (Pierce & Fox, 2012; Missildine et al., 2013; Tune et al., 2013; Albert & Beatty 2014; Moffett & Mill, 2014).

Additionally, both Pharmacy students and high school AP chemistry students statistically stated considerable rise in scores of pre-test and post-test exams while comparing the traditional and flipped classroom teaching technique (Pierce & Fox, 2012; Schultz et al., 2014). Students in flipped classroom not only perform better in the class, but are also able to read the course materials much faster than students in traditional classroom approach (Mason et al., 2013).

Besides, recently an investigator had designed and applied flipped classroom for the 1st year students at Cyprus International University in Northern Cyprus. This study aimed to enhance the learning skills, engagement and interaction between teacher and students. The former instructional approach was traditional classroom. Afterwards, the flipped classroom approach changed students' learning style. As a consequence, students became more active learners, motivated to study and their interaction with peers and instructors improved (Nat, 2015).

2.6. Project-Based Flipped Classroom (PBFC)

Although there are many researches as mentioned in some of the literature above, which have designed and implemented both projects based learning and flipped classroom instructional methods separately in various learning environments, there is

no specific research which would design and implement both methods at the same time as a PBFC learning approach, particularly in N.Cyprus. Hence, this research aimed to carry out a research about an alternative learning method as PBFC in order to find the learners' problems with this approach and examine the learners' perceptions. This study used the design-based implementation approach to design and develop PBFC instructional approach. The next chapters will provide the detail information regarding the stages of design and implementation of this method along with the outcomes.

2.7. Related Works

Tretten and Zachariou (1995) directed an evaluation of Project-Based Learning in four primary schools applying instructor questionnaires, instructor interviews, and a survey of parents. Worth looking fact in this study was that the participated schools had merely lately begun to exploit the Project-Based Learning method and that all of the 64 instructors, were studied. An average percentage of 37% was the instructional time dedicated to Project-Based Learning across all 4 schools and 64 teachers. In accord with instructors' self-reports, using the Project-Based Learning entailed a vast variety of established advantages for learners including a positive change in their mentality towards learning, work customs, problem-solving abilities, and self-esteem. Concisely speaking, the authors remark that: "Acting either on their own or in groups, students function more confidently and feel more empowered when they apply efficient work methods and take advantage of critical thinking to work out problems through interacting with relevant projects.

Throughout this fruitful practice, students learn new knowledge and skills and strengthen their positive work attitudes, critical thinking proficiencies, and productivity. This study was expanded by a follow-up survey, done by Tretten and

Zachariou (1997), with fourteen participated schools, which among them some had been practicing Project-Based Learning for almost three years.

In this latter study, authors attempted to confirm instructors' self-report ratings comparing with the initial study by observing learners during their projects. Unfortunately, the observation base and scoring system turned out to be deficient and then was abandoned. However, the instructor surveys, divulge an interesting detection. Teachers were requested to score the frequency rate of diverse types of learning, exhibited by students working on projects. The instructors had to score on a four-leveled scale ranging from 1 to 4, with a 1 for "none of the time", a 2 for "some of the time", a 3 for "most of the time", and a 4 for "almost all the time".

As anticipated for such brief scaling system, the average ratings for distinct learning items (e.g., "problem-solving skills," "knowledge/content," "responsibility") exhibited a small variance and were relatively high (all averages were between a 3 and a 4). Nonetheless, in terms of the importance of each kind of learning, the order was interesting. The highest score belonged to "problem-solving skills" (3.47) and "aspects of cooperation" (3.47), while all other learning outcomes scores between 3.32 ("critical thinking skills") and 3.43 ("aspects of responsibility") except one: instructors gave their lowest score (3.07) to the item "I believe they learn important knowledge/content." These instructors look to believe that learning important contents is not one of the main advantages of Project-Based Learning.

Other research in which self-report data was applied as a criterion of project efficiency include an inspection of the efficacy of Project-Based Learning on third-, fifth-, and tenth-grade students, who had turned out to have low motive (Bartscher, Gould, &

Nutter, 1995). After participating in project, a great percentage of these students (82%) admitted that projects triggered their motivations, and most (93%) exhibited an increase in their interest in the subjects involved.

The study also contained an independent criterion of project efficiency, completed homework percentage. Although a 7% growth in homework completion due to project work was observed, its small amount alongside with the absence of a control group in the survey, made its proper interpretation difficult to be done.

Horan, Lavaroni, and Beldon (1996) conducted a two-staged Project-Based Learning study in two semester (fall and spring) of the same educational year. The attitude of highly capable to lowly capable PBL students who were participating in group problem-solving activities was compared for both semesters. Researchers focused on five vital thinking attitudes (synthesizing, forecasting, producing, assessing, and reflecting) and five social participation behaviors (inter-group awareness, initiating, managing, working together, and inter-group initiating). The study outcome was provocative, but hard to assess. To sum up, highly capable students engaged in the measures social participation behaviors and critical thinking behaviors almost 150% and 50% more than lowly capable students, respectively. However, the interesting result was that lower capable students represented the greatest increase in critical thinking and social participation attitudes, a growth of 446% from the fall to the spring evaluations, compared to an increment of 76% for the highly capable students.

Moreover, Lamar et al., (2010), carried out a study about project-based learning. The researchers applied this method in the subject of power electronics in Spain, at University of Oveido. They used this method in prototype of static study of topology

converter and Switching Mode Power Supply (SMPS). The aim of the study was to cater learners with main concepts of SPMS and topology converter and also make them ready for advance level study in these areas. The students' perceptions were positive due to improvement in their abilities to solve problems and they also appreciated the time management and evaluation of the subject.

On 2015 two investigators, Meyer and Wurdinger conducted a research about project-based learning in two different schools, in order to assess the students' perception toward this method of instruction. The research was focused on three questions including, in what way, students skills will be developed in 1 year by project-based method? What are the students' perceptions toward project-based learning? and what is the relationship between students' life skills and their grade level?. There were about 275 students, level 6-9, who participated in this research. Triangulation research method is used in order to gather data. The outcome of the research demonstrates that the life skills of students' perceptions were quite positive and also project-based method assists them to develop several life skills comprises time management, responsibility, interaction and problem solving. As a result, project based learning had positive impact on students' life skills in 6-9 grade levels, and helped them to be successful in the global economy and community of 21st century.

Furthermore, recently other investigators (2016) have applied project-based learning method for data structure and database course. The aim of the research was assess the impact of project-based learning and so mastering the students' learning skills in the course. There were 1000 students who randomly selected to participate in this study. The students were divided in two groups of traditional teaching class and project-based teaching class. The outcome of the study illustrates that the project-based learning

requires more activity and energy from educators than traditional teaching method. The project-based approach motivates students' learning enthusiasm, enhances their comprehensive capabilities and vocational skills. According to teachers' perceptions, the project-based learning method is more challenging and beneficial for learners rather than traditional instructional approach.

On the other hand, there are many researchers who applied flipped classroom approach in different instructional organizations. Johnson (2006) applied flipped classroom teaching approach to evaluate the high school students' perceptions. There were 63 participants who were the teacher/researcher's, upper level, in math classrooms. The result of the study shows that fifty three participants, 84%, either agreed or strongly agreed with the item that flipped classroom is more engaging than traditional classroom teaching. Only 5% of participants replied that they disagreed. Moreover, 83% of students were either stringly disagree or disagree about not to suggest flipped classroom to a friend. Hence, the result shows that this method is worth to recommend to other firends. Furthermore, for the statment that flipped classroom gives me a greate chance to interact with others, 85% of students either strongly agreed or agreed and there was only one who disagreed to this statement.

Adittionally, majority of students, 91%, quite negative about studying with flipped classroom gives me less class time to study math. As a consequence, the study shows that majority of learners were quite positive to this approach, they enjoyed the flipped classroom teaching environment. Only few students , 8% felt that flipped was less engaging than traditional classroom instruction, and 5% did not like to watch online videos (Johnson, 2006).

Bates and Galloway (2012) applied flipped classroom method to the first year students in physics course. The number of participant was about 200. The study evaluation focused mainly on problem solving than bookwork. The rate of the successfull students who passed the course was 89% with an average mark at the upper end of the last year exam average. So, the result analysis of this study shows that 80% of respondents were quite satisfy and positive to study by this method rather than traditional classroom instruction.

Adam Butt (2014) utilized flipped classroom method for final year students of Actuarial course in Australian National University (ANU). There were 100 students who enrolled in this course. The study is used from July to November (2 semesters), 2012. The enrolled students could ask their questions during lecture times and also via Moodle learning systems. According to the study result, average students perceive the concept of the course through class activities. The students specified that flipped classroom method could be comprehended as a positive method to the University classroom by reason of its integration of demonstration and activities. As a consequence, 75% of participants observed this method as being beneficial for their learning compared to traditional classroom instruction.

Ataran and Zeinuddin (2015) assessed the Malaysian students' perceptions toward flipped classroom approach. There were 13 students from different majors who enrolled in Research in Education course. The educator engaged students not only in class activities but also give them quizzes about what they have learned after studying instructional materials. The result analysis of students' perceptions shows that 80% of students responded that flipped classroom is more engaging than traditional learning; hence, it presents that majority of learners had positive perceptions about learning with

flipped classroom method. Furthermore, majority of students had positive perceptions about flipped videos, the result presents that 100% of students watched the video regularly and 78% stated that the videos was easy to understand. However, some students may sometimes watch other videos to understand the concept deeply.

Zhao and Ho (2014) carried out research from two administrations of Chinese history course in 2011 the "traditional" version and 2013 the "flipped" version. They measured the gathered data from 65 participants in 2011 and 33 participants in 2013. The result of the study shows that there was not a considerable distinction in the composition of both flipped and traditional classroom instruction. However, over 53% of students' stated flipped classroom as an appealing approach, 14% of students felt this method less appealing.

Moraros et al., (2015), conducted a research to compare the flipped classroom approach in health science syllables. They aimed to find the impact of flipped classroom approach in the characteristics of students' socio demographic, student's final marks and student's perceptions and satisfaction level. They applied this method on graduate students of introductory epidemiology course. There were 67 master students who enrolled in this course. Investigators applied this method for two semesters in 2012-2013 academic years. The result of the analysis shows that 80% of participants responded to this as an effective or very effective approach. The comparison of the result among international students' perceptions and American students' perceptions presents international students rated it as a more effective method ($X^2 = 11.35, p < 0.05$). Furthermore, the result shows that the scores of students who collaborated in flipped classroom classes were considerably higher that students who enrolled prior to the flipped classroom (p= 0.003).

Chapter 3

METHODOLOGY

This section presents comprehensive information about research design, data tools and techniques, sample, data collection and analysis which have been applied in the current research.

3.1 Research Method

The research method used in this study is a case study. This method has origins in social science and is mainly focused on why learners or people act as they do: their beliefs, knowledge, fears, attitudes and etc... . Hence, in this research, the case study relies on both 'How' and 'What' questions (Yin, 1984). In this study, a mixed method was used for data gathering that comprises both quantitative and qualitative data.

The aim of the qualitative research approach is to expose the nature of many perspectives or to determine the organization's reasons. In addition, this method provides data about "human" side of an issue, which is often contrary ideas, reactions, opinions, and individual relationships (Denzin, 2000).

LeCompte and Goetz (1984) pointed out that in qualitative studies, three types of data are being accumulated, including "data related to process", "data related to environment", and "data related to perceptions", based on the opinions of the individuals who participated in the research. So, this approach contains three data gathering methods, such as field notes, audio or video records and transcripts.

The qualitative data will be analyzed first and in the next step, the data gathered by questionnaire will be analyzed, in order to gain more thorough understanding of understand the qualitative data more certain. After collecting these data, the last step is to associate and preform the gathered data. Stake's (1995) stated that, the main address in the art of case study is the learners who are planning to use case study as an approach in their research project.

However, this method does not have an appropriate status as a strategy in social science due to lack of having a proper structured protocol (Yin, 2002). Hence, scientists who plan to use case study typically get confused " as what a case study actually is and how this approach can be distinguished from other qualitative research types" (Merriam, 1998, p.xi). Yin (1984) stated the case study research method as "an empirical inquiry which investigates a contemporary in its real life context while the limitations between context and phenomenon are not clearly obvious (p.23).

Additionally, Crewsswell (2002), as cited in VanWynsberghe and Khan (2007), point out that "A case study is a problem to be studied, which will reveal an in-depth understanding of a "case" or bounded systems which comprises understanding an event, activity, process or one or more individuals"(p. 2).

Furthermore, the Designed-Based Implementation (DBI) method is used in the research in order to show a significant development of design research that usually emphasizes on classroom to examine novelties that bring up an association and organization of supports for enhancing instruction and learning in the classrooms. As a result, this method in the research is called designed-based implementation, since the

design needs thinking to figure conspicuously in the projects and creativities (William et al, 2011).

The design of this study is inspired of transferring and incorporating both flipped classroom and project based teaching approaches into project-based flipped classroom teaching approach. This teaching method mainly aims at enhancing students' perceptions and development as critical thinkers, team players and problem solvers. Furthermore, it completely engages students and lecturer into the educational process and motivates more students in terms of thinking through the utilization of learning application and technologies.

3.2 The Case

The case of this research was undergraduate students who registered for a Computer and Network Security (CNS) course in the Fall 2015 in Information Technology (IT) department at Eastern Mediterranean University, N. Cyprus.

The proposed study focuses on the influences of a project-based flipped teaching method that utilizes lecturer's prepared online videos and PowerPoint slides on learning achievements in CNS course, which may provide chances for students to review, discuss, and investigate project content with the lecturer in the class. The lecturer created the PowerPoint slides and recorded short videos for each specified project topic. The length of each video is quite 10 minutes, which is almost short, because long videos can cause users to be at risk of losing their focus while learning the concept. All the prepared instructional materials are uploaded on the Moodle learning system to be accessible for all students at anytime and anywhere.

Furthermore, there were 30 students who registered in the CNS course equally divided into six groups of 5. At the beginning of December, three weeks prior to the administration of their final exam, students were given the project topic. So, the entire group was expected to complete their project within 3 weeks. Each group was assigned a different project topic along with pertinent educational materials available in the Moodle learning system.

Moreover, the students in each group were responsible for studying provided materials before each class session, so to participate in weekly class discussions, with their group members and lecturer. Hence, students worked on a series of critical thinking questions provided by the instructor. In addition, in the after-class sessions, each group of students separately joined an online chat session, in order to discuss issues related to their projects. So, the lecturer monitored the students' knowledge of understanding to clarify misconceptions and to give feedback, in both in-class discussions and chat sessions.

Table 1: Demographic of Cryptography and Network Security Students

		Frequency	**Percent**
Gender	Male	22	73.3
	Female	8	26.7
Age	18-19	1	3.3
	20-21	10	33.3
	22-24	10	33.3
	Above25	9	30.0

Table 1 illustrates the demographic of students who registered in the CNS course. This course was offered by the IT department in fall 2016 at EMU University, N.Cyprus.

There were 30 undergraduate students, 8 females and 22 males from age 18 to above 25 and from different fields who registered in this course.

3.3 Design-Based Implementation (DBI)

The basic step about developing a DBI research method is to make shared practices and norm about the developmental theory and examine particular estimations and claims. In other words, this method needs to create an individual specific "grammatical argument" in order to judge the sufficiency of supported data for specific theories, claims and verdicts upon the information.

In the DBI research approach, the driving queries may be related to "what works", so that the experimental case design would be appropriate. On the other hand, the DBI research method makes questions about "what works when, how and for whom?", "How we can enhance the form of this method in order to make it more supportable", and "what sizes a system is needed, in order to enhance more?". Responding to these queries and also sub-questions needed to validate and develop an innovative theory that requires a huge range of research approaches (William et al, 2011).

This study is designed as the project-based flipped classroom instructional approach by investigating and incorporating the steps of both project-based and flipped classroom approaches. In order to implement the project based flipped classroom teaching approach, this research first conducted a study to analyze the implementation process of project based and flipped classroom methods, then project-based flipped classroom steps are developed.

3.4 Data Collection Tools

The current research utilizes two different data collection tools that are used to collect data. These tools are comprised of focused group interviews and questionnaires. Rossi and Freeman (1993) pointed out that qualitative data are useful for defining the nature of the need, whereas quantitative data are essential for specifying the extent of the need. The queries were designed to gain an overall grasp of students' perceptions, so the following explains the approaches used for gathering data.

3.4.1 Questionnaire

In this study, a closed-ended questionnaire was developed by means of a survey (Appendix B). The queries of the questionnaire were adopted from Graham Brent Johnson who had carried out his thesis study on 2006, about "Student Perceptions of The Flipped Classroom" in University of British. He applied this method to high school students for Mathematic course, in order to assess the students' understanding of flipped classroom (Johnson, 2006).

The questionnaire is divided into three sections; the first part includes demographic information (gender, ethnicity, department, age). The second part contains five questions using a seven point Likert scale. The Likert scale answers are classified as: Completely dissatisfied (1), Mostly dissatisfied (2), Somewhat dissatisfied (3), Neither satisfied or dissatisfied (4), Somewhat satisfied (5), Mostly satisfied (6), Completely satisfied (7). The questions, measures the students' satisfaction level of using Moodle online system in contrast to the traditional classroom.

In addition, the third part comprises of 20 questions used in a five-level Likert scale. The Likert scale items consisted of strongly disagree (1), disagree (2), neither agree

nor disagree (3), agree (4), and strongly agree (5). These queries were designed to measure a broad understanding of students' perceptions about project-based flipped approach.

3.4.2 Focus Group Interview

In addition to quantitative data, this research used a focused group interview method to understand the students' perception of project-based flipped classroom in their own words (Appendix C). Hence, 5 open-ended questions were designed for students to explain their own ideas and give feedback related to: student's perceptions and project-based flipped classroom impact on students.

The first four open-ended queries detailed particular project-based flipped classroom applications and the last query was designed to gather students' general comments about this teaching method.

Furthermore, the interview queries were also asked for each student in a group on the last day of their project submission in order to filled notes their answers.

3.5 Data Analysis

The gathered quantitative data was analyzed by using SPSS program, Version 23.0, 2015. The calculation was based on independent sample t-test in order to assess the students' perception of using Moodle online learning system and individual based study in project-based flipped classroom. The students' level of satisfaction in project-based flipped classroom was more than half of the class.

Moreover, the interview was conducted by the lecturer in groups. An interview was done face-to-face in the last class session. Before starting, the question's standard level and permission were checked by the course instructor. The last session of the class,

which was the project submission day were spent in the interview. Afterward, the collected data were written by Ms Office Word.

3.6 Validity and Reliability

The measure used in the survey was examined for validity and reliability with the collected data. Joope (2000) indicates that the reliability of the research is the degree of the outcome that is stable over time and also if the outcome of the research is reproducible into another similar technology, so the instrument of the research would be considered as reliable. The reliability of this study is measured by Cronbach's alpha, which is illustrated as strong for both sub-scales in Table 2.

Table 2: General Reliability

	Cronbach's Alpha	N of Items
LMS Learning Systems (Moodle)	.812	5
Project based Flipped Classroom	.816	22
General	.705	27

According to the result of the Cronbach's alpha coefficient, the calculation of the values is based on the sample of the research (n=30), (0.81) for LMS learning systems, and (0.81) for project-based flipped classroom teaching approach, which indicates a high level of internal consistency for all scales of this research. Additionally, the total Cronbach's alpha coefficients for these two samples are (0.70), which has a good consistency.

Furthermore, Joope (2000) stated that the level of validity in qualitative research determines the accuracy of research's measurement and outcome, so the validity of qualitative research can be indicated by asking queries and investigating other researchers.

Besides, to ensure the reliability of the study in this research, some data were gathered through interviews, which were based on the ethical research principles. The validity process of the gathered data and data analysis, have been noted to be reliable and expressive. Hence, the duration of consistency has been taken into consideration through research, data gathering and analysis. Moreover, the point of saturation initiates to repeat the processes and concepts, which might be the respond to the research queries. The number of participants is adequate since the appearance of processes and concepts start to repeat each other (Patricia et al, 2015).

Apart from these, triangulation as a method for expanding the credibility of assessment and research detections is applied in order to incorporate the privileges of both the qualitative and the quantitative aspects of the current research. This method is used to make sure that the validity of research can be confirmed making the maximum benefit of a diversity of strategies to gather data on the same subject, which brings in several types of samples and also methods of data collection. However, the ultimate aim of triangulation is not unquestionable to cross-validate information, but instead to grasp diverse dimensions of a specific phenomenon.

During the last few years, the application of qualitative and quantitative strategies in investigating the same phenomenon has remarkably drawn the attention of scholars and experts. Due to that, using some sort of 'triangulation' in social probes has turned into an agreed tradition to apply. In the social sciences, the footprint by taking advantage of 'triangulation' can be observed in Campbell and Fiskel (1959). This was later developed by Web (1966) and elaborated by Denzin (1970) beyond its conventional association with research methods and designs.

Chapter 4

FINDINGS AND DISCUSSIONS

The goal of this research is to assess the students' perceptions of project-based flipped classroom. Qualitative and quantitative data were examined in order to figure out the students' perceptions. Furthermore, this research used Designed Based Implementation (DBI) method in order to design and implement project-based flipped classroom teaching approach.

4.1 Design and Implementation of Project-Based Flipped Classroom

This section illustrates the design and development process of Project-Based Flipped Classroom (PBFC) method. This method is the integration of project-based teaching method and flipped classroom method. The study has designed and demonstrated the steps that should be taken through the PBFC approach in the following table. Table 3 illustrates the steps of project-based learning, flipped classroom and integrating these two instructional methods into a new teaching method as PBFC.

Table 3: The stages of the project-based learning, flipped classroom and project-based flipped classroom instructional methods

	Project-Based Classroom	**Flipped Classroom**	**Project-Based Flipped Classroom**
Defining strategies	Education around complex projects is based on challenging problems or questions.	Education through individual computer-based activities outside the classroom, and interactive group learning activities inside the classroom.	Education by complex projects through individual computer-based activities outside the classroom and activities inside the classroom.
Learning materials	The necessary learning resources are introduced to students as they are encouraged to explore them by themselves.	Learning materials are available to all students online, using an LMS learning system like Moodle.	Learning materials are available to all students online, using an LMS learning system like Moodle.
Teachers' role	Teachers set the real-world problems, learning objectives, tasks, timeline and deadline. Teachers give students the resources of learning, which they need to research the concepts and apply them in a practical form. Teachers are the ones playing the role of the "questioner", facilitating the learning process and supporting the relationships within and among the project groups.	Teachers set course contents, learning objectives, tasks, and timeline. Teachers cater the learning materials such as recorded videos, PowerPoint slides, and Podcasts relevant to their course. In the class teachers provide students with opportunities like giving real sample questions and bring up discussions to help them perceive the concept of the course deeply.	Teachers set the project topic, targets, contents, tasks, chat sessions, timeline, and deadline. Teachers cater learning materials such as recorded videos, PowerPoint slides, or Podcasts relevant to each group's project, online, provided via an LMS learning system like Moodle. Teachers explain and provide real sample discussion questions in the class, in accordance with each group's task and then monitor students' activities and the progress of their projects. During chat sessions, teachers give feedback to students about how well the instructional materials were understood.
Students' role	Students collect information relevant to their ideas by generating hypotheses that lead them to construct a diagnosis. Students take part in collaborative activities in order to negotiate and find solutions to the driving questions.	Students study the instructional materials to develop their knowledge. Students ask about their problems on what they need to enhance and how to solve their projects, either in the class or via E-mail.	Students study the instructional materials to develop their knowledge. During weekly chat sessions, students share their problems and ask for what they need more to enhance and solve their projects.
Learning Environment	The learning processes are conducted in the classroom. These processes are questioning students with real sample-world queries, class discussions and effective collaboration with peers and teachers.	The learning environments are in and outside the classroom. Students study the online learning materials at home. Later, they have discussions and collaboration with peers	The learning environments comprise lectures outside the classroom, inside the classroom and online sessions by an LMS learning system.

	Through these processes, students are questioned with real sample world's queries.	and teachers in the classroom to acquire deeper comprehension.	Students study the project learning materials as online at home. Later, they have discussions and collaboration with peers and teachers in the classroom to acquire deeper comprehension about their project. Each student or group of students has specified weekly chat sessions to share their ideas and ask about their problems regarding to their project solution.

The first column demonstrates the process of Project-Based Learning (PBL) method which requires much more preparation and planning as with all instructions. This method of learning initiates along with an idea and some essential questions. These questions will not only launch the activities regarding the project, but also addresses many content standards. By having these standards, educators are capable of devising a plan with integrations of many subjects into the project within a specified period (Stix and Hrbek, 2006). The steps through the implementation of project based classroom comprise (Norman & Spohrer, 1996):

1- Educator starts by providing students with real-world sample questions in order to set the context for their project, objectives, tasks, and also to evaluate the students' knowledge, specifies the timeline and deadline.
2- Educator and students take part in collaborative activities in order to negotiate and find solutions to the driving questions.
3- Educator provides the students with resources of learning they need for investigating the concepts. Later on, they will be applying them in a pragmatic form.

4- Students collect the necessary information from provided research to use in their discussion and investigation.
5- Students generate their project by using educational tools.
6- Students get ready to submit and present their project on the dedicated deadline set.
7- Students present their projects.
8- The projects are assessed based on the educator's provided criteria.

The second column explains the strategy of the Flipped Classroom (FC) educational approach. This method drastically changes the technique of the instruction. If a teacher would like to carry on with this advancement in instruction, s/he is supposed to provide students with online educational materials such as recorded videos, screencasts, PowerPoint slides, etc. So, to make students engaged more deeply and actively. Hence, by this method, students have unlimited access to necessary materials, as well as having their lecturer as the most important resource which I believe is the best benefit of this educational method. Moreover, teachers use their class time as an active learning experience through which students are able to share their problems and understanding with other learners and instructors. The implementation of flipped classroom includes the following steps (Pierce & Fox, 2012; Schultz et al., 2014):

1- Educator starts by defining the educational strategy of flipped classroom.
2- Educator sets the course contents, objectives, strategies and tasks.
3- Educator designs and produces online learning materials such as recording short videos, designing PowerPoint slides, or Podcast to be fed as course contents.
4- Students study online learning materials related to their course before in-class sessions, which empower them to actively participate in weekly discussion sessions.

5- Students make discussions with their peers and teachers during the weekly classes, benefiting from various opportunities so to perceive the concept of the course deeply.
6- Students carry out more research after in-class sessions to solve their online tasks.
7- Students finalize their weekly and final tasks according to the timeline and deadline.
8- Educator assesses the students' progress in terms of class activities, knowledge and experiences based on the defined criteria.

The last column presents the design and implementation of the PBFC instructional method. According to the project-based learning approach, the session begins by showing a complex problem to each group of students, providing a minimal data about it (Barrows, 2000). This approach provides a chance for students to review, discuss, and investigate project contents with the lecturer in the class. Moreover, based on the flipped classroom approach, the lecturer creates PowerPoint slides and records short videos for each specified project topic. The implementation of project-based flipped classroom includes the following steps:

1- Educator starts by giving students a sample project in order to evaluate the students' knowledge and sets the stages for their project.
2- Educator defines the educational strategy of the project-based flipped classroom along with the project contents, learning objectives, tasks, timeline and deadline.
3- Educator caters the online learning materials such as designing PowerPoint slides, recording short videos or Podcasts for the project contents, using a learning management system (LMS).
4- Students study the online learning materials related to their project at home. This

enables them to attend the weekly discussion sessions.

5- Students make discussions with peers and teachers in the weekly classes, which provide opportunities for them to build up their perception of the concept and their project stages thoroughly.
6- Each group of students develops discussions among their group members and teachers in the weekly chat sessions, in order to control, monitor and self-evaluate the progress of their projects.
7- Students finalize their project according to the timeline and deadline.
8- Educator assesses the students' progress in class activities, knowledge and experiences along with the delivered project based on the defined criteria.

This research used the Moodle learning platform to deliver online project materials. In addition, weekly online chat sessions via Moodle have provided students with a chance of controlling their progress of their projects. The CNS class included 30 students and the duration of the project was defined as six weeks. Hence, the whole process was applied during the last six weeks of the semester. The findings received as the outcome of this research were transported parallel to the research questions of this study. This section shows the statements of the students given as directly estimated.

4.2 Students' Perceptions towards Project-Based Flipped Classroom

In this section, students' perceptions about the PBFC approach are examined. Table 4 illustrates the mean, and the standard deviation of the relevant data.

Table 4: Students' Perceptions towards Project-Based Flipped Classroom Scores

	N	**X**	**Std. Deviation**
Students' perceptions of the project-based flipped classroom	30	72.63333	8.66417

As it can be seen from Table 4, 20 items from Table 5 were combined to determine the students' perceptions about PBFC approach and the result of the analysis shows that the students' acceptance level of PBFC method is quite positive, as the mean reads 72.63 and Std. Deviation is 8.66. As a result, the majority of students showed satisfaction towards this approach. Table 5 below shows the students' answers towards items of the project-based flipped classroom. This table comprises 20 questions which applied to CNS registered students.

Table 5: Students' perceptions about Project-Based Flipped Classroom

Questions	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Mean	Std. Deviation
1. The flipped classroom is more engaging that traditional classroom instruction.	0	6.6	30	36.7	26.7	3.8333	.91287
2. I would not recommend the project-based flipped classroom to a friend.	23.3	36.7	26.67	6.67	6.67	2.3667	1.12903
3. The project-based flipped classroom gives me a greater opportunity to communicate with other students.	0	3.3	36.7	33.3	26.7	3.7667	.93526
4. I like to study with online materials like PowerPoint slides and online videos.	0	3.3	23.3	36.7	36.7	4.0667	.86834
5. I would rather have the entire class moving at the same pace in the course.	0	0	36.7	36.7	26.7	3.9000	.80301
6. I am spending less time working on the traditional Cryptography project.	6.6	16.7	50	16.7	10	3.0667	1.01483
7. I would rather watch a traditional teacher-led lesson than online materials.	16.7	23.3	33.3	16.7	10	2.8000	1.21485
8. I dislike self-pace myself through the course.	20	40	36.7	0	3.3	2.2667	.90719
9. I find it easier to pace myself successfully through the course.	1.3	2	20	50	26.7	4.0000	.78784
10. I am spending less time working on the project-based flipped classroom to practice Cryptography.	0	0	50	30	20	3.6000	.81368

11. I am more motivated to learn Cryptography in the project-based flipped classroom.	1.7	5	50	30	13.3	3.5000	.82001
12. The project-based flipped classroom has improved my learning of Cryptography.	0	3.3	46.7	40	10	3.5000	.86103
13. More university units should use project-based flipped classroom approach.	0	3.3	40	30	26.7	3.8000	.88668
14. Short videos in project-based flipped learning are more effective than traditional face to face lectures.	0	13.3	43.3	23.4	20	3.4667	1.00801
15. My experience in this course has been better than the traditional classroom approach.	0	13.3	26.7	26.7	33.3	3.8000	1.06350
16. For the past few weeks in the class, I communicated a lot with students, particularly with my group members.	3.3	3.3	10	36.7	46.7	4.0667	1.14269
17. For the past few weeks, I had to work hard in the class.	0	3.3	13.3	50	33.3	4.1000	.80301
18. The availability of course materials, communication and assessment tools helped me to improve my learning.	0	6.7	3.3	33.3	56.7	4.2667	1.04826
19. Over the past few weeks, I needed a technical assistant for this class.	0	0	20	46.7	33.3	4.0333	.92786
20. The project I have worked on this course deals with real life applications and information.	0	0	6.7	33.3	60	4.4333	.77385

As it can be observed, item 3 shows that more students, 60%, agreed that the project-based flipped classroom gives them a greater opportunity to communicate with other students, whereas only 3.3% disagreed and about 36.7% of students were neutral to this item. Student quotes regarding to this item were:

> *I had fun talking with my group members about the project. We came from different technical backgrounds. Sharing our knowledge teaches us.*

> *It's a good thing to work in a team when it comes to project. We share responsibility and skills. But it's important that everyone be active and responsible.*

> *We had to sit together, discuss, do online chat sessions and check on each other. It's a bit difficult to get everyone to do their part well and on time. A member should always keep an eye on others if we want a good complete work. But on the whole, it was an exciting experience.*

Moreover, the outcome of question 12 indicates that 50% of students agreed that the PBFC has improved their learning, 46.7% were neutral and 3.3%disagreed with this item. Student quotes regarding to this item were:

> *I learned enough. I think I should work more. The materials were useful. Lecturer was available. As a student, I needed to take care of my learning. It was my first experience and it was difficult. I think it was a good one.*

In addition, item 18 indicates that almost all the students, about 90%, were positive toward the use this method due to the availability of course materials, communication and assessment tools that helped them to improve their learning. There were only 6.7% students that disagreed and 3.3% were neutral. As a result, based on the students' interview, their perceptions generalized as the following quote:

> *The materials were useful. I needed more materials, so I had to go search for more. Lecturer was a good help. But I had to do a lot of work. Of course it helped me learn. At times I had to double check if what I had learned was correct, hence we checked together in our team.*

> *This method of teaching provides an interactive environment which enhances practical experience and teamwork skills among students, which is a very beneficial skill in today's world. It also teaches them to take responsibility in a group.*

The students' opinions shows that they particularly highlight the rich educational environment and they had been positively affected by their computer-based communication, working in a group, managing time and tasks, so to achieve their

success.

4.2.1 Gender Differences on Students' Perceptions about Project-Based Flipped Classroom

In order to test whether the students' perceptions about the PBFC approach differs significantly among male and female respondents; independent sample t-test is applied.

Table 6: Students find it easier to pace themselves successfully through the course, depending on the gender

Gender	N	X	Sd	df	t	p
Female	8	3.5000	0.75593	28	2.236	0.33
Male	22	3.6364	0.73266			

According to Table 6, there is no significant difference for men and women since t (28) = 2.236, p= 0.33 <0.05. It is comprehended that male and female students are positive in terms of individual studying. The results of the analysis show that there is no significant difference in the online learning readiness level for males and females.

Table 7: Students' motivation about learning CNS with PBFC method, depending on the gender

Gender	N	X	Sd	df	t	p
Female	8	4.0000	0.75593	28	2.134	0.42
Male	22	3.3182	0.77989			

Table 7 above demonstrates the female and male students' motivations toward studying with PBFC approach. According to the analysis of question 11, the outcome is, t (28) = 2.134, p= 0.42 <0.05, the majority of the students were positive; however there is a slight distinction among male and female students. As a result, according to the average (X= 3.31), it is concluded that male students are less motivated to study by this method than female.

Moreover, female students took more advantage in the traditional learning classroom than flipped classroom in terms of higher satisfaction of interaction and flexibility opportunities. The similar results were obtained by these investigators such as Bergmann & Sams, 2012, Fischer, Schult & Hell, 2012 and Gonzalez-Gomez et al, 2012.

Table 8: Students' perceptions about using PBFC approach in more universities, depending on the gender

Gender	N	X	Sd	df	t	p
Female	8	3.5909	0.90214	28	2.294	0.30
Male	22	3.8750	0.64087			

Table 8 shows the result of students' perceptions toward using project-based flipped classroom in other universities. The analysis of the research is, t (28) = 2.236, p= 0.33 <0.05, which shows that most of the students were positive toward this item and there is no significant distinction among male and female students' perceptions in using this approach in other universities.

Table 9: Students' perceptions of the use of short videos in flipped learning approach being more effective than traditional face to face lectures, depending on the gender

Gender	N	X	Sd	df	t	p
Female	8	4.1250	0.99103	28	2.313	0.28
Male	22	3.2237	0.92231			

As it is can be seen from Table 9, there is a considerable difference among students' perceptions, t (28) = 2.313, p= 0.28 <0.05. The perceptions are formed upon whether using short videos in the PBFC is more efficient than the traditional teaching approach. Therefore, the result shows that female students (X= 4.12) are more likely to use online short videos instead of studying in the traditional classroom (Item 14).

In parallel to this result, a research on students' attitude through flipped classroom for chemistry class were carried out and the result shows that female students were more interested in using the flipped method than the traditional one due to raising up the speed of study by having the ability to rewind the videos (Glynn, 2013). The following quotes show some negative, neutral and positive ideas of students about this item:

> *I personally prefer learning the basics and fundamentals from my lecturer. I don't know why exactly, but I guess I feel more secure with receiving the knowledge from my lecturer. It helps me understand what he delivers and what he expects me to learn in return.*

> *I guess I prefer sitting in the classroom and listening to my lecturer because I have very little chance of losing concentration and dealing with distraction. Of course, it's a new and nice idea to learn more autonomously. However, a classroom gives me more focus. Plus, I can ask my questions right on the spot and the lecturer can clear out any confusion for me while topics are still fresh on my mind.*

It seems that female students are naturally more conservative when it comes to trying out new learning approaches, specifically those which puts them is more contact with technology and waves them away from the safe classroom atmosphere when the teacher is available for a certain period of time.

> *I don't really mind learning from videos. However, I still believe classrooms and lecturers are the most effective means of learning. Technology is good as an aiding mean, but not a substitute.*

> *It's fun and flexible. You don't have to sit for hours listening to lectures. Sometimes, other students' questions bore me because they are so simple and I already grabbed the point. So watching videos spares me of listening to boring questions and extensive explanations.*

> *I like videos because I can skip the parts that I already know or I can repeat and pause at any point. You can't do that in a lecture. It's flexible and good.*

Female students show more interest and excitement towards this method, seemingly because they feel to have more freedom.

4.2.2 The Pros of Using a Project-Based Flipped Classroom Approach

There were some students who underlined that project-based flipped classroom method contains some advantages. According to Table 5, in section 4.2, 50% of students believed that project-based flipped classroom enhanced their learning, 46.7% were neutral and there were 3.3% students who disagreed. Additionally, according to the students' opinions, 56.7% agreed on the benefits of applying project-based flipped classroom approach in more universities, 40% were neutral and 3.3% disagreed.

Furthermore, students' replies to items 16 and 17 showed that the majority of them, 83.3% and 83.4%, believed that studying with this method requires more work and also needs more communication to be carried out with their peers or group members, about 3.3% and 13.3% of students were neutral and 3.3% and 6.7% disagreed.

Moreover, the analysis of question 18 shows that PBFC method positively enhanced 90% of students' learning skills by providing them with unlimited course materials, communication and assessment tools, while only 3.3% were neutral and 6.7% disagreed.

The following quotes show some ideas of students about pros of this method.

> *It is helpful to work with a team. We learn from each other and help each other in a team. There is good support from friends.*

> *This method of teaching enables students to directly talk with their teacher online, at a specified time, while working on their project tasks; therefore, they can follow the tasks and solve their project easily.*

It is evident that the students enjoy working in a team and count on peer support.

> *It makes us work for learning. So we must read, work and try. It is like you earn something from your own trial and error. It Makes confidence and what you learn, you will never forget.*

It is somehow an inevitable fact that some students usually get more workload unwantedly simply because they care more about the results and their scores than other team members, so the rather lazy ones easily take advantage.

> *There was a lot of work and coordination to be done. It was as if I was responsible for everything to be done right. Good experience I must say!*

As a further comment, the students' perceptions about PBFC method pointed out that this method masters their learning skills by having collaboration in a group, having more freedom to study based on their own pace, and in case if they face any difficulty, they may ask from their peers, teachers or assistant.

> *If the whole process is dealt with smoothly and the support content is rich and handy, the idea of project-based flipped classroom can be way more practical than just theoretical lessons followed by a few quick lab sessions. Through this approach, students can discover experience and learn more autonomously and it promotes their sense of responsibility towards learning and self-teaching.*

As a result, according to the interview questions, it has been detected that nearly all the students had a positive opinion on a project-based flipped classroom. They also expressed that the educational environment of project-based flipped classroom is very rich.

4.2.3 The cons of using a project-based flipped classroom approach

On the contrary, some students mentioned that project-based flipped approach comprises cons as well; Question 2, 5 and 8 illustrate that 13.34% of students thought not to recommend project-based flipped classroom method to their friends, and 26.7%

preferred to have the entire class in their own pace of the study and also 3.3% disliked the method of self-space studying through the course. However, 60%, 36.7% and 60% of students were disagreed to these questions and the rest 26.7%, 36.7% and 36.7% were neutral. Here are the opinions of some students about disadvantages of this method:

> *Sometimes different ideas of teammates make others confused and when the professor is not reachable, it can get quite challenging.*

> *Sometimes you try and try and it's not working. So it makes you angry and tired or bored. You just want to get the answer as soon as possible, but maybe the professor is not at access for example over the weekend.*

It is quite clear that learners still show dependency and fear not accomplishing what they are expected to achieve without constant help and support of their master.

> *The students have different backgrounds in terms of programming languages and overall computer literacy, thus the dominant students are usually dealing with much more workload in the team simply because the job has to be done and if the whole team is not capable then a few most capable ones will have to take over.*

This could be a point to consider when teaming up the students and assigning projects to them. It is natural that those less capable of IT skills will totally rely on the dominant ones and make them tired and overworked.

> *It can be used as some support to traditional learning, but it cannot completely replace it or institutions mustn't let it weigh much more than traditional learning and teaching styles. Still, being in a classroom and in contact with teachers and learners is much more beneficial than self-study.*

According to their opinions, the main disadvantage as mentioned in some students' quotes is mainly oriented around their worry of not being able to do the task right

without having their teacher or assistant around. Students are naturally very dependent on their lecturers and what they receive as lecture notes in the classroom. So this experience shakes their confidence to some extent.

Moreover, their main problem was concerned with their background, not related to IT. So were registered from Pharmacy department to this course as an elective course and their project was about generating a web-based Cypher application. In order to solve their project, they should have known computer programming and basic Web design knowledge. Hence, generally problems include: communication with their group members, digression and students' different backgrounds.

4.3 Students' opinions towards using the Moodle learning system

In this section, students' perceptions about the Moodle learning system are examined. There are five questions with a Likert-scale of very easy to very hard, and these queries measure the students' satisfaction level of using Moodle online system. Table 9 below illustrates the mean, and standard deviations and the detailed answers of the students' perceptions to each item.

Table 10: Students' opinions towards using the Moodle learning system

Questions	1	2	3	4	5	6	7	Mean	Std. Deviation
1. How much did you enjoy the Moodle learning system?	6.7	10	26.7	13.3	20	13.3	10	4.1000	1.72906
2. How much did you enjoy the computer aided demonstration?	3.3	16.7	10	23.3	26.7	6.7	13.3	4.2667	1.68018
3. How much did you enjoy the chatting and using the online learning materials in Moodle?	6.7	26.7	10	10	20	16.7	10	4.0000	1.91185

4. How much do you enjoy the traditional lectures with the physical presence of the lecture?	3.3	16.7	20	13.3	20	13.3	13.3	4.2333	1.77499
5. How would you rank the ease of catching up on missed from an absence?	10	13.3	6.7	23.3	30	13.3	3.3	4.0333	1.65015

The analysis' result of Table 10 demonstrates that 43.4% of students slightly enjoyed using Moodle, 33.3% enjoyed it and were satisfied, and 33.3% replied that working with Moodle learning system is hard for them. Furthermore, there are about 30% of students who responded that using a computer through their studying was nearly easy. As for 20% of students, it was hard to be adopted, while, 50% replied that there were quite satisfied to study with using computers.

The analysis of question 4 shows that 26.3% of students enjoyed studying with traditional learning method, whereas 33.3% of students were liked moderately and 40% of students completely disliked studying by traditional teaching approach.

The last question is about the ease of catching up with the missed classes by Moodle, so only 16.6% of students believed it to be hard to catch up, since the other students' perceptions were positive and specified it as easy to follow up missed lectures by the Moodle learning system.

4.3.1 Students' opinions towards using the Moodle learning system, depending on the gender

An independent t-test was applied to the entire 5 queries about the Moodle learning system in order to understand whether there is difference among male and female

students' perceptions. There is only one significant point which is illustrated in the following table.

Table 11: Students enjoy chatting and using online materials in the Moodle, depending on the gender

Gender	N	X	Sd	df	t	p
Female	8	2.7500	1.48805	28	2.316	.028
Male	22	4.4545	1.87025			

As it is seen from Table 11, this finding can be interpreted that there was a significant difference between male and female perceptions, t (28) = 2.316, p= 0.28 <0.05. The male students (X= 4.45) enjoyed more chatting and had more tendency to use Moodle learning system than female students (Item 5). Additionally, investigators had carried out a research toward students' perceptions of the Moodle learning system. The outcome presented that males find the quality characteristics of the Moodle learning system more significant than female students (Horvat et al, 2013).

4.3.2 Students' point of view of the learning experiences in the traditional classroom against to the flipped classroom setting

As it can be seen from Table 5, question 1 shows that the majority of students, 63.4%, agreed that project-based flipped classroom is more engaging than traditional teaching classroom and 30% of students were neutral and only 6.6% of students believed that the traditional classroom is more engaging. The result shows that most of the students were quite positive about this approach than traditional classroom method.

Moreover, from item 7 it can be understood that 40% of participants disagreed, 33.4% were neutral and 26.6% agreed on preferring to watch the traditional teacher lessons than online materials. According to question 14, 43.4% of students believed that short videos in the project-based flipped learning are more effective than traditional face to

face lectures, 43.3% were neutral while 13.3% were disagreed with this item. There were about 60% of students who replied that their experience in this course had been better than the traditional classroom approach. However, 26.7% were neutral and 13.3% disagreed.

Item 6 considers the students' perceptions about studying cryptography would take less time by traditional teaching method against project-based flipped classroom method. According to the result, 26.7% of students disagreed and 23.4% agreed and 50% of the class was neutral toward this item. In contrast, question 10 considers the students' perceptions about whether studying cryptography would take less time by project-based flipped classroom method compared to the traditional teaching method.

The result of analysis about students' opinions shows that no students disagreed with this item, 50% of students were neutral, 50% completely agreed that studying by project based flipped classroom would take less time than traditional methods of learning.

Furthermore, as it can be seen in the last item, the majority of participants, 93.3%, agreed that their project was of real-life applications and information.

The following quotes show some ideas of students about students' point of view, how the learning experiences differ in the traditional classroom against to the flipped classroom setting. Some of the students' opinions obtained as a result of the interviews and observation are as follows:

> *I am more motivated to do my projects by project-based flipped method rather than the traditional method. Because we worked hard with real life applications and information and it made us engage and communicate more with our group members and other classmates as well. Therefore, we could learn the NS*

course concept deeply.

It is worthy to mention that most students found the approach stimulating and more fun than traditional learning methods and it just made them more motivated and actively involved.

> *I enjoyed chatting and using online instructional materials by Moodle, the short videos are more effective than traditional face-to-face lectures and it gave me less class time to understand and practice CNS project contents.*

Nearly all the students confirmed that project-based flipped classroom is more engaging than the traditional classroom. Students preferred to study with online materials rather than books or other types of traditional materials.

> *My experience in CNS project would have been better with a traditional format, because based on my weak background and technical knowledge in this course, I was always in need of technical assistance and since it is kind of self-study learning method, I had to work harder in order to learn and do my project tasks.*

As natural as it is, learner's autonomy seems to be intertwined with how confident they feel with their background knowledge when dealing with self-study approaches.

> *I would rather watch online materials than traditional teacher lesson due to my interest in self-study through the course.*

Students showed more participation and motivation while working on their projects in their team. Therefore, their knowledge and learning improved in CNS course. What's more, according to the students' ideas above, it is evident shows that their problems concerned their background and lack of knowledge on computer, internet and learning tools.

Chapter 5

CONCLUSION

5.1 Conclusion

The general consensus is that higher education organizations should support learners to be prepared for future learning in their educational life as well as their lives beyond the university. The project-based flipped classroom provides learners with a learner-centered approach and self-directed education using the online educational materials. Furthermore, it enhances the engagement and communication of students with their educators and peers.

In this study, the students' perception about a novel learning method, project-based flipped classroom, is assessed. The study designed and implemented a project-based flipped classroom to achieve solid evidence and knowledge on the insights of students and their success. This research determined that nearly all the students had a positive opinion towards project-based flipped classroom. They expressed that educational environment is a rich environment where they were positively affected by their computer-based communication, working in a group, managing time and tasks in order to achieve their success.

Moreover, this method masters students' learning skills by having collaboration in a group, having more freedom to study based on their own pace, so if they face any difficulty they may ask from their peers, teachers or assistant. Furthermore, almost all

the students showed more participation and motivation while working on their projects in their team. Hence, they preferred to study with online materials rather than books or other types of traditional materials.

There were also a few negative notations of the process regarding the difficulty of self-study method. The main problem of these students was concerned with their background which was not related to IT. They registered from Pharmacy department to this course as an elective course. Their project was about generating web-based Cypher application, so in order to solve their project; they should have known computer programming and basic Web design knowledge.

Overall, almost all the students were satisfied with project-based flipped educational approach except those few students who did not have a strong background in IT and also a little amount of dissatisfaction towards not having the lecturer by the students' side as regularly as in traditional methods.

5.2 Recommendations

As previously stated, the current research has examined the students' perceptions toward project-based flipped classroom learning approach. For future studies, it could be recommended to increase the sample size and also provide a diversity of project contents to gain more efficient consequences from the process of project-based flipped classroom.

REFERENCES

Schunk, D.H. (1991). Learning theories: An educational perspective. New York: *Macmillan.*

Gropper, G.L. (1987). A lesson based on a behavioral approach to instructional design. In C.M. Reigeluth (Ed.), *Instructional theories in action* (pp. 45–112).

Merrill, M.D., Kowalis, T., & Wilson, B.G. (1981). Instructional design in transition. In F.H. Farley, & N.J. Gordon (Eds.), *Psychology and education: The state of the union* (pp. 298–348). Berkeley: McCutchan.

Jonassen, D.H. (1991). Evaluating constructivistic learning. *Educational Technology*, 31 (9), 28–33.

Bednar, A.K., Cunningham, D., Duffy, T.M., & Perry, J.D. (1991). Theory into practice: How do we link? In G.J. Anglin (Ed.), *Instructional technology: Past, present, and future.* Englewood, CO: Libraries Unlimited.

West, C., Farmer, J. and Wolff, P. (1991) Instructional design: Implications from cognitive science. *Englewood Cliffs: Prentice Hall*.

Perkins, D.N. (1991). Technology meets constructivism: Do they make a marriage? *Educational Technology*, 31 (5), 18–23.

Pitchard, A. (2009a). Ways of Learning: Learning theories and learning styles in the classroom, *Behaviorism and the beginnings of theory* (pp. 5-16), London and NewYork, Routledge.

Pitchard, A. (2009b). Ways of Learning: Learning theories and learning styles in the classroom, *Learning Styles* (pp. 41-56), London and NewYork, Routledge.

Verduin, R., Jr., & Clark, T. A. (1991). Distance education: The foundations of effective practice. *San Francisco*: Jossey-Bass.

Billings, D. M., Connors, H. R., & Skiba, D. J. (2001). Benchmarking best practices in Web-based nursing courses. *Advances in Nursing Science*, 23, 41-52.

Boyle, D. K., & Wambach, K. A. (2001). Interaction in graduate nursing Web-based instruction. *Journal of Professional Nursing*, 17, 128-134.

King, J. C., & Doerfert, D. L. (2000). Interaction in the distance education setting. Retrieved January 5, 2004, *from the World Wide Web*: http://www.ssu.missouri.edu/ssu/aged/naerm/s-e-4.htm

Meyen, E., & Lian, C. H. T. (1997). Developing online instruction: One model. *Focus on Autism and Other Developmental Disabilities*, 12, 159-165.

Moore, M. G., & Kearsley, G. (1996). Distance education: A systems view. *Belmont: Wadsworth Publishing Company.*

Muirhead, B. (2001a). Enhancing social interaction in computer-mediated distance education. *USDLA Journal*, 15 (4).

Muirhead, B. (2001b). Interactivity research studies. *Educational Technology & Society*, 4 (3).

Sherry, L. (1996). Issues in distance learning. *International Journal of Educational Telecommunications*, 1, 337-365.

Tuovinen, J. E. (2000). Multimedia distance education interactions. *Education Media International*, 37, 16-24.

Wagner, E. D. (1994). In support of a functional definition of interaction. *The American Journal of Distance Education*, 8 (2), 6-29.

Perez, C. M. V. (2001). Factors influencing how students value asynchronous Web-based courses. *Unpublished doctoral dissertation*, University of North Texas. Dissertation Abstract International, AAT 9989796.

Collins, J., Hammond, M. & Wellington, J. (1997). Teaching and Learning with Multimedia. *London: Routledge*.

Scott B., Ken C. H. & Edwin M. G. (1999). The Effects of Internet-Based Instruction on Student Learning, *Journal of Asynchronous Learning Network*, Vol. 3, No. 2,.98-106.

Lewis, N. J. (2000). The Five Attributes of Innovative E-Learning, *Training and development*, Vol.54, No. 6, 47 51.

Marc, J. R. (2002). Book review: e-learning strategies for delivering knowledge in the digital age. *Internet and Higher Education*, 5, 185-188.

Almosa, A. (2002). Riyadh: Future Education Library. *Use of Computer in Education, (2nd ed).*

Dowling, C., Godfrey, J. M. & Gyles N. (2003). "Do Hybrid Flexible Delivery Teaching Methods Improve Accounting Students' Learning Outcomes," *Accounting Education:An International Journal*, 12 (4), 373-391.

Klein, D. & Ware, M. (2003). E-learning: new opportunities in continuing professional development. *Learned publishing*, 16 (1) 34-46.

Hameed, S. Badii, A. & Cullen, A. J. (2008). Effective e-learning integration with traditional learning in a blended learning environment. *European and Mediterranean conference on information system*, (25-26).

Young, J. R. (1997). "Rethinking the Role of the Professor in an Age of High-Tech Tools". *The Chronicle of Higher Education*, 44 (6).

Jones, B. F., Rasmussen, C. M., & Moffitt, M. C. (1997). Real-life problem solving: A collaborative approach to interdisciplinary learning. *Washington, DC: American Psychological Association.*

Thomas, J. W., Mergendoller, J. R., and Michaelson, A. (1999). Project-based learning: A handbook for middle and high school teachers. Novato, *CA: The Buck Institute for Education.*

Lage, M., & Platt, G. (2000). The internet and the inverted classroom. *Journal of Economic Education*, 31, 11.

Mok, H. N. (2014).Teaching tip: The flipped classroom. *Journal of Information Systems Eduion*, 25 (1), 7-11.

Strayer, J. (2012). How learning in an inverted classroom influences cooperation, innovation and task orientation. *Learning Environments Research*, 15(2), 171-193.

Kaner, C. and Fiedler RL. (2005) Inside out: a computer science course gets a makeover. Paper presented at: *Proceedings of the Association for Educational Communication and Technology International Conference*; Orlando, FL.

Day, J. and Foley, J.(2006) Evaluating a web lecture intervention in a human–computer interaction course. *IEEE Trans Educatin*; 49:420–431.

Jonassen, D.H. (1991a). Evaluating constructivistic learning. *Educational Technology*, 31(9), 28–33.

Jonassen, D.H. (1991b). Objectivism vs constructivism: Do we need a new philosophical paradigm. *Educational Technology Research and Development*, 39(3), 5–14.

Allen, M., E. Mabry, M. Mattrey, J. Bourhis, S. Titsworth and N. Burrell. (2004). Evaluating the Effectiveness of Distance Learning: A Comparison Using Meta-Analysis. *Journal of Communication*.

Burdman, P. (1998). Classrooms without walls: More students are taking college courses online. *UC Berkeley to see drops in minorities*. San Fransisco Chronicile, March 31, P.A1.

Osguthrorpe, R. T., & Graham, C. R. (2003). Blended learning environment: Definitions and directions. *The Quarterly Review of Distance Education*, 4(3), 227-233.

Jones, B. F., Rasmussen, C. M., & Moffitt, M. C. (1997). Real-life problem solving: A collaborative approach to interdisciplinary learning. Washington, DC: *American Psychological Association*.

Thomas, J. W., Mergendoller, J. R., and Michaelson, A. (1999). Project-based learning: A handbook for middle and high school teachers. Novato, *CA: The Buck Institute for Education.*

Ljung, E. J., & Blackwell, M. (1996). Project OMEGA: A winning approach for at-risk teens. *Illinois School Research and Development Journal*, 33, 15-17.

Shepherd, H. G. (1998). The probe method: A problem-based learning model's effect on critical thinking skills of fourth- and fifth-grade social studies students. Dissertation Abstracts International, *Section A: Humanities and Social Sciences*, 59 (3-A), p. 0779.

Moursund, D. (1999). Project-based learning using information technology. Eugene, OR: *International Society for Technology in Education*.

Tretten, R. & Zachariou, P. (1997). Learning about project-based learning: Assessment of project-based learning in Tinkertech schools. San Rafael, *CA: The Autodesk Foundation.*

Gülbahar, Y. & Tinmaz, H. (2014). Implementing Project-Based Learning And EPortfolio Assessment In an Undergraduate Course. *Journal of Research on Technology in Education*, ISSN: 1539-1523.

Benthany, B. S. (2012). Flipped Your Classroom to Increase Active Learning and Student Engagement. *28th Annual Conference on Teaching and Learning*.

Tucker, B. (2012). The Flipped Classroom. *Education Next.* Vol.12 (1).

Frand, J. L. (2000). The information-age mindset: changes in students and implications for higher education. *EDUCAUSE Rev*. ;35:14–25.

Muesser, N. (2015). A Flipped Classroom Model for Developing Universities in Developing Countries. *Global Learn 2015 - Berlin, Germany*

Bergmann, J. and Sams A. (2013). Flip Your Students' Learning. *Educational Leadership*, v70, n6, p16-20

William, J. (1890). The Principles of Psychology in two volumes. *New York: Henry Holt and Company.*

Schunk, D.H. (1991). Learning theories: An educational perspective. *New York: Macmillan.*

Snelbecker, G.E. (1983). Learning theory, instructional theory, and psychoeducational design. *New York: McGraw-Hill.*

Jonassen, D.H. (1991). Evaluating constructivistic learning. *Educational Technology*, 31 (9), 28–33.

Duffy, T.M., & Jonassen, D. (1991). Constructivism: New implications for instructional technology. *Educational Technology*, 31 (5), 3–12.

Brown, J.S., Collins, A., & Duguid, P. (1989). Situated cognition and the culture of learning.*Educational Researcher*, 18(1), 32–42.

Norman, D.A., Spohrer, J.C. (1996). Learner-Centered Education. *Apple Computer INC*.

Pitchard, A.(2009). Ways of Learning: Learning theories and learning styles in the classroom, Cognitive, constructivist learning (pp. 17-33), *London and NewYork, Routledge.*

Mirza, A. (2012). Comparing the Effectiveness of Classroom and Online Learning: Teaching Research Methods. *Journal of Public Affairs Education*. JPAE 19(2), 199–215

Benson, L., Elliot, D., Grant, M., Holschuh, D., Kim, H., et al. (2002). Usability and instructional design heuristics for e-learning evaluation. In Proceedings of World Conference on Educational Multimedia, Hypermedia and Telecommunications (pp. 1615-1621). *Presented at the World Conference on Educational Multimedia, Hypermedia and Telecommunications (EDMEDIA),* Chesapeake, VA: AACE.

Fulford, C. P., & Zhang, S. (1993). Perceptions of interaction: the critical predictor in distance education. *American Journal of Distance Education*, 7 (3), 8 – 21.

Kumari, D. S. (2001). Connecting graduate students to virtual guests through asynchronous discussions: Analysis of an experience. *Journal of Asynchronous Learning Networks,* 5(2), 53–63.

Sherry, L. (1996). Issues in distance learning. *International Journal of Distance Education,* 1 (4), 337–365.

Davies, J., & Graff, M. (2005). Performance in e-learning: Online participation and student grades. *British Journal of Educational Technolo*gy, 36 (4), 657–663.

Rovai, A. P. (2002). Sense of community, perceived cognitive learning, and persistence in asynchronous learning networks. *Internet and Higher Education*, 5, 319–332.

Govindasamy, T. (2002). Successful implementation of e-Learning pedagogical considerations. *Internet and Higher Education 4* , 287–299.

Davies, D. (2003). Design content for blended learning solution. E-*Learning Conference*, Manchester, 18–19 March.

Barkley, E. (2010). *Student engagement techniques: A handbook for college faculty*. San Francisco: Jossey-Bass.

Coates, H. (2006). *Student engagement in campus-based and online education: University connections.* London: Routledge.

Bryson, C. and Hand, L. (2007a) Do staff conceptions of good teaching and learning approaches align with enhancing student engagement?. *Presented at Higher Education Research and Development Society of Australia Conference*.

Hockings, C., Cooke, S., Yamashita, H., McGinty, S. and Bowl, M. (2008b) Switched off? A study of disengagement among computing students at two universities. *Research Papers in Education*, 23 (2), pp.191-201.

Margulieux, L. E., Bujak, K. R., McCracken, W. M., & Majerich, D. M. (2014). Hybrid, Blended, Flipped, and Inverted: Defining Terms in a Two Dimensional Taxonomy. *Proceedings of The Hawaii 12th International Conference on Education*, 12, 2394-2402

Strayer, J. (2012). How learning in an inverted classroom influences cooperation, innovation and task orientation. *Learning Environments Research,* 15(2), 171-193. doi: 10.1007/s10984 012-9108-4.

Johnson, D. (2012). Power up!: Taking charge of online learning. *Educational Leadership*, November, 84-85

Carpenter, J.P., & Pease, J.S. (2012). *Sharing the learning. Kappan,* 94(2), 36- 41. October, 36-41.

Graham, C.R. (2006). *Blended Learning Systems: Definition, Current Trends, and Future Directions. In C. J. Bonk & C.R. Graham (Eds.),* The handbook of blended learning: global perspectives, local designs. San Francisco, CA: Pfeiffer, 3-21.

Zimmerman, B.J. (2002). Becoming a self-regulated learner: An overview. *Theory into Practice*, 41 (2), 64–71.

Freeman, S., Eddy S.L., McDonougha, M., Smithb, M.K., Okoroafora, N., Jordta, H. & Wenderotha, M.P. (2014). Active learning increases student performance in

science, engineering, and mathematics. *Proceedings of the National Academy of Sciences of the United States of America*, 111(23), 8410–8415.

Bonwell, C.C. & Eison, J.A. (1991). Active Learning: Creating Excitement in the Classroom. ERIC Digest. *ERIC Clearinghouse on Higher Education*.

Prince, M.J. (2004). Does active learning work? A review of the research. *Journal of Engineering Education*, 93(3), 223-231.

Butt, A. (2014). Student views on the use of a flipped classroom approach: evidence from Australia. *Business Education Accreditation*, 6(1), 33–43

Kong, S.C. & Song, Y.(2015), An experience of personalized learning hub initiative embedding BYOD for reflective engagement in higher education, Computers& Education. *Journal of Elsevier*, pp.227-240.

Schultz, D., Duffield, S., Rasmussen, S., & Wageman, J. (2014). Effects of the flipped classroom model on student performance for advanced placement high school chemistry students. *Journal of Chemical Education*, 91(9), 1334-1339. doi: 10.1021/ed400868x

Pierce, R. & Fox, J. (2012). Vodcasts and active-learning exercises in a "flipped classroom" model of a renal pharmacotherapy module. *American Journal of Pharmaceutical Education*, 76(10), Article 196. doi: 10.5688/ajpe7610196.

Tune, J.D., Sturek, M., & Basile, D. P. Flipped classroom model improves graduate student performance in cardiovascular, respiratory, and renal physiology. *Advan in Physiol Education*. 37:(4) 316-320. doi:10.1152/advan.00091.2013

Mok, H. N. (2014). Teaching tip: The flipped classroom. *Journal of Information Systems*, 25(1), 7-11.

Strayer, J. (2012). How learning in an inverted classroom influences cooperation, innovation and task orientation. *Learning Environments Research*, 15(2), 171. doi:10.1007/s10984-012- 9108-4

Mason, G., Shuman, T., & Cook, K. (2013). Comparing the effectiveness of an inverted classroom to a traditional classroom in an upper-division engineering course. *IEEE Transactions on Education*, 56(4), 430-435. doi: 10.1109/TE.2013.2249066

Missildine, K., Fountain, R., Summers, L., Gosselin, K. (2013). Flipping the classroom to improve student performance and satisfaction. *Journal of Nursing Education*, 52(10), 597-599. doi: 10.3928/01484834-20130919-03.

Albert, M. & Beatty, B. J. (2014). Flipping the classroom applications to curriculum redesign for an introduction to management course: Impact on grades. *Journal of Education for Business*, 89(8), 419-424. doi: 10.1080/08832323.2014.929559.

Moffett, J. & Mill, A. C. (2014). Evaluation of the flipped classroom approach in a veterinary professional skills course. *Advances in Medical Education and Practice,* 5, 415-425.

Nat, M. (2015). A Flipped Classroom Model for Developing Universities in Developing Countries. *Global Learn 2015* - Berlin, Germany

Goetz, J., & LeCompte, M. (1984). *Ethnography and qualitative design in educational research.* New York: Academic Press.

William, R. P., Barry J. Fishman, Britte H. C., and Nora S. (2011). Organizing Research and Development at the Intersection of Learning, Implementation, and Design. *Educational Researcher*, Vol. 40, No. 7, pp. 331–337.

Stake, R. E. (1995). The art of case study research. Thousand Oaks, *CA: SAGE Publications.*

Yin, R. K. (2002). Case study research: Design and methods. *Thousand Oaks, CA: SAGE Publications.*

Creswell, J. W., Hanson, W. E., Plano, V. L. C., & Morales, A. (2007). Qualitative research designs selection and implementation. *The Counseling Psychologist*, 35 (2), 236-264.

Merriam, S. B. (1998). *Qualitative research and case study applications in education*. San Francisco, CA: Jossey-Bass.

Hamdan, N., McKnight, P., McKnight, K. & Arfstrom, K. (2013).A Review of Flipped Classroom.*A Report by George Mason University*.

Rossi, P., & Freeman, H. (1993). Evaluation: a Systematic Approach. *London: Sage Publications.*

Denzin, N. K. , Lincoln, Y. S. (2000). Handbook of Qualitative Research. *London: Sage Publications.*

Yin, R. K. (1984). Case study research: Design and methods (1st ed.). *Beverly Hills, CA: Sage Publications.*

Joppe, M. (2000). *The Research Process*. Retrieved February 25, 1998, from http://www.ryerson.ca/~mjoppe/rp.htm

VanWynsberghe, R., & Khan, S. (2007). Redefining case study. *International Journal of Qualitative Methods*, 6(2), Article 6.

McLaughlin, J. E. , Roth, M. T., Glatt, D. M. , Gharkholonarehe, N., Davidson, C. A., Griffin, L. M., Esserman, D. A. and Mumper, R. J. (2013). The Flipped Classroom: A Course Redesign to Foster Learning and Engagement in a Health Professions School. *Academic Medicine*, Vol. 89, No. 2.

Patricia, I. F. & Lawrence, R. N. (2015). *Are We There Yet? Data Saturation in Qualitative Research.* The Qualitative Report. Vol 20, Number 9.

Hung, W., David, H. and Rude, L. (2008). *Problem-based learning*. Handbook of research on educational communications and technology, 485-506.

Mennin, S. P., Martinez, B. (1986). The cost of problem-based vs traditional medical education. *Med. Educ* 20:187-94.

Bergmann, J., Sams, A. (2012). Flip your classroom: reach every student in every class every day. *Eugene, OR: International Society for Technology in Education*.

Lage, M. J., Platt, G., Treglia, M. (2000). Inverting the classroom: a gateway to creating an inclusive learning environment. J Econ Educ.

Glynn J. J. (2013). The effects of a flipped classroom on achievement and student attitudes in secondary chemistry. Master thesis, Montana State University.

Horvat, A. , Dobrota, M., Krsmanovic, M. & Cudanov, M. (2013). Student perception of Moodle learning management system: a satisfaction and significance analysis. Interactive Learning Environments. Vol. 23, No. 4, 515–527.

Campbell, D. and Fiskel, D. 1959, Convergent and Discriminant Validation by the Multitrait- Multimethod Matrix, *Psychological Bulletin*, 56: 81-105.

Webb, E. et al 1966, Unobtrusive Measures: Non-reactive Research in the Social Sciences, *Chicago: Rand McNally*.

Denzin, N. 1970, *The Research Act in Sociology*, Chicago: Aldine.

Tretten, R., Zachariou, P.: Learning about Project-based Learning: Self-Assessment Preliminary Report of Results. San Rafael, CA, *The Autodesk Foundation*, 1995

Tretten, R., Zachariou, P. (1997). Learning about Project-based Learning: Assessment of Project-based Learning in Tinkertech Schools. *San Rafael, CA, The Autodesk Foundation,*

Bartscher, K., Gould, B., & Nutter, S. (1995). Increasing student motivation through project- based learning (Master's Research Project). *Saint Xavier and IRI Skylight (ED 392 549).*

Horan, C., Lavaroni, C., & Beldon, P. (1996). Observation of the Tinker Tech Program students for critical thinking and social participation behaviors. Novato, *CA: Buck Institute for Education.*

Lamar, D. G., Pablo, F. M. , Manuel, A. , Rodríguez, A. , Rodríguez, M. and Javier S.(2010). A Project-Based Learning Approach to Teaching Power Electronics. IEEE Educon Engineering- *The Future of Global Learning Engineering Education*. DOI 10.1109

Mayer, K. and Wurdinger, S. (2015). Students' Perceptions of Life Skill Development in Project-Based Learning Schools. *Journal of Educational Issues*. ISSN 2377-2263 2016, Vol. 2, No. 1

Kannan, R. , Mahajan, S., Rajkumar, R. (2016). An Approach on Effective & Efficient Project-Based Learning (PBL). *International Journal of Applied Engineering Research*. ISSN 0973-4562. Vol. 11, No. 8, pp 5920-5926.

Carr, M. and Fhloinn, N. E. ()

Adam Butt, A. (2014). STUDENT VIEWS ON THE USE OF A FLIPPED CLASSROOM APPROACH: EVIDENCE FROM AUSTRALIA Australian National University. *BUSINESS EDUCATION and ACCREDITATION*, Vol.6.

Zhao, Y. and Ho, A. (2014). Evaluating the Flipped Classroom in an Undergraduate History Course. *Harvard Graduate School of Education*.

Johnson, G., B. (2006). STUDENT PERCEPTIONS OF THE FLIPPED CLASSROOM. *Master Thesis. Coppin State University*

Moraros, J., Islam, A., Yu, S., Banow, R., and Schindelka, B. (2015). Flipping for success: evaluating the effectiveness of a novel teaching approach in a graduate level setting. *BMC Medical Education*. DOI 10.1186/s12909-015-0317-2

APPENDICES

Appendix A: Questionnaire

Questionnaire for students

This questionnaire is used for a research and aimed at investigating students' perceptions and attitudes of mobile learning as a learning tool at Eastern Mediterranean Universities. In this research, mobile learning is defined as the use of new technological devices for learning purposes incorporated in class. Examples comprise smartphones, iPad, Laptop, Netbooks or PC which makes students able to get access to the Internet, reading lecture notes or articles, watching videos and etc.

Thanks for your support and participation.

General personal information:

1. Gender:

○ Male

○ Female

2. Age

○ 18-20

○ 21-25

○ Over 26

3. Nationality

○ Asia

○ Africa

○ Europe

○ Other ……..

Questions	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Mean	Std. Deviation
The flipped classroom is more engaging that traditional classroom instruction.							
I would not recommend the project-based flipped classroom to a friend.							
The project-based flipped classroom gives me a greater opportunity to communicate with other students.							
I like to study with online materials like PowerPoint slides and online videos.							
I would rather have the entire class moving at the same pace in the course.							
I am spending less time working on the traditional Cryptography project.							
I would rather watch a traditional teacher-led lesson than online materials.							
I dislike self-pace myself through the course.							
I find it easier to pace myself successfully through the course.							
I am spending less time working on the project-based flipped classroom to practice Cryptography.							
I am more motivated to learn Cryptography in the project-based flipped classroom.							

The project-based flipped classroom has improved my learning of Cryptography.							
More university units should use project-based flipped classroom approach.							
Short videos in project-based flipped learning are more effective than traditional face to face lectures.							
My experience in this course has been better than the traditional classroom approach.							
For the past few weeks in the class, I communicated a lot with students, particularly with my group members.							
For the past few weeks, I had to work hard in the class.							
The availability of course materials, communication and assessment tools helped me to improve my learning.							
Over the past few weeks, I needed a technical assistant for this class.							
The project I have worked on this course deals with real life applications and information.							

Compared with traditional learning, I believe that mobile learning (is)…

Questionnaire	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
More initiative and dynamic					
More portable device, more flexible learning					
Enhances daily learning					
Utilizes the "pieces of time"					
Broadens the knowledge					
Enables high engagement					
Ensures study effectiveness					
Provides a better alternative to study					

Appendix B: Interview Questions

1. What are the main advantages of the project-based flipped classroom?

2. What are the disadvantages of the project-based flipped classroom?

3. Would the project-based flipped classroom be useful for other subjects? Why or why not?

4. What improvements would you recommend to improve learning in the project-based flipped classroom?

5. Please state any other comments you wish to make about the project-based flipped classroom.

Appendix C: Turnitin Originality Report

Turnitin Originality Report

Thesis by Mobina Behesh

From mobina (SCHOOL OF COMPUTING AND TECHNOLOGY)

- Processed on 13-Jul-2016 09:37 EEST
- ID: 689374495
- Word Count: 17114

Similarity Index
17%
Similarity by Source

Internet Sources:
15%
Publications:
9%
Student Papers:
7%

sources:

1 1% match (Internet from 22-Jun-2014)

http://ocw.metu.edu.tr/pluginfile.php/3298/course/section/1174/peggy_2013_comparing_critical_features.pdf

2 1% match (student papers from 30-Aug-2015)
Class: SCHOOL OF COMPUTING AND TECHNOLOGY
Assignment:
Paper ID: 564772539

3 1% match (student papers from 02-May-2016)
Class: SCHOOL OF COMPUTING AND TECHNOLOGY
Assignment:
Paper ID: 668521439