GAMIFICATION IN E-LEARNING: THE EFFECT ON STUDENT PERFORMANCE AND PERCEPTION AT AN IRAQI UNIVERSITY

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GAMIFICATION IN E-LEARNING: THE EFFECT ON STUDENT PERFORMANCE AND PERCEPTION AT AN IRAQI UNIVERSITY

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ABSTRACT

GAMIFICATION IN E-LEARNING: THE EFFECT ON STUDENT PERFORMANCE AND PERCEPTION AT AN IRAQI UNIVERSITY

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Creating an effective environment in e-learning is one of the challenges that are encountered by educational and pedagogical institutions to increase the engagement and motivation of students during the educational process. One method to make an e-learning environment effective and attractive is the application of the gamification concept, which improves learners' engagement by integrating e-learning with game design elements. The aim of this study is to analyze the effects of gamification elements such as (points, level-up, badges and leaderboard) in Moodle system on students' performance and perception. Forty-seven Iraq University students were participated in the online Architecture course into two different settings. Thirty students of the experimental group worked with gamification tools (points, level-up, badges and leaderboard) and seventeen students of the control group had access to the same session and activities but without the gamification tools. Data sources included students' grades of pre and post-tests on papers and students' survey results of experimental group according to the Technology Acceptance Model (TAM). The results indicated that students in the experimental group had no statistically significant

difference from the control group regarding the student's performances on pre-test scores, whereas the experimental group students had higher grades than the control group students indicating a statistically significant difference regarding the students' performances on post-test scores. Furthermore, nearly all students in the experimental group strongly agreed that using the gamification tools (points, level-up, badges and leaderboard) in Moodle system were engaging and beneficial in education.

Keywords: Gamification, e-learning, students' performance, students' perception.

OZ

E-ÖĞRENİMDE OYUNLAŞTIRMA: BİR IRAK ÜNİVERSİTESİ'NDE ÖĞRENCİ PERFORMANSI VE ALGISI ÜZERİNE BİR ÇALIŞMA

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Öğrenmede etkin bir ortam oluşturmak, eğitim ve pedagojik kurumların, eğitim sürecinde öğrencilerin katılımını ve motivasyonunu arttırmak için karşılaştıkları zorluklardan biridir. Bir e-öğrenme ortamını etkili ve çekici kılmak için oyun tasarım unsurlarıyla e-öğrenmeyi entegre ederek öğrencilerin katılımını artırmayı ve dolayısıyla perfomanslarını artırmayı amaçlayan oyunlaştırma konseptinin uygulanması araştırmaya değer bir yöntemdir. Bu çalışmanın temel amacı, Moodle öğrenme yönetim sistemindeki (puan, seviye, rozet ve puan listesi gibi) oyun elemanlarının öğrencilerin performans ve algıları üzerindeki etkilerini incelemektir. Kırk yedi Irak'lı Üniversite öğrencisi, çevrimiçi Tasarım dersinin iki farklı grubu olarak çalışmaya katılmıştır. Deney grubunda yer alan 30 öğrenci oyunlaştırma araçları (puan, seviye, rozet ve puan listesi) ile çalışmış ve kontrol grubunun on yedi öğrencisi ise aynı içerik ve etkinliklere erişmiş, ancak oyunlaştırma araçları kullanmamışlardır. Bu çalışamanın veri kaynakları, öğrencilerin Teknoloji Kabul Modeli'ne (TAM) göre kağıt üzerinde uygulanan ön ve son test notlarını ve deney grubu öğrencilerinin doldurduğu anket sonuçlarını içermektedir. Araştırmada, deney ve kontrol gruplarındaki öğrencilerin çalışma öncesi uygulanan ön test sonuçları arasında istatistiksel olarak anlamlı bir fark bulunmadığı, ancak çalışma sonrası uygulanan son test sonuçlarına göre deney grubu öğrencilerinin kontrol grubundaki

öğrencilere göre istatistiksel olarak anlamlı olarak daha yüksek not aldığı bulunmuştur. Ayrıca, deney grubundaki öğrencilerin neredeyse tamamı, Moodle sisteminde oyun araçlarını (puan, seviye, rozet ve puan listesi) kullanmanın eğitimde ilgi çekici ve faydalı olduğunu belirtmişlerdir.

Anahtar Kelimeler: Oyunlaştırma, e öğrenme, öğrencilerin performansı, öğrencilerin algıları.

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LIST OF ABBREVIATIONS

TAM	Technology Acceptance Model
LMS	Learning Management System
MOODLE	Object Oriented Dynamic Learning Environment
SPSS	Software Package Statistical Science

CHAPTER 1

INTRODUCTION

1.1 Purpose of the Study

Education has become a great concern in societies that rely on modern technology and in which many efforts have been made for more effectiveness and availability to learners. Traditional teaching techniques, such as the use of blackboards, lectures, books and written exercises, have been the main elements to transmit knowledge. Teachers have continuously sought new methods and instructional approaches; however, traditional education has been considered inefficient and boring by many students in which today's schools face huge problems around student motivation and engagement to learn [1]. The reasons are as per the following: it makes students unable to think outside the curriculum because they repeat what the teacher presents students concentrate only on exams as opposed to endeavoring to understand the scientific content of their subjects. In the traditional teaching mechanism, many university students hesitate to state their opinions or avoid asking questions in front of other students during classroom lectures since they wish to avoid embarrassment or confusion, or simply because they need some practice speaking in front of an audience. The last reason is that some students who study and work ordinarily have problems in arriving punctually to their first courses. This lowers the level of student participation in discussions in addition to causing late completion by some student's assignments and tasks [2]. We therefore require a different learning environment that is conducive to learning supported by information technology to assist students obtaining and generating knowledge by transferring their own knowledge and experiences, and simultaneously trying to generate interest in the current chosen topics, and in the teamwork and also to be able to develop interactions with other team members, all of which is E-learning. E-learning is utilization of information and telecommunication technology to deliver information for education and training [3].

E-learning is being introduced in universities as a basic a part of a student learning experiment in higher education. It is not basic work only for those universities with

the task of distance education; it is also integrated into campus-based universities [4]. The application of e-learning will be a solution to overcome the obstacles of space and time in learning. Researchers have been operation for a long time to improve the effectiveness of e-learning, resulting in a modified e-learning model from teaching to learning [5], [6].

However, numerous e-learning units fail to accomplish the required result in absence of learning and information of strategies and techniques to advance information systems of on-line management. Researches on information system indicates students' satisfaction to be the most significant among fundamental aspects in evaluating e learning systems success [7].

Researchers have analyzed the reason for some students ceasing their e-learning after their primary experiment. They detected a few causes for students' weak "efficiency, effectiveness, satisfaction and motivation" in e-learning, several of which include weakly the project of managed, Ignore the key stages of the e-learning development, using inappropriate technology in e-learning systems and bad graphical interfaces [3]. It is through the application of the concept of gamification that we increase the efficiency, effectiveness, motivation and satisfaction of students in e-learning. The term "gamification" refers to the use of game elements and tools such as the mechanics and dynamics in the field that are not a computer game [3].

Gamification as a rising trend has been recognized by many researchers and institutions such as Gartner Research [8], [9], [10]. In 2013, gamification was positioned as an innovation whose development should be followed with exceptional importance [11], [12]. Approximately one decade ago, it was found that the use of computer game elements can have a positive effect on the psychological characteristics of students and learning behavior [13].

The main purpose of this study was to combine the characteristics of gamification with e-learning that defined what all the elements of computer games are thought to be specifically considered when creating online courses in addition to how they can be effectively implemented in the (re)design of existing online learning systems. As another goal, we investigate the effects of gamification in e-learning on learners' performance and perception and how it is possible to make the contribution enjoyable with the aim of reducing the rate of frustration during the learning process; therefore, we used the Technology Acceptance Model (TAM) [14] in a survey that examined the effect of using gamification tools in the e-learning platform on student performance

and perception. This, therefore, will provide those responsible for the management and development of online learning programs with important information about performance and perceptions of students regarding the use of gamification tools in the e-learning environment so that they can enhance the effectiveness of online learning and create mechanisms to encourage students to adopt it.

1.2 Significance of the Study

Application of gamification in the learning context is a modern educational approach that combines the benefits of the elements of gamification with learning goals. Gamification can be defined in general as "the use of game design elements in non-game contexts," [15] adopting a simplistic strategy to determine game element tools such as points, level-ups, badges and leaderboards. These elements are explained in detail in Chapter 2.

The research [7], [16], [17], [18] conducted in this area shows that the positive effects of gamification can be useful to promote learner engagement with learning activities progress and its impact on student performance towards education. So far, these studies have focused on the theoretical aspects and presented little statistical information on the potential advantage of this approach; therefore, their appropriateness to traditional classroom setups is limited. Empirical data, therefore, are required to promote any connection between gamified setups and motivate students. In this study, we will focus on the context of online education, especially in the field of computer engineering. Related theoretical and empirical analyses are presented in addition to a proposal for the standardization of elements of games that might come into consideration for implementation with the learning management system (LMS) Moodle, which we have tested on a course at an Iraqi university to obtain qualitative and quantitative data from students. There is still little work on this subject. Therefore, the results in this contribution compare with previous studies presented in the conclusion (Chapter 5) will be important and practical for teachers working in a range of educational contexts and at all levels of education, as well as for those who wish to increase student participation and promote learning.

In this study, we provide the following contributions to the literature:

- A presentation of the design and evaluation of a gamified e-learning experience in Iraqi university settings.

- We reveal the potential of gamification on learners' performance and perception in e-learning environments.

1.3 Research Questions

The following research questions guided our study:

1. What are the effects of gamification tools (points, level-up, badges and leaderboard) in the Moodle e-learning environment on learners' Architecture course performance?
2. What are the perceptions of the learners about the gamification tools (points, level-up, badges and leaderboard) in the Moodle e-learning environment according to the Technology Acceptance Model (TAM)?

CHAPTER 2

LITERATURE REVIEW

In this study, we discuss the theory of games and e-learning. In order to comprehend gamification, it is essential to have a fundamental comprehension of games. It is not important to be actually knowledgeable in producing computer games. However, it is still better to comprehend the essential thought of how games work.

This chapter presents the essential game elements and mechanics that are used in gamification. First, the concept of e-learning, the fundamentals of gamification, and game elements are covered, followed by an introduction of the tools of gamification in e-learning.

2.1 Higher education and e-learning

The Universities execute regularly higher education. Students select a field of study commensurate with their needs and address their issues, thereby contributing to greater seriousness in their study. Higher education is increasingly being carried out in the e-learning form [7].

E-learning is defined as information and communication technology used to help students to improve their learning [19]. [20] describes e-learning as the system capacity to transmit, administer and oversee electronically learning information and learning materials. E-learning has its advantages [7], the e-learning system and online applications are extremely well known, enabling clients to access data specifically through the Internet [21], which means e-learning enables learning from any location at any time, thereby allowing the learner to control course information (with regard to convenience and flexibility) including delivery to management, academic establishments and professional organizations, which embrace e-learning by implementing an expanding array of technology enabled platforms [22].

The study of students' learning experience in higher education is targeted at students' traits like the interpretation of learning they have when enrolling in courses and the

framework of teaching, such as teaching techniques, the learning context, such as student conception of the teaching quality and the amount of work, the students' approach to study, their activity, reasons for approaching study in certain manners, as well as their learning results quality [7].

Furthermore, higher education has recently been subjected to important changes. The requirement to develop e-learning has become necessary and it can be handled more effectively on the basis of the theory of gamification [23]. The use of gamification increases student satisfaction, participation, effectiveness and efficiency. The correct incorporation of e-learning, gamification, and tasks for learners increases the motivation to learn [7].

2.2 Gamification

The first authenticated use of the term "gamification" occurred in 2008 [24] and the term was simply known for the use of game design elements in non-game contexts. Since 2008, the scope of gamification as a concept has been expanded and identified by others as follows:

1) The operation of thinking and mechanics games to solve problems [24].
2) The use of game mechanics and dynamics to enhance behaviors [24].
3) The use of game mechanics in non-game environments such as marketing, functional and medical fields [10] [11].
4) The use of gamification game mechanics, game thinking and aesthetics to interact with people, stimulate action, enhance learning and resolve issues [25].

The gamification of pedagogical concepts does not essentially involve a real game or information technology. That requires the incorporation of design elements or patterns of activity commonly present in games into contexts of education in order to increase user participation in the performance various types of activities in a non-gaming context, especially if these activities tend to be considered uninteresting or routine [26]. This thinking puts the games on a different standard. They are not only tools for entertainment but also for inspiration, participation and persuasion [27]. Gamification has recently been employed in several various areas [28] in an effort to ameliorate the results of employees in developing their daily tasks and work [29] and using gamification tools in e-learning [30]. Gamification has some common elements with behavioral learning theory, such as positive reinforcement, instant feedback, and progressive challenges. Educational gamification suggests that using the

characteristics of games, such as systems of rules and/or a rewards system, have role in shaping the behavior of learners [31].

2.3 Gamification Elements

According to [7], games can be defined as “a form of play with goals and structure”. Recreational games offer interesting activities. Computer-supported gamified services [7] are all designed to structure, support and stimulate exercise activities [32]. It has also been proposed that players elaborate skills of literacy and problem solving in business games, and that good business games are good basis for learning providing chances for players to actively throughout play [7].

“Game elements” can be known as “elements that are characteristic to games” [33].

The game elements may be separated into two different categories, namely "game mechanics and game dynamics" [34]. "Game mechanics" are identified as varied acts, behaviors and mechanisms of control involved in “gamified” activity, such as "points, levels, badges, virtual goods, leaderboards, and virtual gifts" [33], [34]. A game is determined as system that has rules, determines content units, the way everything acts and the way players collaborate within the game universe. The dynamics of game are defined stimuli which include rewards, ranks, achievements, individuality, competition and altruism.

We will explain game mechanics and dynamics and how gamification can be leveraged in learning.

According to [34], (see Table 1) the *x*-axis is a measure of human desires; therefore, these are the emotions which are basically dynamics. The *y*-axis measures the causes which represent game mechanics. Game mechanics are the triggers or the causes which would lead to these emotions, which means game mechanics act on the emotions or on human desire to push the student to perform various activities or produce results related to these emotions. Therefore, if we can apply this mechanic, we will obtain these dynamics.

Table 1: Game Mechanics and Dynamics

Game Mechanics	Game Dynamics						
		Rewards	Ranks	Achievement	Individuality	Competitions	Altruism
	Points	★	○	○		○	
	Levels		★	○		○	
	Badges	○	○	★	○	○	
	Virtual goods	○	○	○	★	○	○
	Leader Boards		○	○		★	
	Gifting		○	○		○	★

In Table 1, the black symbols suggest which one of these primary emotions are triggered with these dynamics, while the white symbols show other possible emotions that are affected by game mechanics. As an example, points are one of the gaming mechanisms and if a point is earned, the user feels rewarded this is human desires or emotion are triggering to motivation to get more points, while possibly effect rank, achievement and accomplishment. When the user increasing points, he moves to the first or second level, thereby the user will rise in rank, which will trigger his emotions. When the user receives badges in the game, it means the user achieves something, thus creating motivation for the user to meet further challenges, and so on with virtual goods, leader boards and gifting**.**

Therefore, emotions become triggered by these dynamics. The use of these elements in e-learning systems causes human emotions to trigger with far more engagement and so a small level of fun, as opposed to a level of an extreme excitement or stress, will still keep the focus of the mind on learning.

Technology and Psychology are used in gamification, which is why it has become popular to the extent that it has become a part of society because there is heavy use of technology, which is growing in society and affecting its psychology. Therefore, the application of these elements increases user experience and engagement to learn. We will explain the most common elements in game mechanics: points, levels, badges/challenges and leaderboard.

2.3.1 Points

These are awarded to learners to motivate them throughout courses and activities. They can be used to drive desired behaviors, signify status in a course, and even unlock new learning stages or rewards. Most studies have found that points supplied immediate feedback, which in turn detected it to motivate students.

The use of points should occur in combination with other elements of gamification, such as levels and leaderboards in order to be efficient in motivating students. This fact was identified by many researchers in [35], [16], [36]. Points are awarded in a wide selection of tasks, including completion of quizzes, attending lectures, participation in class exercises, resolution puzzles, creative thinking in assignments, completing practice questions, or correct answers [37]. It was discovered that giving points was effective in increasing intrinsic motivation [37]. The students found a points-based gamification system to be somewhat motivating and quite attractive [38]. This motivation may be due to the points supplying learners with instant feedback for the completion of an activity or task [37]. It was found that immediate feedback was a "key aspect of gamification, in that it solidifies the connection between doing right and being rewarded for it" [37, p.246].

2.3.2 Levels

One of the key elements that make for successful gamification is ensuring suitable progression and sequencing through content and activities in a manner that does not leave the learner disappointed and instead ensures an appropriate level of challenge [39]. Levels help learners understand when they have reached a milestone or a level of accomplishment. Many also use levels as an opportunity to provide meaningful feedback and highlight areas for improvement and allow the division of a game into small pieces that are detached and accessible. Advancing to higher levels is usually a powerful stimulus for continuous effort [40]. To implement the levels, users should earn points. After obtaining a predetermined number of points, users move up to another level [40]. Levels positively affect student motivation and participation in learning, where researchers have found that 93% of students follow their levels and achievements, while 89% work actively to acquire achievements. As a result, course designers may want to ensure that there are clear criteria available to students to review

how to earn higher levels. If points are used to select "leveling," designers can specify the quantity of points required prior to reaching the next level [40].

2.3.3 Badges

Badges help to motivate learners to do more, innovate faster, and work smarter than others. Challenges that are a somewhat difficult but meaningful for learners with visible recognition will motivate them to strive higher and work harder.

Badges are symbolic rewards given to students for "any kind of skills, knowledge, or achievement" [37] that can be displayed to learners to "let others know their mastery or knowledge." They are typically specific [16], [41].

Badges introduce a social element to courses by permitting students to compete with other learners who are working towards identical goals [42]. If social participation is integrated into the curriculum, extra esteem of their achievements from friends and family [42]. Learners generally granted access for reviewing badges they have and check the demands for gaining new badges [41].

There are results regarding the effect of badges on a learner's motivation and performance [37], [43]. It was found that the badges "had a catalytic effect that was required". Similarly, it was reported in [41] that students feel gratified for carrying out their homework and expressed additional appreciation when they were awarded with a badge for their achievement. According to [41], it was determined the presence of a difference in patterns of obtaining badges for students having varying levels of previous knowledge, where participation badges were given to low-performing students, while skills badges were awarded to higher-performing students with the aim of increasing motivation for both groups.

2.3.4 Leaderboard

The leaderboard is the element most used in gamification tools, and there are results regarding the effect of leaderboards on motivating students [37]. They are basically scoreboards that display progress and arrange learners to help them measure their performance against their peers. For competitive students, leaderboard provide immediate feedback and allow learners to constantly attempt to improve their rankings. A leaderboard generates contest and a feeling of being among a group with similar thinking while allowing learners to compare their performance with another students' performance [37]. Leaderboard depend on the points system, on the number of

achievements made by learners, or on the progress of the learner towards a final goal [16]. This allows learners in spending all their time comparing their accomplishments with others without letting anyone else know "that they are constantly involved in such a social comparison" [41]. Researchers have shown that "leaderboard" are a "source of motivation because students can see their work publicly and are instantly recognized" [16]. In addition, leaderboards shown inspire to students "participants to maintain their performance for longer, compared to points and control groups" [37].

2.4 Gamification with E-learning

Although e-learning is one of the newer and innovative solutions in education, it still lacks emotional interaction with students. This concern indicates that the sense of participation through the system is not well perceived. The gamification concept creates participation of students through the educational environment in order to increase their motivation by using game techniques such as scoreboards and immediate feedback [16]. Combination of e-learning and gamification will assist to create a studying environment that makes learners feel more stimulated and involved to accomplish the assigned task.

Games usually allow players to restart or play once more, making recoverable errors. This freedom of failure permits students to have experiences without fear, thereby increasing student participation [7]. Gamification should be true to programmed learning or system-based learning, which confirms only the reconciliation of new technology with the theory [44]. The core of gamification is beyond the technology it is also in the varied educational environment as well as in the system of decisions and rewards, and all aim to increase stimulus and access to higher levels of participation in the learning process [7]. Well-designed educational games provide continuous opportunities for player improvement, large amounts of feedback, and very complex tasks for each individual to solve alone as well as environments that change in response to learners' actions [7]. Much of the research [45], [46], [47] that has concentrated on using gamification to enhance participation has been to find methods to stimulate students to engage more with the core theme of learning. Attention is focused on increasing participation in training, education, education in general and various classroom activities and e-learning platforms.

One of the most remarkable instances of gamification, coming from Volkswagen's "Fun Theory Initiative," is the piano staircase in the Odin plan that turns the stairs at a train station into a piano that is activated using footsteps. This has led to large growth in the number of people using the staircase instead of the escalator next to it [48]. Therefore, the side of gamification is the idea of competition and competition occurring under the rules of the game. Where there is no great penalty for failure, this competition can be either against another player or another team or against one's previous achievements. However, the element of competition or the attempt to beat any opponent, or even a previous result, will psychologically affect the player to play more [49].

2.5 Chapter Summary

The concept of gamification not only pertains to using game elements, it also contains aspects of game design and game technique, which are important. The player's experience is not only affected by the elements of the game, but through the interaction between all these aspects, it affects how they meld in to the objectives of the gamified system. This "melding" is achieved through the suitable use of game design and game techniques. Therefore, this study is an initial attempt to understand the views of learners and their performance in this matter by interaction with the game design and game techniques in the e-learning system.

CHAPTER 3

METHODOLOGY

In this chapter, the methodology behind this study is presented. The first part describes the design of the study, participants and procedure followed by a presentation of the data collection methods.

3.1 Design of the Study

The main goal in this study is to combine the characteristics of gamification tools with e-learning system and to examine the effects of using gamification tools (points, level-up, badges, and leaderboard) in Moodle system on learners' performance and perception. In this study, the experimental research methodology used is shown in Table 2.

Table 2: Study Experimental Design

Groups	**Pretest**	**Treatment (3 weeks)**	**Posttest**	**Difference**
Experimental Group	Pretest-Architecture material on paper	Online Architecture course **with gamification tools (points, level-up, badges and leaderboard)** in Moodle system	Posttest-Architecture material on paper & **online survey** about their attitude towards **using gamification tools (points, level-up, badges and leaderboard)** in Moodle system **according to TAM**	Compare the pre- and post-test and Analyze the survey results for the experimental group
Control Group	Pretest-Architecture material on paper	Online Architecture course **without gamification tools** in Moodle system	Posttest-Architecture material on paper	

3.2 Participants

This study, the experiment of using gamification tools in an e-learning system was held for three weeks. At first, the participants were 70 students from (Computer Engineering Department at Wasit University in Iraq /fourth level/ one class). Their age ranged from 18- 25. The participants were examined with pre-test on paper and assigned randomly into two groups (35 students in each group) to enroll in online Architecture course in Moodle system. The only difference was that one of the two groups had been implemented with gamification elements (points, level-up, badges and leaderboard) in online Architecture course. Both groups were examined post-tests on paper. Only 47 participants (26 male students and 21 female students) of both group who attended online Architecture course were included into analysis in order to compare their knowledge of the Architecture course and to determine how gamification tools (points, level-up, badges and leaderboard) in Moodle system affected learners' performance. We used Google Survey for experimental group which measured the learners' achievement goals and their perceptions about using (points, level-up, badges and leaderboard) in Moodle system according to the Technology Acceptance Model (TAM).

3.3 Procedure

In this study, Moodle version 3.3.2 was used to simulate the e-learning process [see Figure 39 in Appendix A]. The Modular Object-Oriented Dynamic Learning Environment, one of the open source e-learning managements systems, can be downloaded gratis of from their own web page. It is built in PHP and supports relational databases such as MySQL, PostgreSQL and Microsoft SQL Server as well as Object Oriented Databases such as Oracle. Moodle was developed primarily to help to build content and it has many specifications which common for a platform of e-learning, including file uploading, calendars, courses pages, forums for discussion, submission of assignments and quizzes, etc. The gamification elements were added in the form of plugins as they were not available in the initial version of the Moodle 3.3.2 system. We created two groups in Moodle system [See Figure 40 in Appendix A], in the experimental group, we designed online Architecture course in Moodle system with using gamification tools [See Figure 41 in Appendix A]. Conversely, for the control group, we designed online Architecture course without gamification tools in

parallel and with equal content that was located on a separate environment in the same Moodle system [See Figure 42 in Appendix A].

In our Moodle system, we downloaded 3 chapters at 3 weeks in online Architecture course. Each chapter included assignments and quizzes [See Figure 43 in Appendix A].

For experimental group environment, we using four gamification elements (points, level-up, badges and leaderboard) with online Architecture course in Moodle system. These elements are as follows:

1) **Points:** Each student earns points for their submission of assignments and quizzes in each chapter in online Architecture course.
2) **Level up:** Students proceed to certain levels whenever they gain a certain predetermined number of points (Figures 1 and 2).

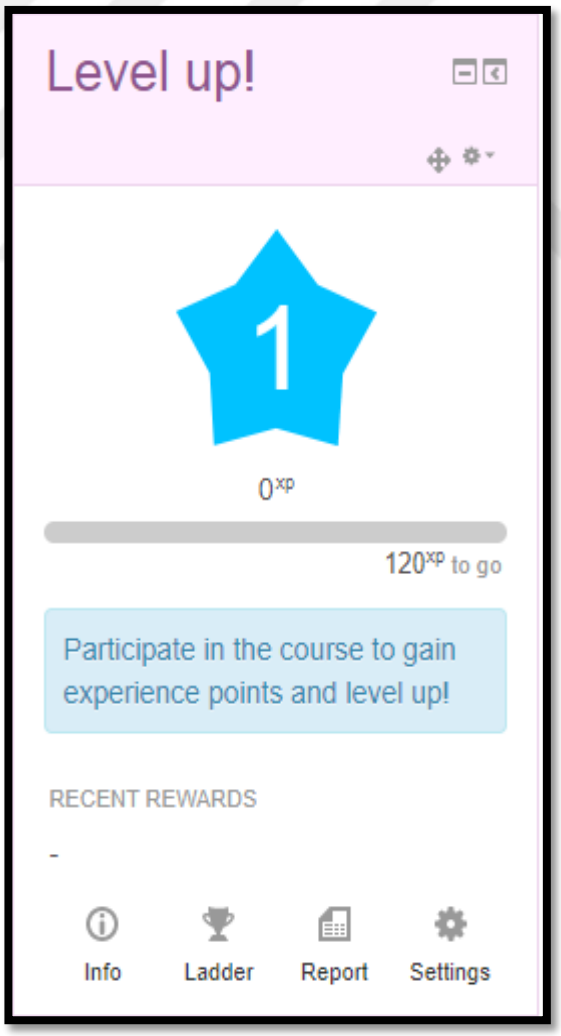
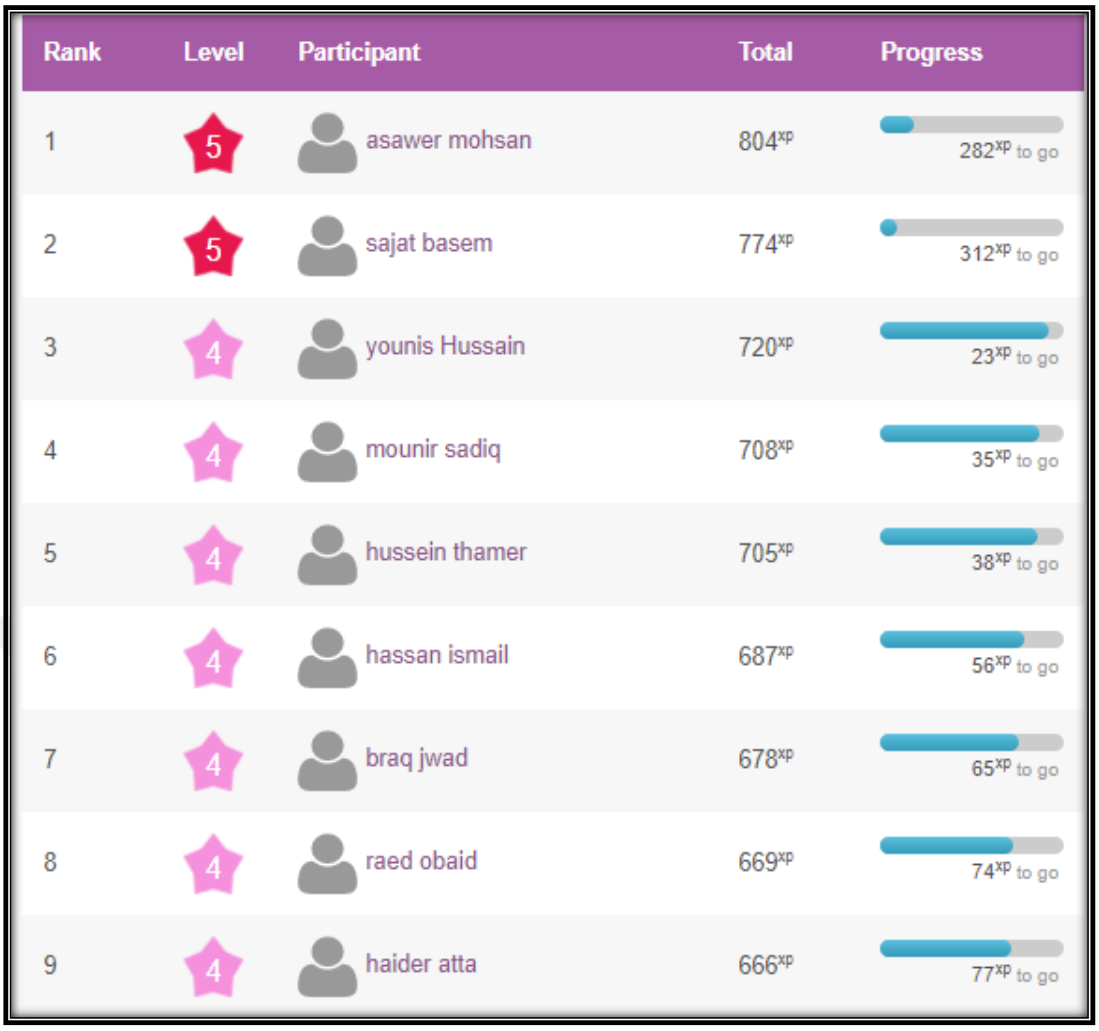


Figure 1: Level-up element in Experimental Group Environment



Rank	Level	Participant	Total	Progress
1	5	asawer mohsan	804xp	282xp to go
2	5	sajat basem	774xp	312xp to go
3	4	younis Hussain	720xp	23xp to go
4	4	mounir sadiq	708xp	35xp to go
5	4	hussein thamer	705xp	38xp to go
6	4	hassan ismail	687xp	56xp to go
7	4	braq jwad	678xp	65xp to go
8	4	raed obaid	669xp	74xp to go
9	4	haider atta	666xp	77xp to go

Figure 2: Students move up to a certain level when they gain a certain a number of Points

3) **Badges:** Students are awarded with badges by completing several actions related to their activities (assignments and quizzes). We created two badges categories in this Moodle system:

   A) In Figure 3, students are awarded these badges when we give grades for their answers in assignments of each chapter.

Name	Badge status	Criteria	Recipients	Actions
Assignment (Chapter 1) Completer	Available to users	• Complete: **"Assignment - Chapter 1 and assignment"**	20	
Assignment (Chapter 2) Completer	Available to users	• Complete: **"Assignment - Chapter 2 and assignment"**	29	
Assignment (Chapter 3) Completer	Available to users	• Complete: **"Assignment - Chapter 3 and assignment"**	30	

Figure 3: Badges (First Category) element in Experimental Group Environment

B) In Figure 4, students earn these badges when they get a high score in quizzes. For example, the students earn a Gold Cup if students score over 90% in the test, a Silver Cup if the students score between 80% and 89%, and a Bronze Cup if the students score between 70% and 79% in the test [see Figure 5].

Figure 4: Badges (Second Category) element in Experimental Group Environment

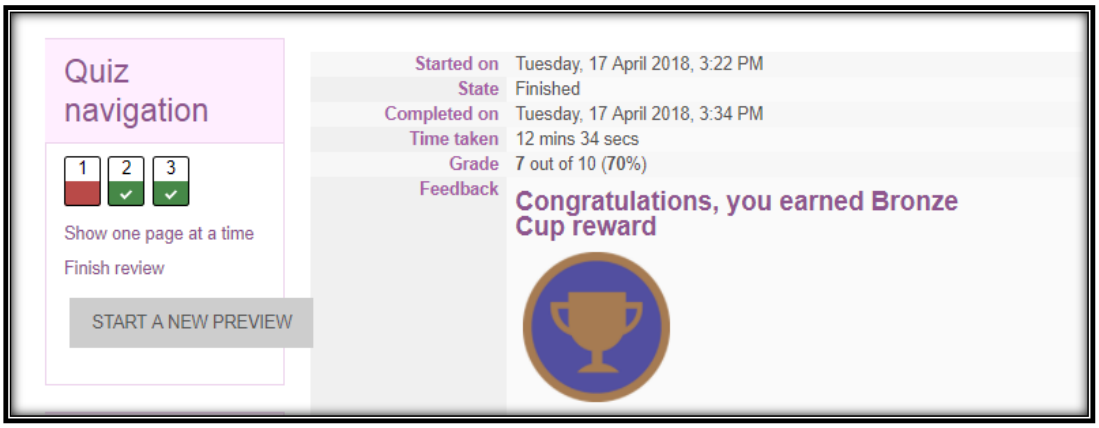


Figure 5: When the students earn Bronze Cup in Experimental Group Environment

4) **Leaderboard:** The top-ranking students are displayed in the leaderboards based on their points and collected badges [see Figure 6]. To make the participation more competitive, we show leaderboard for students in every week when they completed assignments and quizzes in each chapter.

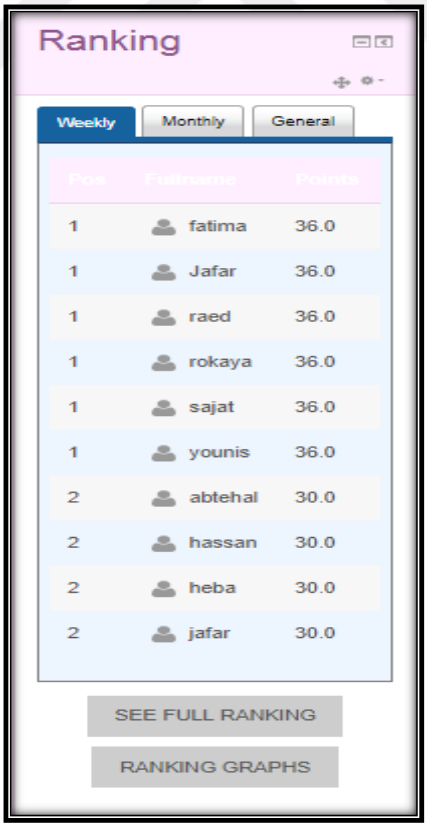


Figure 6: Leaderboard element in the Experimental Group Environment

The Architecture course is annual system, so in educational materials and topics that were used online Architecture course were used to lectures in traditional classroom face-to-face sessions in the beginning of the Architecture course, the students of experimental and control groups were prompted to use online Architecture teaching materials completely alone in their home through three weeks without teacher intervention in this period (three weeks), In this way, the impact of using gamification tools on students in the experimental group environment and without using gamification tools on students in the control group environment were measuring, resulting in increased reliability of the experimental procedure.

3.4 Data Collection

In this study, the data were collected from two sources:

3.4.1 Pre- and Post-test Data

The pre- and post-test were performed in paper. The scores for the pre- and post-test ranged from zero to a complete score of 100. The pre- and post-tests were implemented on 70 participants in the experimental and control groups. The 25 questions and multiple choice of the pre-tests were similar to those in the post-test but the sequence of the questions was changed (see Appendix B). The pre-test examined students in both groups at the beginning of April in 2018 and three weeks later, at end of online Architecture course both groups completed a post-test. There were 70 participants in the experimental and control groups but 47 participants (30 students of experimental group and 17 students of control group) who attended the online Architecture course in Moodle system were taken pre and post-test.

3.4.2 Online Survey Data

The second data source was a survey of participants in the experimental group. The survey was implemented in Moodle system (see Figure 44 in Appendix A) after the students' performance of the post-test using Google Forum based on the Technology Acceptance Model (TAM) [14]. The survey, consisting of 32 questions (see Appendix C), of the experimental group was designed to evaluate the students' attitude towards using gamification tools (points, level-up, badges and leaderboard) in Moodle system and to measure the learners' performance and perceptions about it, 30 responses were received from the experimental group.

3.5 Statistical Test

Specific statistical tests are most appropriate for analysis of data collected using specific types of design [50]. According to [50], the appropriate statistical test for analyzing the date in this study is the independent two samples t-test (two-tailed).

This study used two statistical methods to analyze the data. First, the data of the pre- and post-tests were subjected to statistical analyses in a statistical program (Microsoft Excel 2013) by using independent two sample t-test (two-tailed) to evaluate whether the significant differences found in the mean values of the experimental group and mean value of the control group:

> **H_0:** There is no statistically significant difference between the experimental and control groups regarding the students' performances on test scores.
>
> **H_1:** There is a statistically significant difference between the experimental and control groups regarding the students' performances on test scores.

As a main tool to perform the statistical analyses, we used Software Package Statistical Science (SPSS) Version 24 in order to validate the identified item structure of the survey for the descriptive statistics in the experimental group by performing a reliability test of these items using Cronbach's alpha coefficient [51].

CHAPTER 4

RESULTS AND ANALYSIS

In this study, a pre-test and a post-test were examined in order to compare the impact of gamification tools on students' learning. In addition, a questionnaire based on the Technology Acceptance Model was conducted to identify the perceptions of students about gamification tools (points, level-up, badges and leaderboard) in Moodle system. There were 30 students in our experimental group, and 17 students in our control group, as explained in Chapter 3. In this chapter, first the comparison of the pre-test and post-test results of the experimental and control groups are presented. Then, the questionnaire results are presented for the experimental group.

4.1 Pre- and Post-Test Results

The t-test was performed to compare the achievement scores of the experimental and control groups. The t-test is a parametric test to evaluate whether the means on a test variable differ significantly between two groups. The data collected were entered and analyzed by using the MS Excel spreadsheet program. The results of the t-test for the pre-test are presented in Table 3. As shown in Table 3, in terms of the pre-test data, the t-test revealed no significant mean difference (t = 0.130 and t-critical two-tail = 2.014) between the achievement of the students in the experimental group and the students in the control group. Since the t-stat (0.130) is smaller than the critical value of the two-tail value (2.014) at the 95% confidence level, the mean of the experimental group and the mean of the control group were equal with respect to the students' knowledge about the Architecture course. Therefore, we accepted hypotheses **H_0,** indicating that there is no statistically significant difference between the experimental and control groups regarding the students' performances on pre-test scores.

Table 3: T-test of the Independent Two Sample for Pre-Test Results

	Experimental group	**Control group**
Mean	32.933	32.471
Variance	156.340	105.765
Observations	30	17
Pooled Variance	138.358	
Hypothesized Mean Difference	0	
df	45	
t-Stat	0.130	
P(T ≤ t) one-tail	0.449	
t-Critical one-tail	1.679	
P(T ≤ t) two-tail	0.897	
t-Critical two-tail	2.014	

As in Table 4, in terms of the post-test data, the t-test reveals a statistically significant mean difference (t = 3.215 and t-critical two-tail = 2.014) between the achievement of the students in the experimental group and the students in the control groups. Since the t-Stat (3.215) is greater than the critical value of the two-tail value (2.014) at the 95% confidence level, the experimental group and the control group had statistically significant difference on students' post-test scores. Therefore, we rejected hypotheses $\mathbf{H_0}$ and accepted hypotheses $\mathbf{H_1}$, indicating that there is a statistically significant difference between the experimental and control groups regarding the students' performances on the post-test scores.

Table 4: T-test of the Independent Two Sample for Post-Test Results

	Experimental group	**Control group**
Mean	54.000	39.765
Variance	198.345	238.941
Observations	30	17
Pooled Variance	212.779	
Hypothesized Mean Difference	0	

df	45	
t-Stat	3.215	
P(T ≤ t) one-tail	0.001	
t-Critical one-tail	1.679	
P(T ≤ t) two-tail	0.002	
t-Critical two-tail	2.014	

In summary, the above results reveal the significant positive effects of gamification tools on students' learning when an instructional environment is embedded with gamification tools, such as points, level-up, badges and leaderboard.

4.2 Survey Results

In the beginning of questionnaire, we ask students of their name to analysis only the students who attendance online Architecture course (see Figures 48 in Appendix C). According to the questionnaire that we created for the students, we received 30 responses from the experimental group. The results are as presented as follows:

4.2.1 Experimental Group's Survey Results

The experimental group survey included 32 questions:

4.2.1.1 Demographic Information

Demographics are the characteristics of a population. Characteristics such as gender, age, education, experience, occupation, income level, and marital status, are all typical examples of demographics that are used in surveys [54].

In this study, gender, age, experience in the Moodle system were the characteristics used in our demographic analysis.

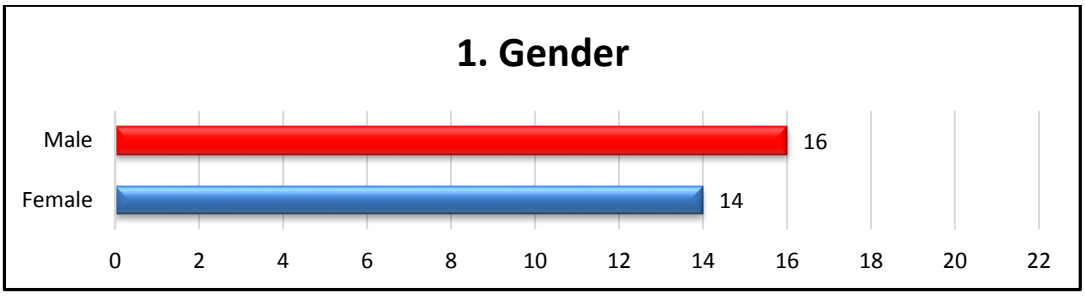


Figure 7: Participants' responses Demographic Information Question 1

Figure 7 shows the statistics of the respondents' gender. According to Table 5, 53.3% of students were male and 46.7% were female. The majority of the respondents in this study were male.

Table 5: Results of Demographic Information Question 1

	Frequency	Percent
Male	16	53.3
Female	14	46.7
Total	30	100

Figure 8 shows the statistics of the respondents' age. According to Figure 8, all the participants have the same age range (18-25) because they were the same level.

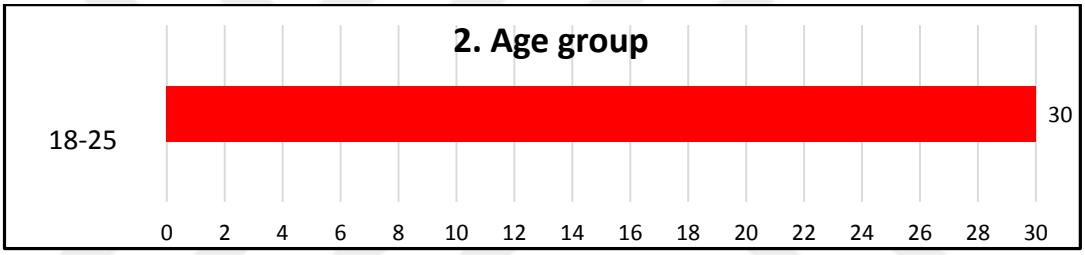


Figure 8: Participants' responses of Demographic Information Question 2

Figure 9 presents the statistics related to the experience of the respondents on Moodle. Table 6 shows that 53.3% of students had less than a year's experience in Moodle and 33.3% said they had no experience, and 6.7% had 3-5 years' and 6.7% had 1-3 years' experience. Thus, the majority of the respondents had less than a year's experience in Moodle.

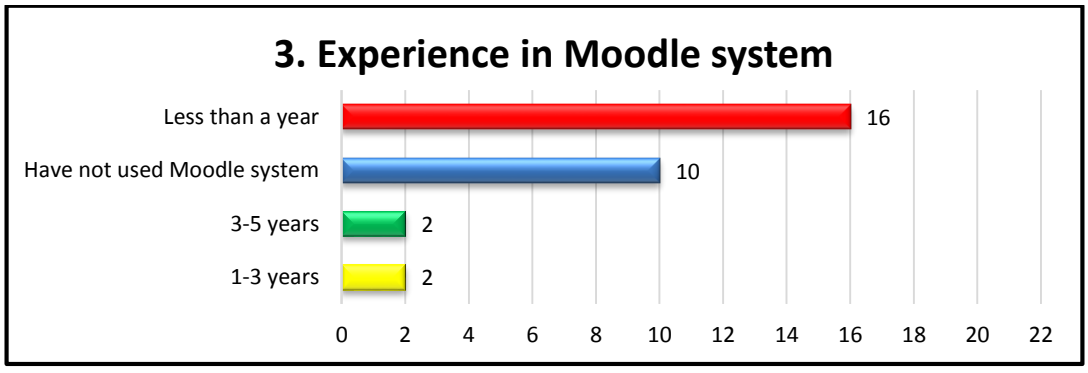


Figure 9: Participants' responses of Demographic Information Question 3

Table 6: Results of Demographic Information Question 3

	Frequency	Percent
Less than a year	16	53.3
Have not used Moodle system	10	33.3
3-5 years	2	6.7
1-3 years	2	6.7
Total	30	100

All of the above results refer to the students having little experience on Moodle for all genders.

4.2.1.2 Descriptive Statistics

This study used an integrated theoretical framework for university students to accept and their intention to use the gamification tools in e-learning (Moodle) based on the Technology Acceptance Model (TAM) [55] to analyze the effect of the use of gamification tools such as (points, level-up, badges and leaderboard) in e-learning (Moodle system) on university student's learning with selected constructs, such as Perceived Ease of Use (PEU), Perceived Usefulness (PU), Attitude Toward Usage (ATU), and Behavioral Intention to Use (BIU). The aim is to develop a gamified technology model for the acceptance of university students to use it in e-learning that would provide a school manager or an educator with implications for the better implementation of e-learning.

In addition, we provide some descriptive characteristics of the gamification tools such as (points, level-up, badges and leaderboard) in Moodle system and the selected constructs:

4.2.1.2.1 Perceived Ease of Use (PEU)

This factor included 6 items and a majority of the participants' responses of these items were strongly agree. This indicates that gamification tools (points, level-up, badges and leaderboard) in Moodle system was perceived as ease to use in their Architecture course learning process.

Table 7 shows the overall results for the perceived ease of use:

Table 7: Results of Perceived Ease of Use

Question	Strongly Agree		Agree		Neither Agree Nor Disagree		Disagree		Strongly Disagree	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Q4. Learning to use gamification tools in Moodle system such as (Points, Level-up, Badges and Leaderboard) is easy for me.	21	70	9	30	0		0		0	
Q5. I find it easy to get what I need from use (Points, Level-up, Badges and Leaderboard) in Moodle system.	19	63.3	11	36.7	0		0		0	
Q6. My interaction with use (Points, Level-up, Badges and Leaderboard) in Moodle system is clear and understandable.	24	80	6	20	0		0		0	
Q7. I find use (Points, Level-up, Badges and Leaderboard) in Moodle system to be flexible to interact with.	25	83.3	5	16.7	0		0		0	
Q8. It is easy for me to become skillfully at using (Points, Level-up, Badges and Leaderboard) in Moodle system.	20	66.7	10	33.3	0		0		0	
Q9. I find using (Points, Level-up, Badges and Leaderboard) in Moodle system easy to use.	21	70	9	30	0		0		0	
Average	21.7	72.2	8.3	27.8	0		0		0	

The details of participants' responses in these items are presented below.

Figure 10 shows the participants' responses that learning using gamification tools (points, level-up, badges and leaderboard) in Moodle system was easy. Table 8 shows that 70% of students were strongly agree, while 30% were agree.

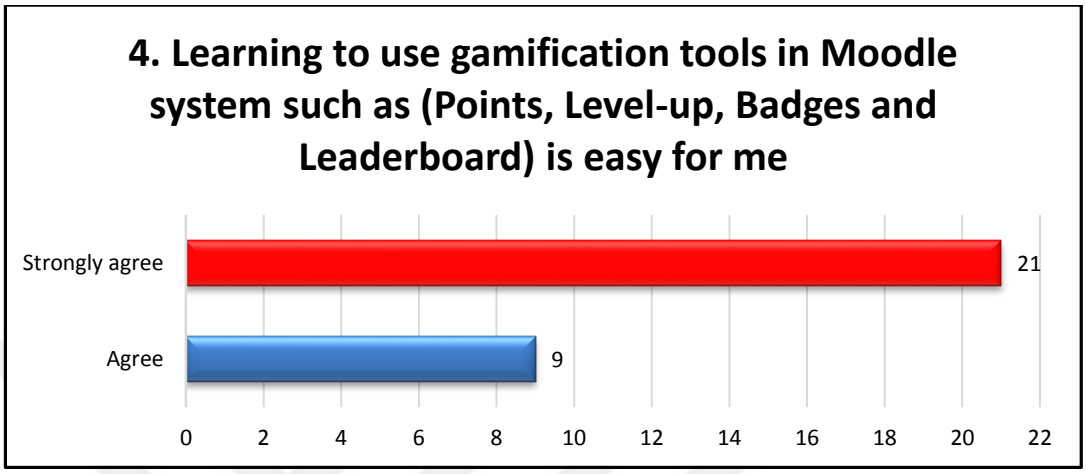


Figure 10: Participants' responses of Perceived Ease of Use Question 4

Table 8: Results of Perceived Ease of Use Question 4

	Frequency	**Percent**
Strongly agree	21	70
Agree	9	30
Total	30	100

Figure 11 shows the participants' responses about was easy to get what they need when they using gamification tools (points, level-up, badges and leaderboard) in Moodle system. Table 9 shows that 63.3% of students were strongly agree, while 36.7% were agree.

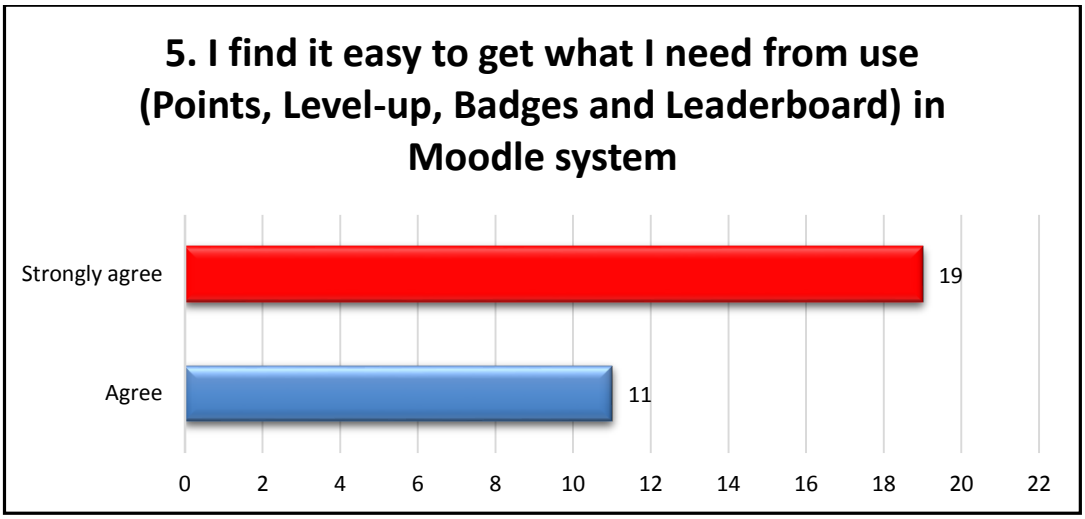


Figure 11: Participants' responses of Perceived Ease of Use Question 5

Table 9: Results of Perceived Ease of Use Question 5

	Frequency	Percent
Strongly agree	19	63.3
Agree	11	36.7
Total	30	100

Figure 12 show the participants' responses that their interaction with use gamification tools (points, level-up, badges and leaderboard) in Moodle system was clear and understandable. Table 10 shows that 80% of the students were strongly agree, while 20% were agree.

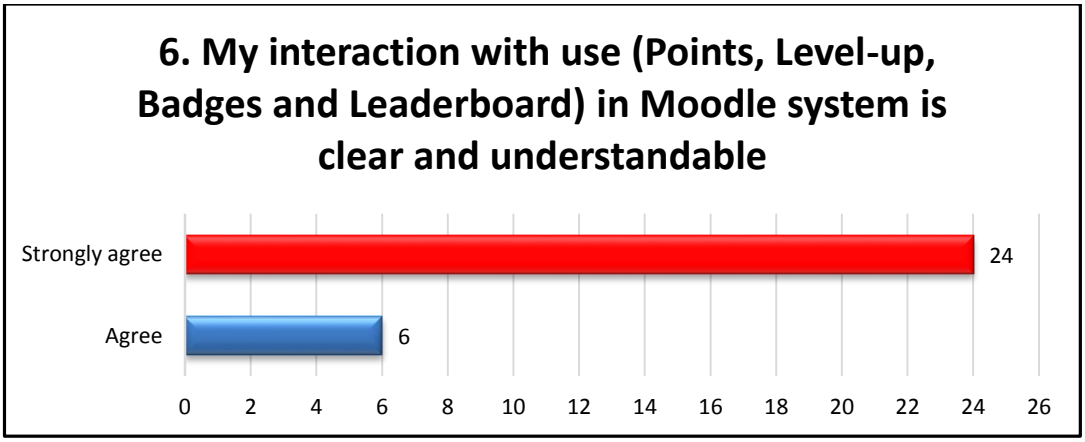


Figure 12: Participants' responses of Perceived Ease of Use Question 6

Table 10: Results of Perceived Ease of Use Question 6

	Frequency	Percent
Strongly agree	24	80
Agree	6	20
Total	30	100

Figure 13 presents the participants' responses about interaction with gamification tools (points, level-up, badges and leaderboard) in Moodle system was flexible. Table 11 shows that 83.3% of the students were strongly agree, while 16.7% were agree.

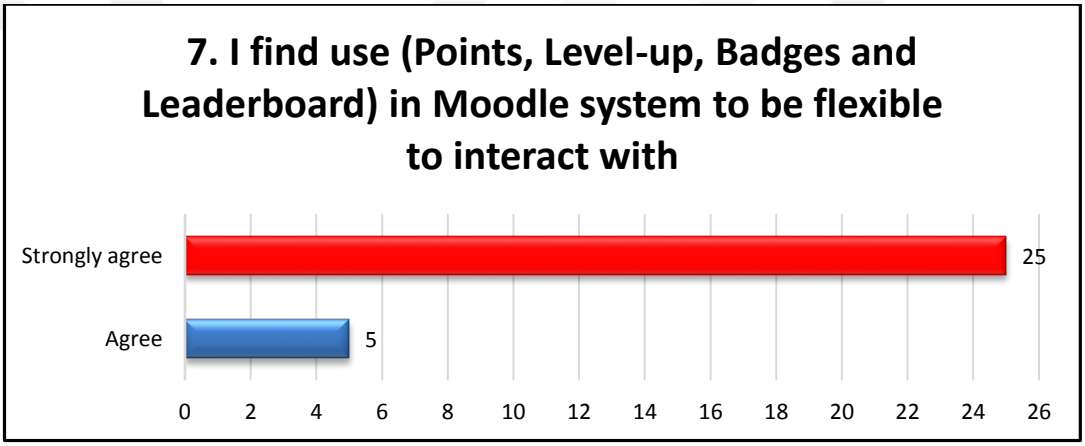


Figure 13: Participants' responses of Perceived Ease of Use Question 7

Table 11: Results of Perceived Ease of Use Question 7

	Frequency	Percent
Strongly agree	25	83.3
Agree	5	16.7
Total	30	100

Figure 14 presents the participants' responses that using gamification tools (points, level-up, badges and leaderboard) in Moodle system was gave them easy to skill. Table 12 shows that 66.7% of the students were strongly agree, while 33.3% were agree.

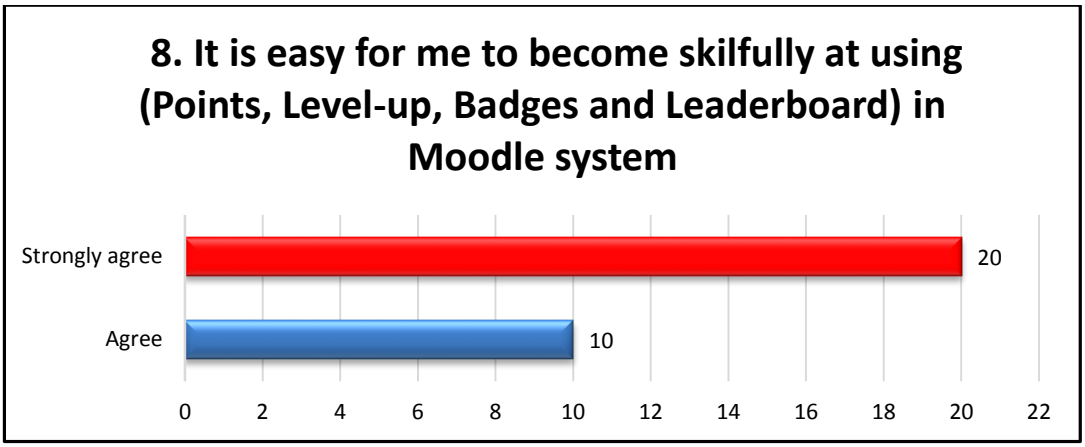


Figure 14: Participants' responses of Perceived Ease of Use Question 8

Table 12: Results of Perceived Ease of Use Question 8

	Frequency	Percent
Strongly agree	20	66.7
Agree	10	33.3
Total	30	100

Figure 15 presents the participants' responses that using gamification tools (points, level-up, badges and leaderboard) in Moodle system was easy. Table 13 shows that 70% of the students were strongly agree, while 30% were agree.

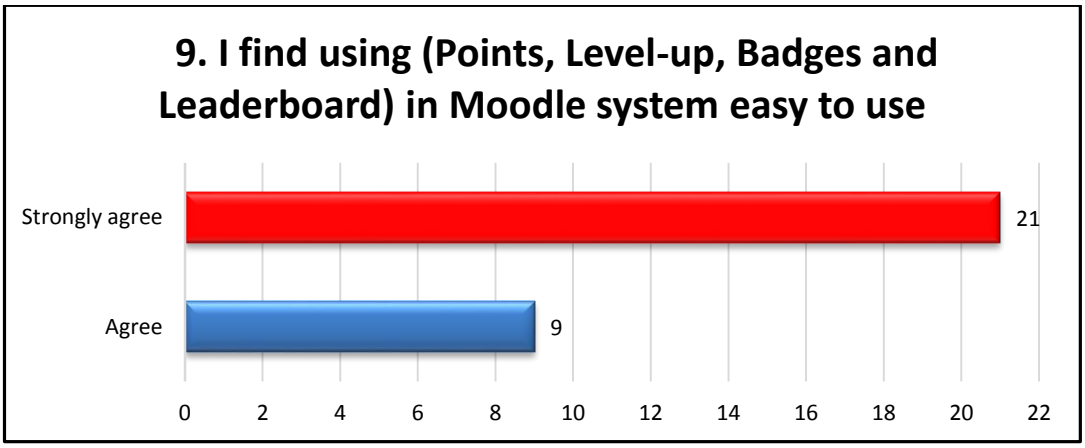


Figure 15: Participants' responses of Perceived Ease of Use Question 9

Table 13: Results of Perceived Ease of Use Question 9

	Frequency	Percent
Strongly agree	21	70
Agree	9	30
Total	30	100

4.2.1.2.2 Perceived Usefulness (PU)

This factor included 11 items and a majority of the participants' responses of these items were strongly agree that using gamification tools (points, level-up, badges and leaderboard) in Moodle system was perceived as useful in their Architecture course learning process.

Table 14 shows the overall results for the perceived usefulness:

Table 14: Results of Perceived Usefulness

QUESTION	Strongly Agree		Agree	Neither Agree Nor Disagree		Disagree		Strongly Disagree	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Q10. Using (Point, Level-up, Badges and Leaderboards) in Moodle system can enable me to accomplish tasks/assignments and quizzes more quickly.	20	66.7	10	33.3	0		0		0	
Q11. Using (Points, Level-up, Badges and Leaderboard) in Moodle system can improve my performance (grades) in related tasks/assignments and quizzes.	21	70	9	30	0		0		0	
Q12. Using (Points, Level-up, Badges and Leaderboard) in Moodle system can make it easier to do my tasks/assignments and quizzes.	20	66.7	10	33.3	0		0		0	
Q13. Using (Points, Level-up, Badges and Leaderboard) in Moodle system in my tasks/assignments and quizzes can increase my productivity.	25	83.3	5	16.7	0		0		0	
Q14. Using (Points, Level-up, Badges and Leaderboard) in Moodle system can enhance my effectiveness.	23	76.7	7	23.3	0		0		0	

Q15. I find (Points, Level-up, Badges and Leaderboard) in Moodle system useful in my tasks/assignments and quizzes	26	86.7	4	13.3	0	0	0
Q16. Using (Points, Level-up, Badges and Leaderboard) in Moodle system helps me to understand a particular topic better and faster.	22	73.3	8	26.7	0	0	0
Q17. Using (Points, Level-up, Badges and Leaderboard) in Moodle system encourages me to actively discover new knowledge.	25	83.3	5	16.7	0	0	0
Q18. Using (Point, Level-up, Badges and Leaderboards) in Moodle system enables me to learn on my own.	27	90	3	10	0	0	0
Q19. I am more aware about learning Architecture course through gamification tools (Points, Level-up, Badges and Leaderboard).	22	73.3	8	26.7	0	0	0
Q20. Using (Points, Level-up, Badges and Leaderboard) in Moodle system is a useful method in learning Architecture course.	22	73.3	8	26.7	0	0	0
Average	23.0	76.7	7.0	23.3	0	0	0

The details of participants' responses in these items were presented below.

Figure 16 shows the participants' responses that using gamification tools (points, level-up, badges and leaderboard) in Moodle system was enable them to accomplish tasks/assignments and quizzes quickly. Table 15 shows that 66.7% of students were strongly agree, while 33.3% were agree.

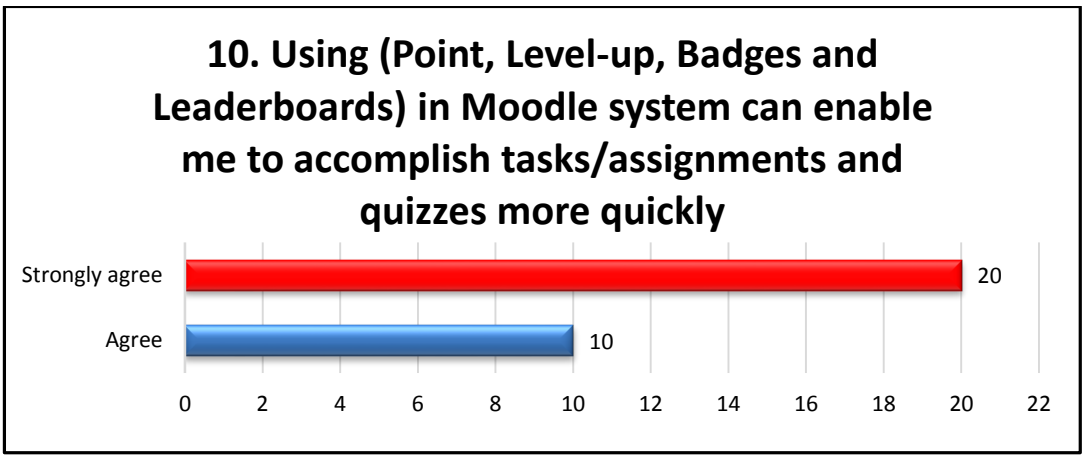


Figure 16: Participants' responses of Perceived Usefulness Question 10

Table 15: Results of Perceived Usefulness Question 10

	Frequency	Percent
Strongly agree	20	66.7
Agree	10	33.3
Total	30	100

Figure 17 shows the participants' responses that using gamification tools (points, level-up, badges and leaderboard) in Moodle system was improved their performance (grades) in tasks/assignments and quizzes. Table 16 shows that 70% of students were strongly agree, while 30% were agree.

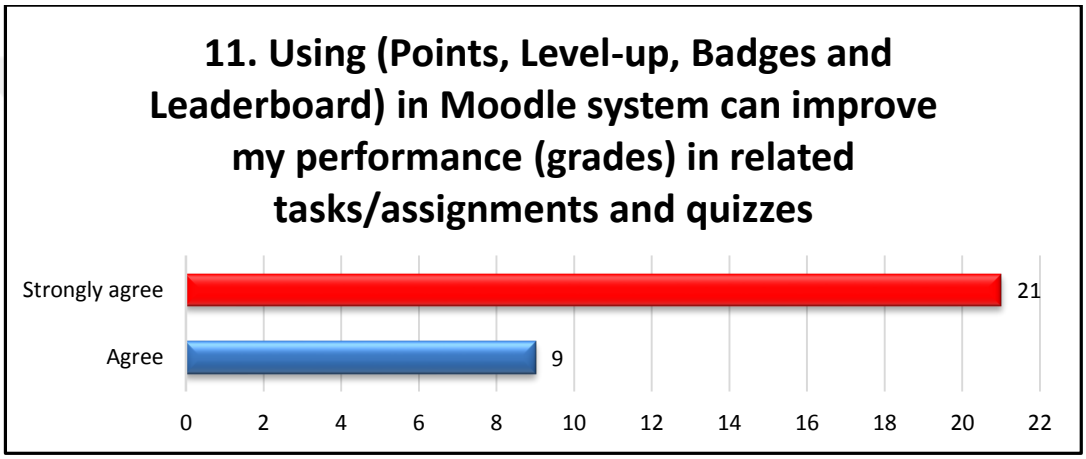


Figure 17: Participants' responses of Perceived Usefulness Question 11

Table 16: Results of Perceived Usefulness Question 11

	Frequency	Percent
Strongly agree	21	70
Agree	9	30
Total	30	100

Figure 18 shows the participants' responses that using gamification tools (points, level-up, badges and leaderboard) in Moodle system was make easer their tasks/assignments and quizzes. Table 17 shows that 66.7% of students were strongly agree, while 33.3% were agree.

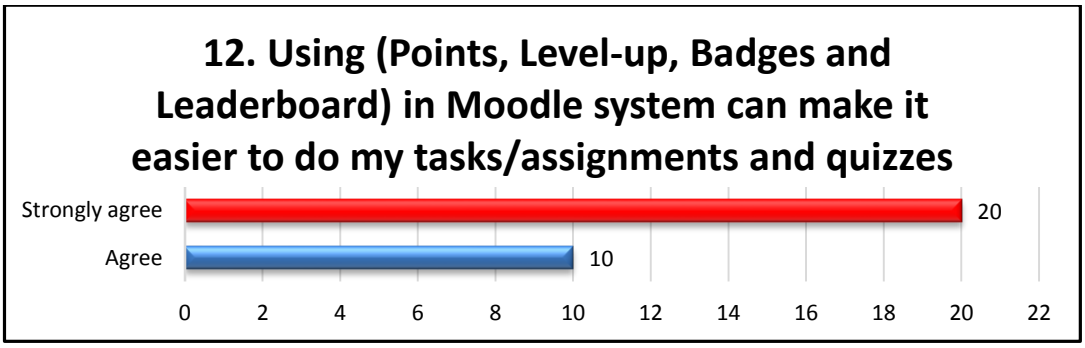


Figure 18: Participants' responses of Perceived Usefulness Question 12

Table 17: Results of Perceived Usefulness Question 12

	Frequency	Percent
Strongly agree	20	66.7
Agree	10	33.3
Total	30	100

Figure 19 show the participants' responses that using gamification tools (points, level-up, badges and leaderboard) in Moodle system in their tasks/assignments and quizzes was increased their productivity. Table 18 shows that 83.3% of students were strongly agree, while 16.7% were agree.

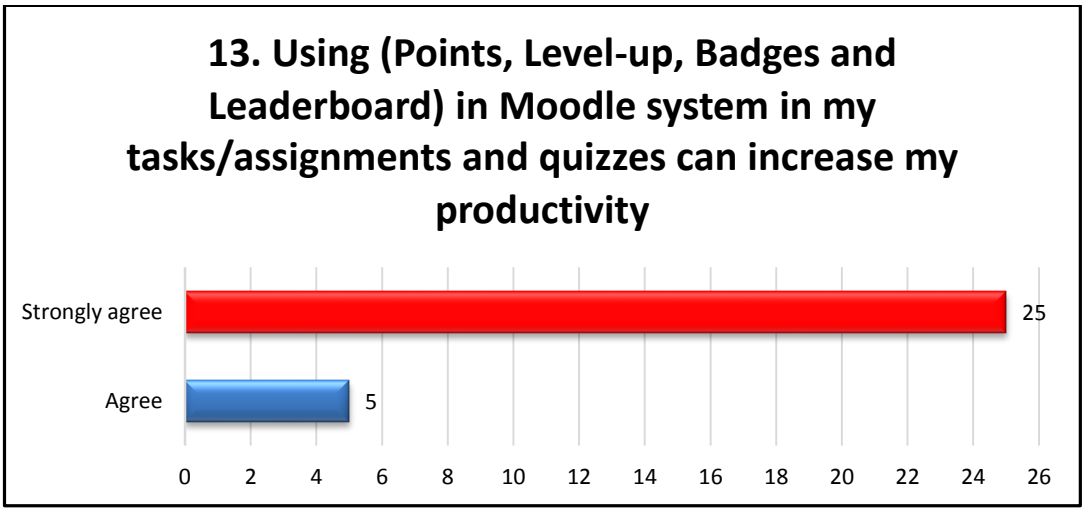


Figure 19: Participants' responses of Perceived Usefulness Question 13

Table 18: Results of Perceived Usefulness Question 13

	Frequency	Percent
Strongly agree	25	83.3
Agree	5	16.7
Total	30	100

Figure 20 show the participants' responses that using gamification tools (points, level-up, badges and leaderboard) in Moodle system was enhanced their effectiveness. Table 19 shows that 76.7% of students were strongly agree, while 23.3% were agree.

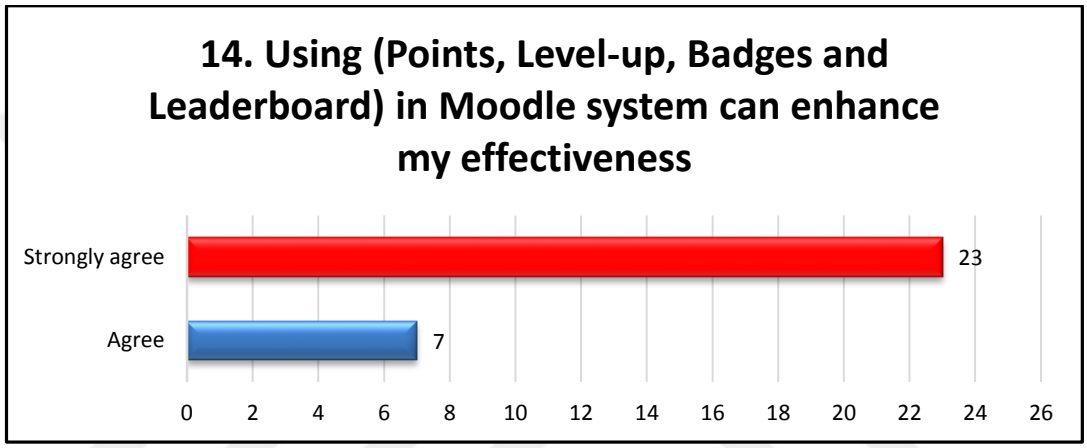


Figure 20: Participants' responses of Perceived Usefulness Question 14

Table 19: Results of Perceived Usefulness Question 14

	Frequency	Percent
Strongly agree	23	76.7
Agree	7	23.3
Total	30	100

Figure 21 show the participants' responses that using gamification tools (points, level-up, badges and leaderboard) in Moodle system was useful in their tasks/assignments and quizzes. Table 20 shows that 86.7% of students were strongly agree, while 13.3% were agree.

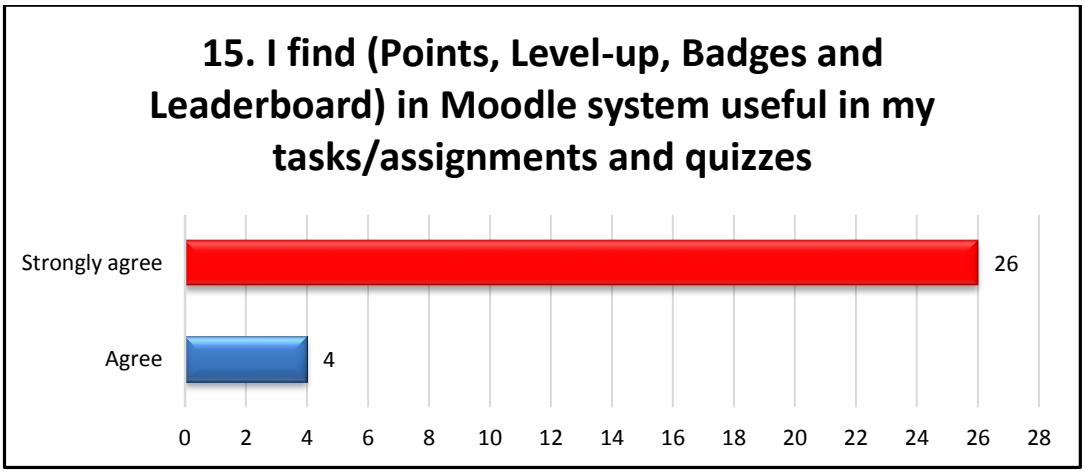


Figure 21: Participants' responses of Perceived Usefulness Question 15

Table 20: Results of Perceived Usefulness Question 15

	Frequency	Percent
Strongly agree	26	86.7
Agree	4	13.3
Total	30	100

Figure 22 show the participants' responses that using gamification tools (points, level-up, badges and leaderboard) in Moodle system was helped them to understand a particular topic better and faster. Table 21 shows that 73.3% of students were strongly agree, while 26.7% were agree.

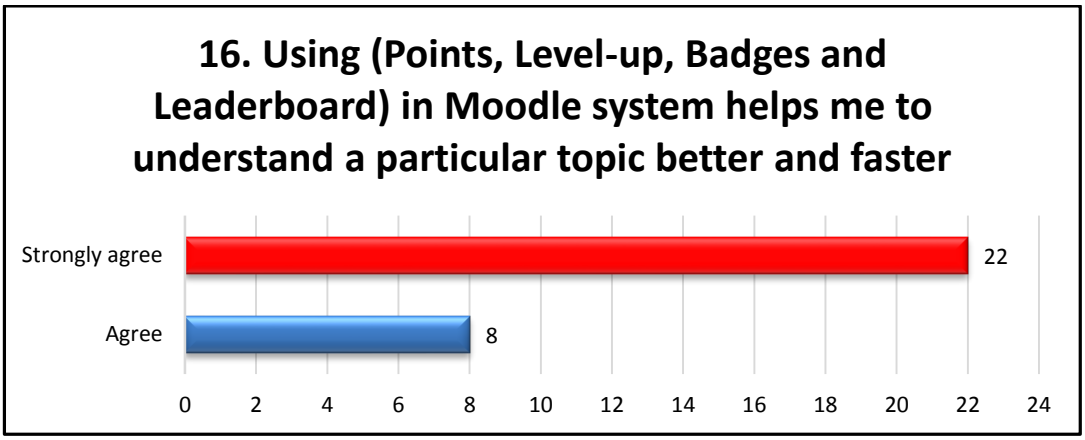


Figure 22: Participants' responses of Perceived Usefulness Question 16

Table 21: Results of Perceived Usefulness Question 16

	Frequency	Percent
Strongly agree	22	73.3
Agree	8	26.7
Total	30	100

Figure 23 show the participants' responses that using gamification tools (points, level-up, badges and leaderboard) in Moodle system was encouraged them to actively discover new knowledge. Table 22 shows that 83.3% of students were strongly agree, while 16.7% were agree.

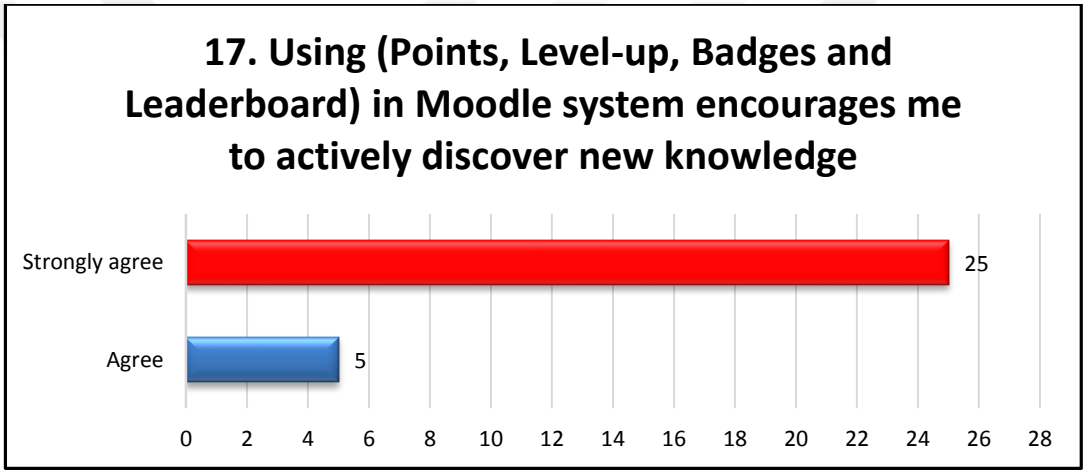


Figure 23: Participants' responses of Perceived Usefulness Question 17

Table 22: Results of Perceived Usefulness Question 17

	Frequency	Percent
Strongly agree	25	83.3
Agree	5	16.7
Total	30	100

Figure 24 show the participants' responses that using gamification tools (points, level-up, badges and leaderboard) in Moodle system was enabled them to learn on their own. Table 23 shows that 90% of students were strongly agree, while 10% were agree.

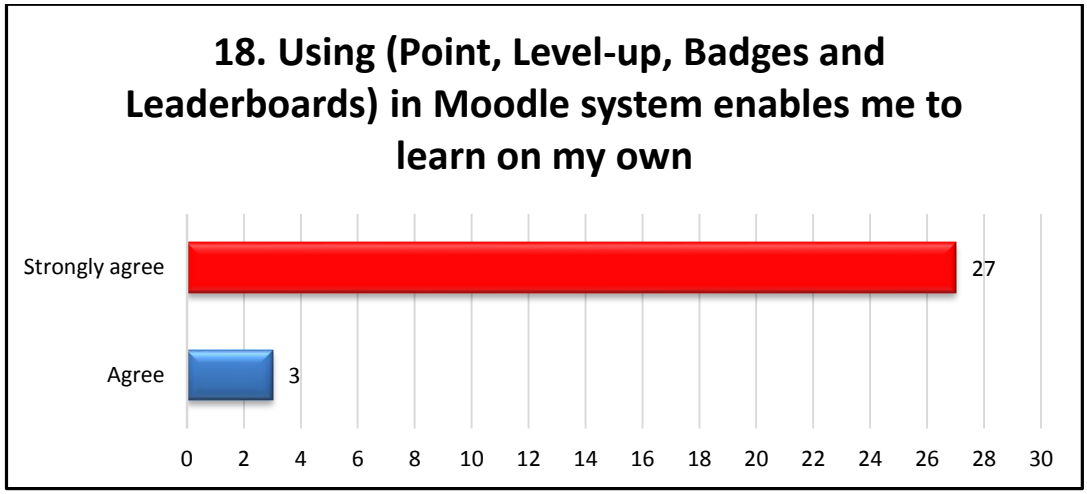


Figure 24: Participants' responses of Perceived Usefulness Question 18

Table 23: Results of Perceived Usefulness Question 18

	Frequency	**Percent**
Strongly agree	27	90
Agree	3	10
Total	30	100

Figure 25 show the participants' responses that using gamification tools (points, level-up, badges and leaderboard) in Moodle system was enabled them to aware about learning Architecture course. Table 24 shows that 73.3% of students were strongly agree, while 26.7% were agree.

Figure 25: Participants' responses of Perceived Usefulness Question 19

Table 24: Results of Perceived Usefulness Question 19

	Frequency	**Percent**
Strongly agree	22	73.3
Agree	8	26.7
Total	30	100

Figure 26 show the participants' responses that using gamification tools (points, level-up, badges and leaderboard) in Moodle system was a useful method in learning Architecture course. Table 25 shows that 73.3% of students were strongly agree, while 26.7% were agree.

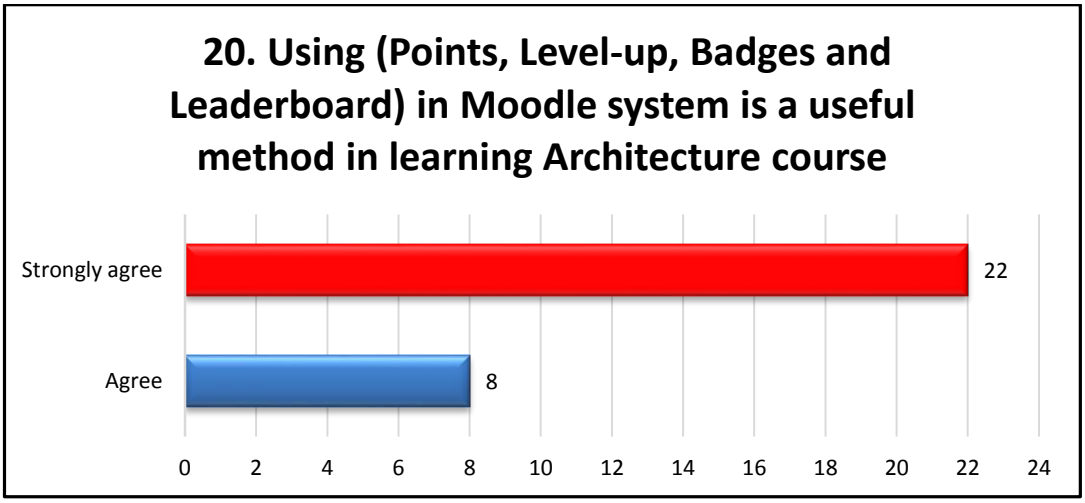


Figure 26: Participants' responses of Perceived Usefulness Question 20

Table 25: Results of Perceived Usefulness Question 20

	Frequency	Percent
Strongly agree	22	73.3
Agree	8	26.7
Total	30	100

4.2.1.2.3 Attitude toward Usage (ATU)

This factor included 9 items and a majority of the participants' responses of these items were strongly agree that attitude toward usage of gamification tools (points, level-up, badges and leaderboard) in Moodle system was provided them with a lot of enjoyment and also motivate them to learn.

Table 26 shows the overall results for the attitude toward usage:

Table 26: Results of Attitude toward Usage

Question	Strongly Agree		Agree		Neither Agree Nor Disagree		Disagree		Strongly Disagree	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Q21. I have fun interacting with using (Points, Level-up, Badges and Leaderboard) in Moodle system.	23	76.7	7	23.3	0		0		0	
Q22. Using (Points, Level-up, Badges and Leaderboard) in Moodle system provides me with a lot of enjoyment.	23	76.7	7	23.3	0		0		0	
Q23. I enjoy using (Points, Level-up, Badges and Leaderboard) in Moodle system.	23	76.7	7	23.3	0		0		0	
Q24. Using (Points, Level-up,	26	86.7	4	13.3	0		0		0	

Badges and Leaderboard) in Moodle system stimulates my interest to learn.							
Q25. Using (Points, Level-up, Badges and Leaderboard) in Moodle system increases my motivation to learn.	25	83.3	5	16.7	0	0	0
Q26. Using (Points, Level-up, Badges, and Leaderboard) in Moodle system makes learning more fun.	24	80	6	20	0	0	0
Q27. Using (Points, Level-up, Badges and Leaderboard) in Moodle system increases my concentration.	20	66.7	10	33.3	0	0	0
Q28. Using (Points, Level-up, Badges and Leaderboard) in Moodle system makes learning more interesting.	26	86.7	4	13.3	0	0	0
Q29. The feedback offered by (Points, Level-up, Badges and Leaderboard) in Moodle system motivates me to continue to progress.	23	76.7	7	23.3	0	0	0
Average	23.7	78.9	6.3	21.1	0	0	0

The details of participants' responses in these items were presented below.

Figure 27 show the participants' responses that their feeling fun interacting with using gamification tools (points, level-up, badges and leaderboard) in Moodle system. Table 27 shows that 76.7% of students were strongly agree, while 23.3% were agree.

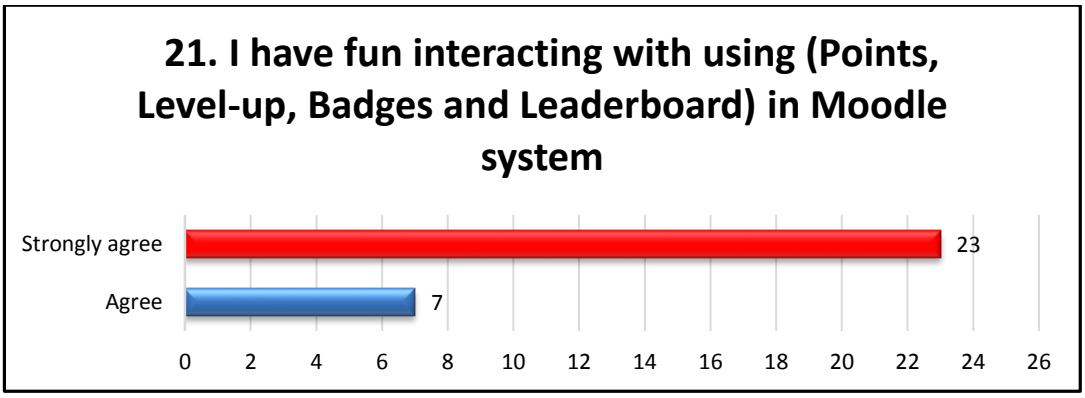


Figure 27: Participants' responses of Attitude toward Usage Question 21

Table 27: Results of Attitude toward Usage Question 21

	Frequency	Percent
Strongly agree	23	76.7
Agree	7	23.3
Total	30	100

Figure 28 show the participants' responses that using gamification tools (points, level-up, badges and leaderboard) in Moodle system was provided them with a lot of enjoyment. Table 28 shows that 76.7% of students were strongly agree, while 23.3% were agree.

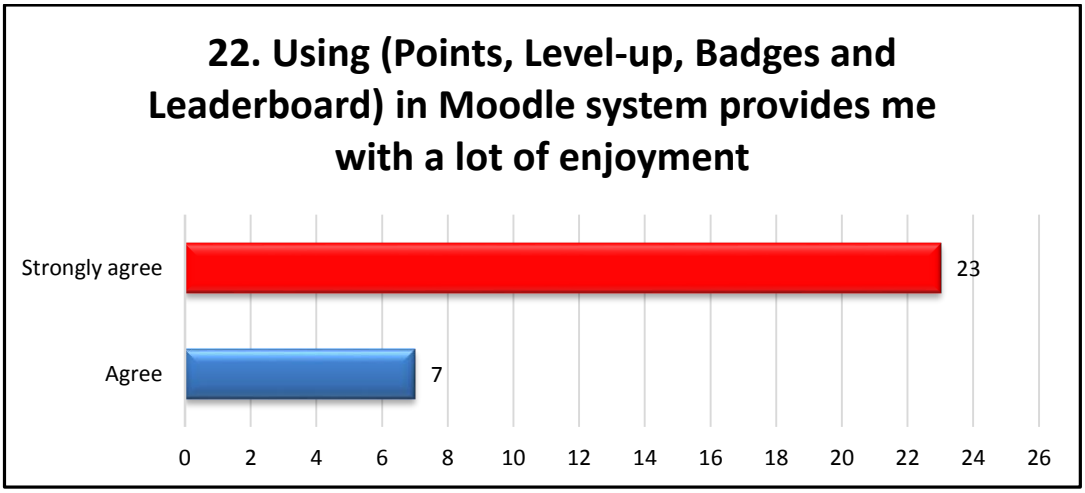


Figure 28: Participants' responses of Attitude toward Usage Question 22

Table 28: Results of Attitude toward Usage Question 22

	Frequency	Percent
Strongly agree	23	76.7
Agree	7	23.3
Total	30	100

Figure 29 show the participants' responses that using gamification tools (points, level-up, badges and leaderboard) in Moodle system was enjoy. Table 29 shows that 76.7% of students were strongly agree, while 23.3% were agree.

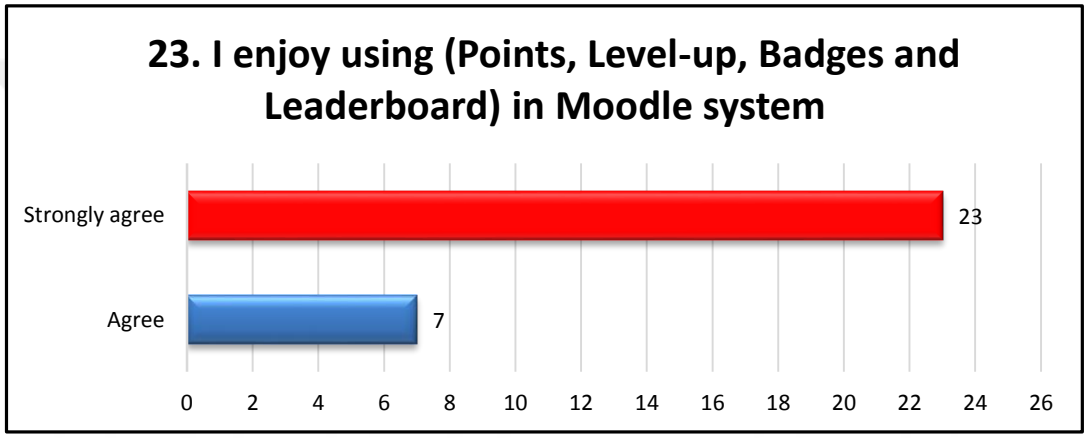


Figure 29: Participants' responses of Attitude toward Usage Question 23

Table 29: Results of Attitude toward Usage Question 23

	Frequency	Percent
Strongly agree	23	76.7
Agree	7	23.3
Total	30	100

Figure 30 show the participants' responses that using gamification tools (points, level-up, badges and leaderboard) in Moodle system was stimulated their interest to learn. Table 30 shows that 86.7% of students were strongly agree, while 13.3% were agree.

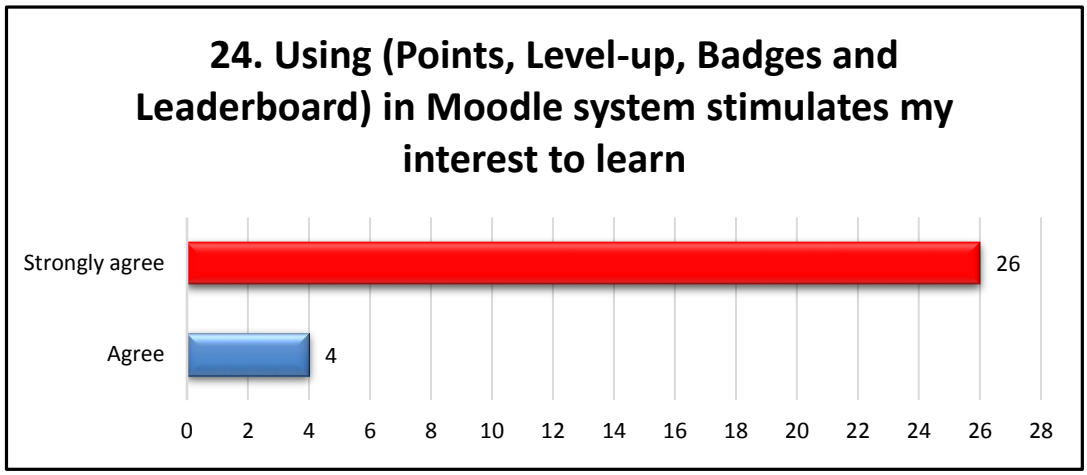


Figure 30: Participants' responses of Attitude toward Usage Question 24

Table 30: Results of Attitude toward Usage Question 24

	Frequency	**Percent**
Strongly agree	26	86.7
Agree	4	13.3
Total	30	100

Figure 31 show the participants' responses that using gamification tools (points, level-up, badges and leaderboard) in Moodle system was increased their motivation to learn. Table 31 shows that 83.3% of students were strongly agree, while 16.7% were agree.

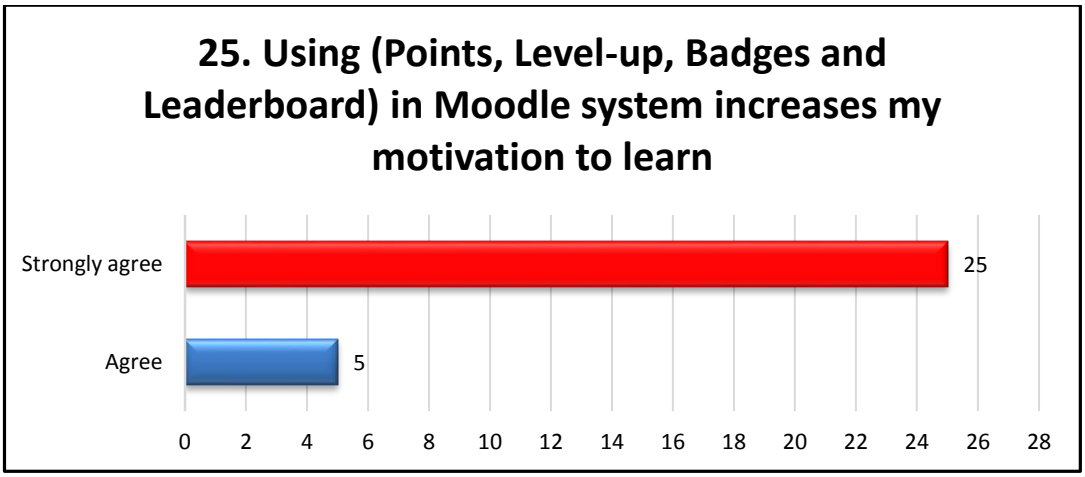


Figure 31: Participants' responses of Attitude toward Usage Question 25

Table 31: Results of Attitude toward Usage Question 25

	Frequency	Percent
Strongly agree	25	83.3
Agree	5	16.7
Total	30	100

Figure 32 show the participants' responses that using gamification tools (points, level-up, badges and leaderboard) in Moodle system was made learning more fun. Table 32 shows that 80% of students were strongly agree, while 20% were agree.

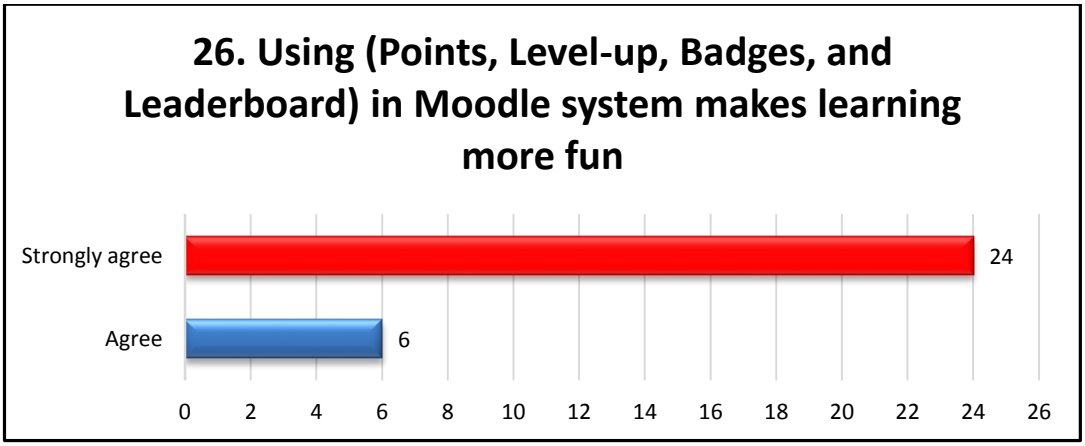


Figure 32: Participants' responses of Attitude toward Usage Question 26

Table 32: Results of Attitude toward Usage Question 26

	Frequency	Percent
Strongly agree	24	80
Agree	6	20
Total	30	100

Figure 33 show the participants' responses that using gamification tools (points, level-up, badges and leaderboard) in Moodle system was increased their concentration. Table 33 shows that 66.7% of students were strongly agree, while 33.3% were agree.

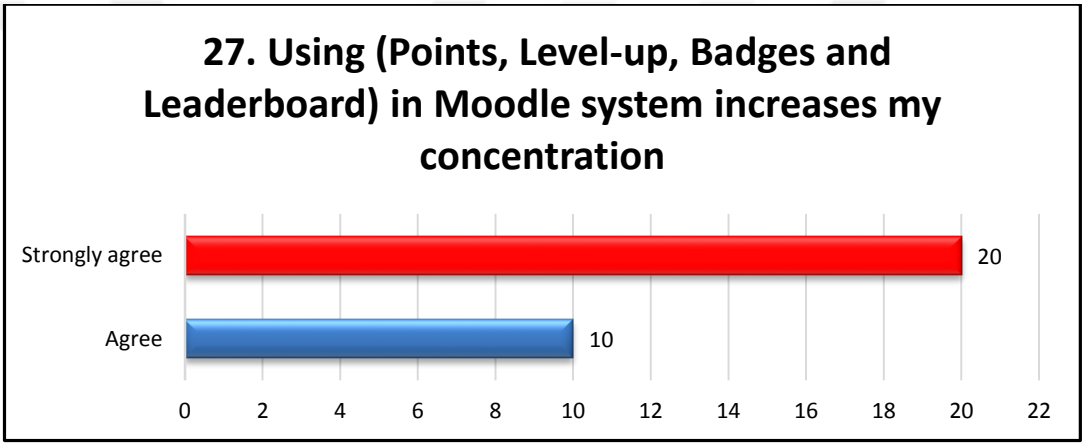


Figure 33: Participants' responses of Attitude toward Usage Question 27

Table 33: Results of Attitude toward Usage Question 27

	Frequency	Percent
Strongly agree	20	66.7
Agree	10	33.3
Total	30	100

Figure 34 show the participants' responses that using gamification tools (points, level-up, badges and leaderboard) in Moodle system was made learning more interesting. Table 34 shows that 86.7% of students were strongly agree, while 13.3% were agree.

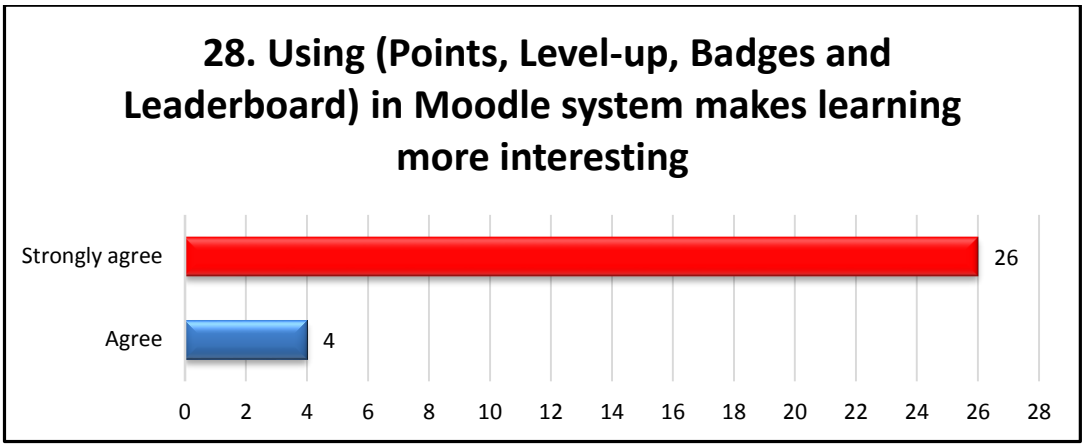


Figure 34: Participants' responses of Attitude toward Usage Question 28

Table 34: Results of Attitude toward Usage Question 28

	Frequency	Percent
Strongly agree	26	86.7
Agree	4	13.3
Total	30	100

Figure 35 show the participants' responses that feedback that offered by gamification tools (points, level-up, badges and leaderboard) in Moodle system was motivated them to continue to progress. Table 35 shows that 76.7% of students were strongly agree, while 23.3% were agree.

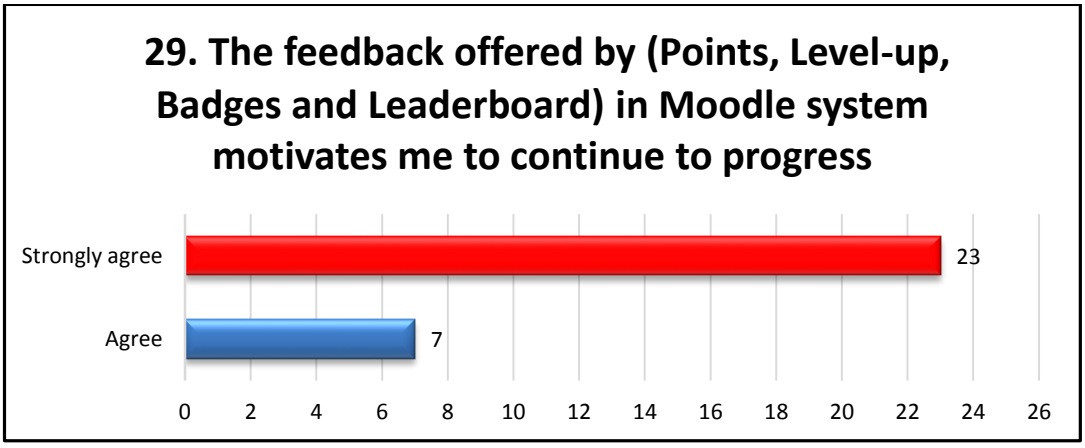


Figure 35: Participants' responses of Attitude toward Usage Question 29

Table 35: Results of Attitude toward Usage Question 29

	Frequency	Percent
Strongly agree	23	76.7
Agree	7	23.3
Total	30	100

4.2.1.2.4 Behavioral Intention to Use (BIU)

This factor included 3 items and a majority of the participants' responses of these items were strongly agree that intention to use of gamification tools (points, level-up, badges and leaderboard) in Moodle system in the future.

Table 36 shows the overall results for the attitude toward usage:

Table 36: Results of Attitude toward Usage

Question	Strongly Agree		Agree		Neither Agree Nor Disagree		Disagree		Strongly Disagree	
	Freq.	%	Freq	%	Freq	%	Freq	%	Freq	%
Q30. I plan to use (Points, Level-up, Badges and Leaderboard) in Moodle system in the future.	26	86.7	4	13.3	0		0		0	
Q31. I intend to continue to use (Points, Level-up, Badges and Leaderboard) in Moodle system in the future.	26	86.7	4	13.3	0		0		0	
Q32. I expect my use of (Points, Level-up, Badges and Leaderboard) in Moodle system to continue in the future.	26	86.7	4	13.3	0		0		0	
Average	26	86.7	4	13.3	0		0		0	

The details of participants' responses in these items are presented below.

Figure 36 show the participants' responses that using gamification tools (points, level-up, badges and leaderboard) in Moodle system in the future. Table 37 shows that 86.7% of students were strongly agree, while 13.3% were agree.

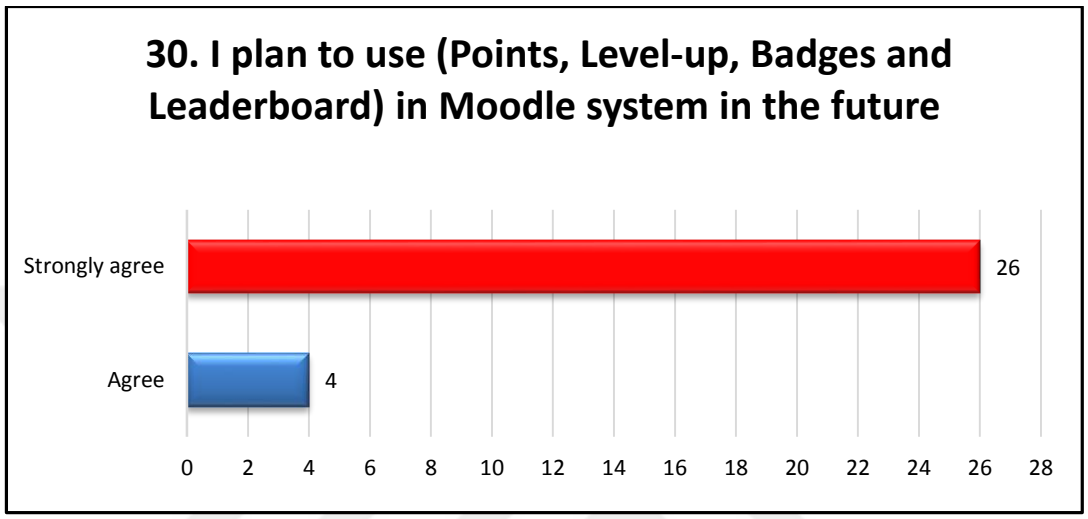


Figure 36: Participants' responses of Behavioral Intention to Use Question 30

Table 37: Results of Behavioral Intention to Use Question 30

	Frequency	**Percent**
Strongly agree	26	86.7
Agree	4	13.3
Total	30	100

Figure 37 show the participants' responses that intend to continue to use gamification tools (points, level-up, badges and leaderboard) in Moodle system in the future. Table 38 shows that 86.7% of students were strongly agree, while 13.3% were agree.

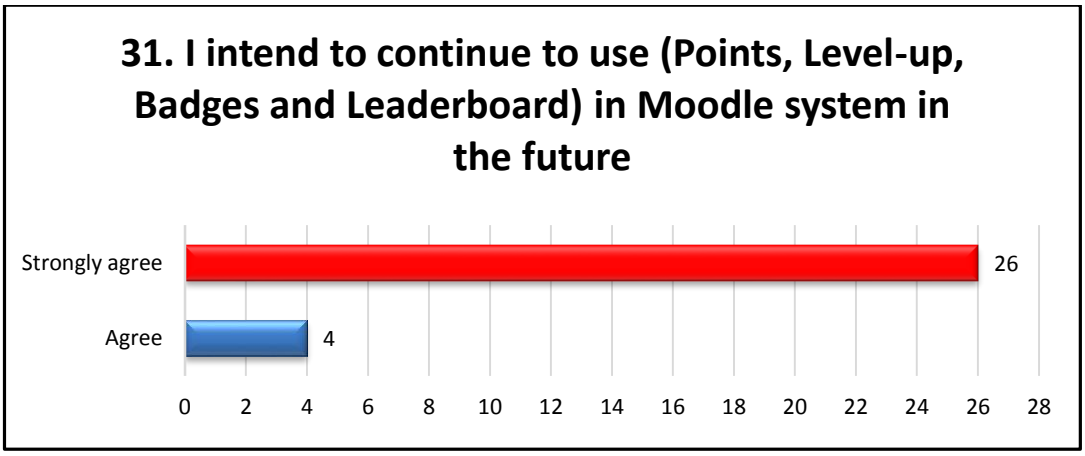


Figure 37: Participants' responses of Behavioral Intention to Use Question 31

Table 38: Results of Behavioral Intention to Use Question 31

	Frequency	Percent
Strongly agree	26	86.7
Agree	4	13.3
Total	30	100

Figure 38 show the participants' responses that their expecting using gamification tools (points, level-up, badges and leaderboard) in Moodle system to continue in the future. Table 39 shows that 86.7% of students were strongly agree, while 13.3% were agree.

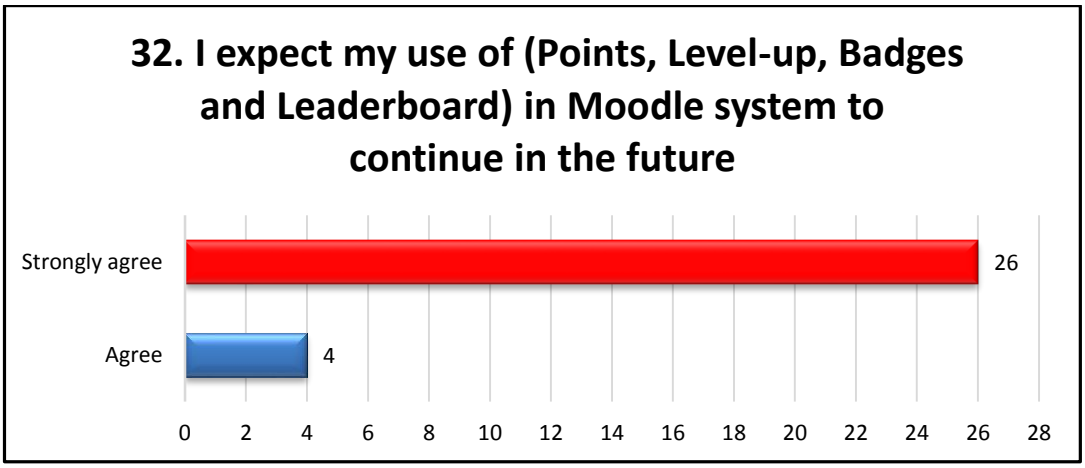


Figure 38: Participants' responses of Behavioral Intention to Use Question 32

Table 39: Results of Behavioral Intention to Use Question 32

	Frequency	Percent
Strongly agree	26	86.7
Agree	4	13.3
Total	30	100

4.3 Reliability Test of the Experimental Group Survey

Reliability estimates (Cronbach's coefficient alpha) were computed for survey of the experimental group.

In this section, we used the reliability test for items PEU, PU, ATU and BIU to analyze the items based on the nature of the measurement of these items (ordinal variables).

Table 40 shows the values of item-total statistics, which include the mean, variance and Cronbach's alpha with regard to whether an item is removed or deleted

According to these tables, Cronbach's alpha for all these items was 0.986, which is greater than 0.70. This means that all these items have acceptable reliability in the experimental group survey.

Table 40: Item total statistics (Experimental Group)

Reliability Statistics	
Cronbach's Alpha	N of Items
.986	**29**

Item-Total Statistics				
	Scale Mean if Item Deleted	**Scale Variance if Item Deleted**	**Corrected Item-Total Correlation**	**Cronbach's Alpha if Item Deleted**
PEU1- Learning to use gamification tools in Moodle system such as (Points, Level-up, Badges, Leaderboard) is easy for me.	**133.7667**	**96.392**	**.904**	**.985**
PEU2- I find it easy to get what I need from use (Points, Level-up,	**133.8333**	**97.178**	**.772**	**.986**

Badges, Leaderboard) in Moodle system.				
PEU3- My interaction with use (Points, Level-up, Badges, Leaderboard) in Moodle system is clear and understandable**.**	**133.6667**	**97.264**	**.928**	**.985**
PEU4- I find use (Points, Level-up, Badges, Leaderboard) in Moodle system to be flexible to interact with.	**133.6333**	**99.826**	**.648**	**.986**
PEU5- It is easy for me to become skilfully at using (Points, Level-up, Badges, Leaderboard) in Moodle system.	**133.8000**	**96.510**	**.864**	**.985**
PEU6- I find using (Points, Level-up, Badges, Leaderboard) in Moodle system easy to use.	**133.7667**	**96.392**	**.904**	**.985**
PU1- Using (Points, Level-up, Badges, Leaderboard) in Moodle system can enable me to accomplish tasks/assignments and quizzes more quickly.	**133.8000**	**96.510**	**.864**	**.985**
PU2- Using (Points, Level-up, Badges, Leaderboard) in Moodle system can improve my performance (grades) in related tasks/assignments and quizzes.	**133.7667**	**97.357**	**.794**	**.985**
PU3- Using (Points, Level-up, Badges, Leaderboard) in Moodle system can make it easier to do my tasks/assignments and quizzes.	**133.8000**	**96.510**	**.864**	**.985**
PU4- Using (Points, Level-up, Badges, Leaderboard) in Moodle system in my tasks/assignments and quizzes can increase my productivity.	**133.6333**	**98.102**	**.883**	**.985**
PU5- Using (Points, Level-up, Badges, Leaderboard) in Moodle system can enhance my effectiveness.	**133.7000**	**97.321**	**.869**	**.985**
PU6- I find (Points, Level-up, Badges, Leaderboard) in Moodle system useful in my tasks/assignments and quizzes.	**133.6000**	**99.421**	**.774**	**.986**
PU7- Using (Points, Level-up, Badges, Leaderboard) in Moodle	**133.7333**	**96.478**	**.928**	**.985**

system helps me to understand a particular topic better and faster.				
PU8- Using (Points, Level-up, Badges, Leaderboard) in Moodle system encourages me to actively discover new knowledge.	**133.6333**	**98.102**	**.883**	**.985**
PU9- Using (Points, Level-up, Badges, Leaderboard) in Moodle system enables me to learn on my own.	**133.5667**	**100.668**	**.672**	**.986**
PU10- I am more aware about learning Architecture course through gamification tools (Points, Level-up, Badges, Leaderboard).	**133.7333**	**96.478**	**.928**	**.985**
PU11- Using (Points, Level-up, Badges, Leaderboard) in Moodle system is a useful method in learning Architecture course.	**133.7333**	**96.478**	**.928**	**.985**
ATU1- I have fun interacting with using (Points, Level-up, Badges, Leaderboard) in Moodle system.	**133.7000**	**97.528**	**.843**	**.985**
ATU2- Using (Points, Level-up, Badges, Leaderboard) in Moodle system provides me with a lot of enjoyment.	**133.7000**	**96.838**	**.928**	**.985**
ATU3- I enjoy using (Points, Level-up, Badges, Leaderboard) in Moodle system.	**133.7000**	**97.528**	**.843**	**.985**
ATU4- Using (Points, Level-up, Badges, Leaderboard) in Moodle system stimulates my interest to learn.	**133.6000**	**99.903**	**.702**	**.986**
ATU5- Using (Points, Level-up, Badges, Leaderboard) in Moodle system increases my motivation to learn.	**133.6333**	**98.516**	**.826**	**.985**
ATU6- Using (Points, Level-up, Badges, Leaderboard) in Moodle system makes learning more fun.	**133.6667**	**97.264**	**.928**	**.985**
ATU7- Using (Points, Level-up, Badges, Leaderboard) in Moodle system increases my concentration.	**133.8000**	**96.648**	**.849**	**.985**

ATU8- Using (Points, Level-up, Badges, Leaderboard) in Moodle system makes learning more interesting.	**133.6000**	**99.903**	**.702**	**.986**
ATU9- The feedback offered by (Points, Level-up, Badges, Leaderboard) in Moodle system motivates me to continue to progress.	**133.7000**	**97.390**	**.860**	**.985**
BIU1- I plan to use (Points, Level-up, Badges, Leaderboard) in Moodle system in the future.	**133.6000**	**99.421**	**.774**	**.986**
BIU2- I intend to continue to use (Points, Level-up, Badges, Leaderboard) in Moodle system in the future.	**133.6000**	**99.421**	**.774**	**.986**
BIU3- I expect my use of (Points, Level-up, Badges, Leaderboard) in Moodle system to continue in the future.	**133.6000**	**99.421**	**.774**	**.986**

CHAPTER 5

CONCLUSION AND FUTURE WORK

In this study, the effects of gamification tools (points, level-up, badges and leaderboard) in the Moodle system on student performance and perception were examined. This chapter summarizes the results of this study and compares them with the results of previous studies. In addition, a number of recommendations for future work are presented.

5.1 Conclusion

The previous studies on gamification reviewed in Chapter 1 were for learners in Athens [7], Spain [16], USA [17], and Ireland [18]. This study expands studies for participants in Iraq where our results corroborate with the findings of previous studies which claim that the use of games elements (gamification) can meaningfully increase student motivation, improve the educational effectiveness of e-learning systems, make an online course more interesting, and increase students' willingness to learn and engage with course materials, which are indicators of a student's academic achievements.

In this study, our work began by making two contributions. First, we presented the design and assessment of a gamified e-learning experience in Iraqi university settings. Second, we revealed the potential of gamification on learners' performance and perception in e-learning environments.

This study used the Moodle program of the experimental research procedure to examine the effects of gamification tools (points, level-up, badges and leaderboard) on students' learning in two separate and equivalent groups of computer engineering students who were engaged in equal core learning materials of the online Architecture course in two pedagogically different environments in the Moodle system, that is, using gamification tools (points, level-up, badges and leaderboard) in the Moodle

system with the online Architecture course for the experimental group and without gamification tools with online Architecture course in the separate environment in the Moodle system for control group. A survey of the experimental group was conducted to identify the perceptions of students regarding (points, level-up, badges and leaderboard) in the Moodle system according to the Technology Acceptance Model (TAM). At the beginning of the empirical procedure, 70 students from the experimental and control groups were subjected to a pre-test of prior knowledge. A total of 47 students (30 students from the experimental group and 17 students from the control group) attended the online Architecture course for three weeks. At the end of the online Architecture course, 70 students from the experimental and control groups were examined in a post-test.

We have two research questions in this study. To answer the first research question, we used the t-test to compare the mean results of the achievement scores of the 47 students of the experimental and control groups in the pre- and post-tests according to two of the hypotheses. The pre- and post-test results show that students in the experimental group had no statistically significant difference from the control group regarding students' performances on pre-test scores, while the experimental group showed a statistically significant difference in comparison to the control group regarding the students' performances on post-test scores. This can be summarized such that the students in the experimental group using the gamification tools of the online Architecture course were significantly more greatly motivated to access and use the online learning material than the control group. These results are compatible with previous results [7] [16] [17] [18].

The second research question was answered by implementation of the survey to identify students' perception of gamification elements (points, level-ups, badges and leaderboards) in the Moodle system to improve gamified systems for learning. The investigation included a student survey in the experimental groups using Google Forms based on the widely known Technology Acceptance Model (TAM). According to the Technology Acceptance Model (TAM), the results in the survey show that nearly every student in the experimental group strongly agreed that using the game elements, such as points, level-up, badges and leaderboard, were useful in creating enjoyment to motivate them to engage with more challenging activities as well as in

assisting to enhance students' performance in the online Architecture course, in which they were confident of its ease of use.

In general, the students have positive attitudes towards using points, level-up, badges and leaderboard in the Moodle system and they showed positive intentions in using gamification tools in their future, thereby making these results compatible with previous experimental results in the literature [16] [18].

To measure the reliability of students' responses in the experimental group in the survey, we used reliability estimates (Cronbach's coefficient alpha) for the PEU, PU, ATU and BIU items to analyze the items based on the nature of the measurement of these items (ordinal variables) to regulate the learning process. In total, the Cronbach's alphas recorded high reliability for all items, which indicated the validity and reliability of the questionnaire data in the experimental group as well as compatibility with the previous results [18].

Finally, if the gamification elements such as points, level-up, badges and leaderboard, are effectively integrated into online courses to motivate students and promote learning, it might lead to better results in terms of attendance and performance. Based on our study, there was a higher attendance level, a higher amount of submitted homework and an improvement in the grades in the post-test and the survey results obtained by the students in the experimental group. This can be explained by the gamification features having their own power to increase students' performance in the learning process, and at the same time, could be the reason for the decrease in drop outs of the majority of students in the experimental group to attend the online Architecture course. Therefore, the teachers need to be able to begin to incorporate mechanisms of learning into their teaching practices. Effectively integrating gamification into education is not only about conferring points, level-up, badges and leaderboard to every e-learning wanting to be gamified, it demands a deep investigation of the engaged students, the course material and aims of learning, and the holistic framework of the learning participation, followed by consideration of what specific elements and mechanisms will most effectively guide the student through the use of correct mechanics in a meaningful learning experience with a higher probability of success.

5.2 Limitation

This study is the limited to the following:

- The results of this study were limited to different size of experimental and groups. Although there were the same number of participants in both groups at the beginning of the study, there were 30 active participants in experimental and 17 participants in control groups in this study. The reason for this could be the gamification tools in learning environment. It might have been affected the participants drop-out rates.
- The results of this study were limited to senior university students at Iraq.
- The results of this study were limited to 3 weeks implementation.

5.3 Future work

There are several aspects of e-learning which are based on gamification and which can be researched in future work. For the particular system that was introduced in this study, it would be very interesting to test the system during an entire semester; therefore, more data would become available so as to assess the effects of game elements on student performance over a whole semester. Furthermore, it would be significant to experiment Moodle system with different topics and therefore provide a clear and comprehensive view on the impact of using gamification in various educational subjects.

Another option is the use of a completely different game mechanic in the e-learning system (such as Hangman, Crossword, Millionaire, Sudoku, Snakes and Ladders, and other games) to assess its potential to increase student participation. However, it would be more valuable to assess each game mechanic individually, creating an overview to compare individual motivational impacts. Moreover, many game mechanics can be combined into the Moodle system by studying other aspects of learner personality and their relationship to the various gamification elements. It is probably also a good perspective to provide users with the possibility of choosing elements of gamification based on their interests to test and compare their impact on student participation.

Finally, it will be an interesting project to design, develop and implement gamification in an e-learning system not only for higher education students; but also similar research can be conducted on students from primary or secondary schools and which can be performed in an informal educational setting such as at the Ministry of Labor and Social Affairs in Iraq. This system will integrate the characteristics different types of

systems for e-learning, and it will acquire a wide array of elements of gamification so that it can be completely gamified. It may also draw inspiration widespread Internet apps and social networking to encourage students even more. This can help gamification to endure and prolong the educational life cycle.

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APPENDICES

APPENDIX A

Screenshots of Moodle Environment

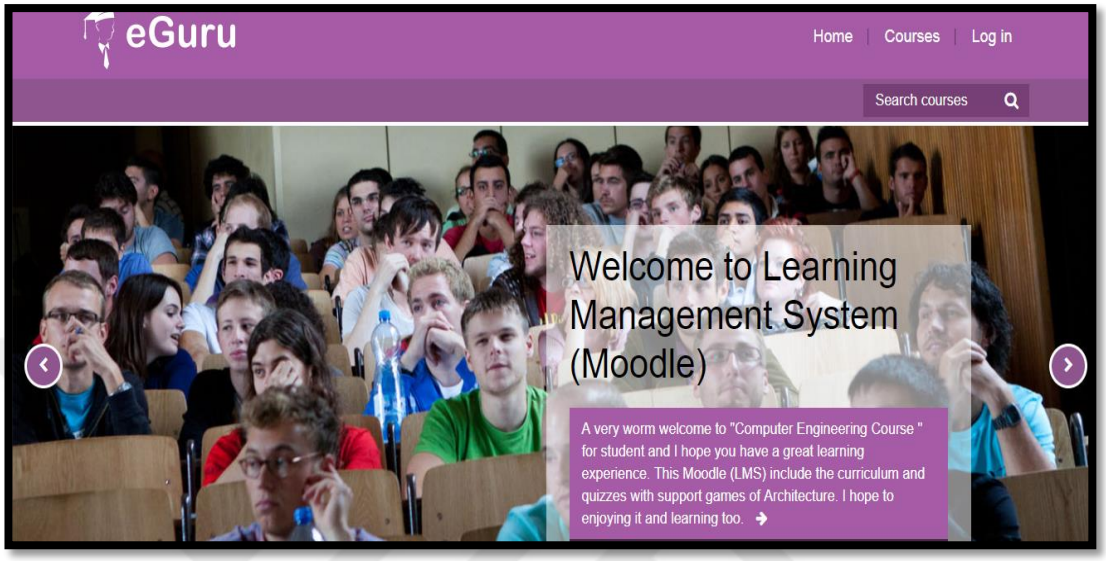


Figure 39: E-learning Environment (Moodle)

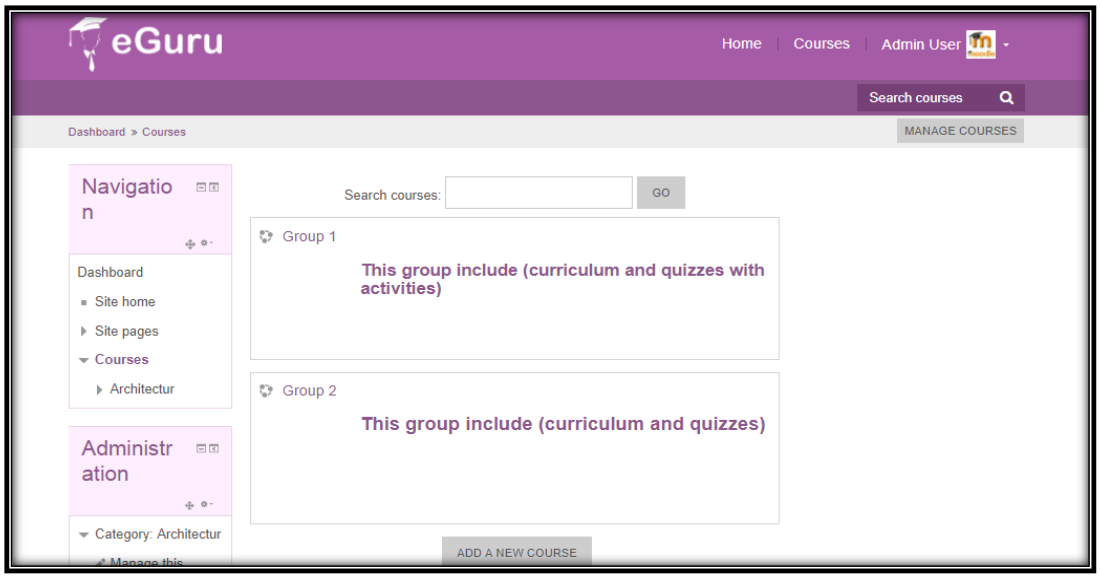


Figure 40: Experimental Group (Group1) and Control Group (Group 2) in Moodle

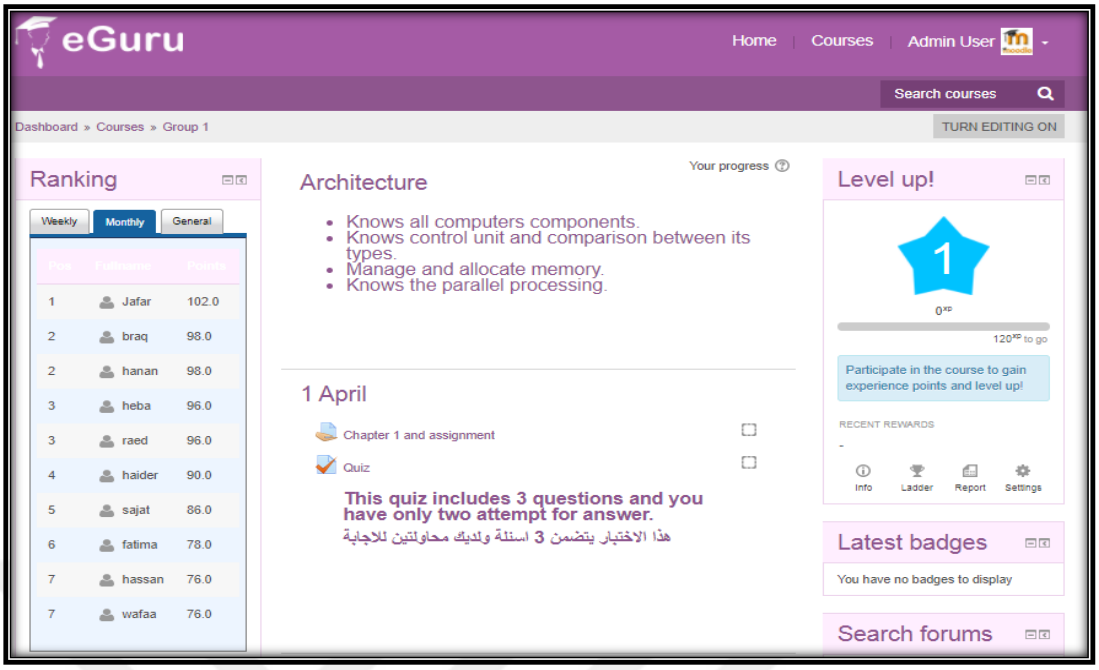


Figure 41: Gamification Elements in Experimental Group Environment

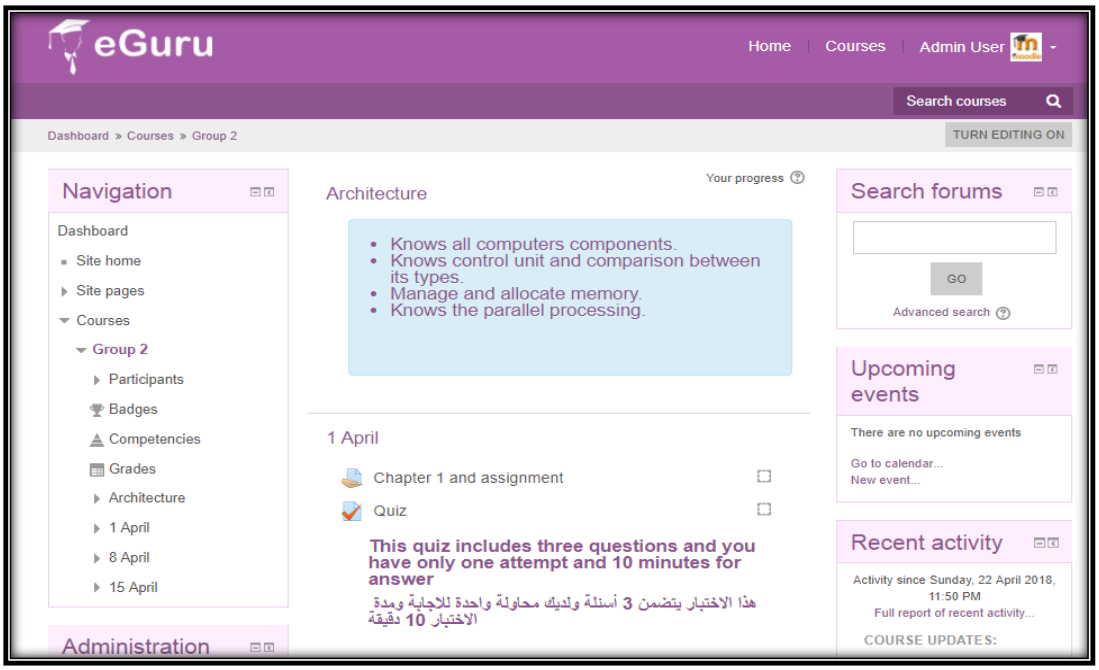


Figure 42: Control Group Environment

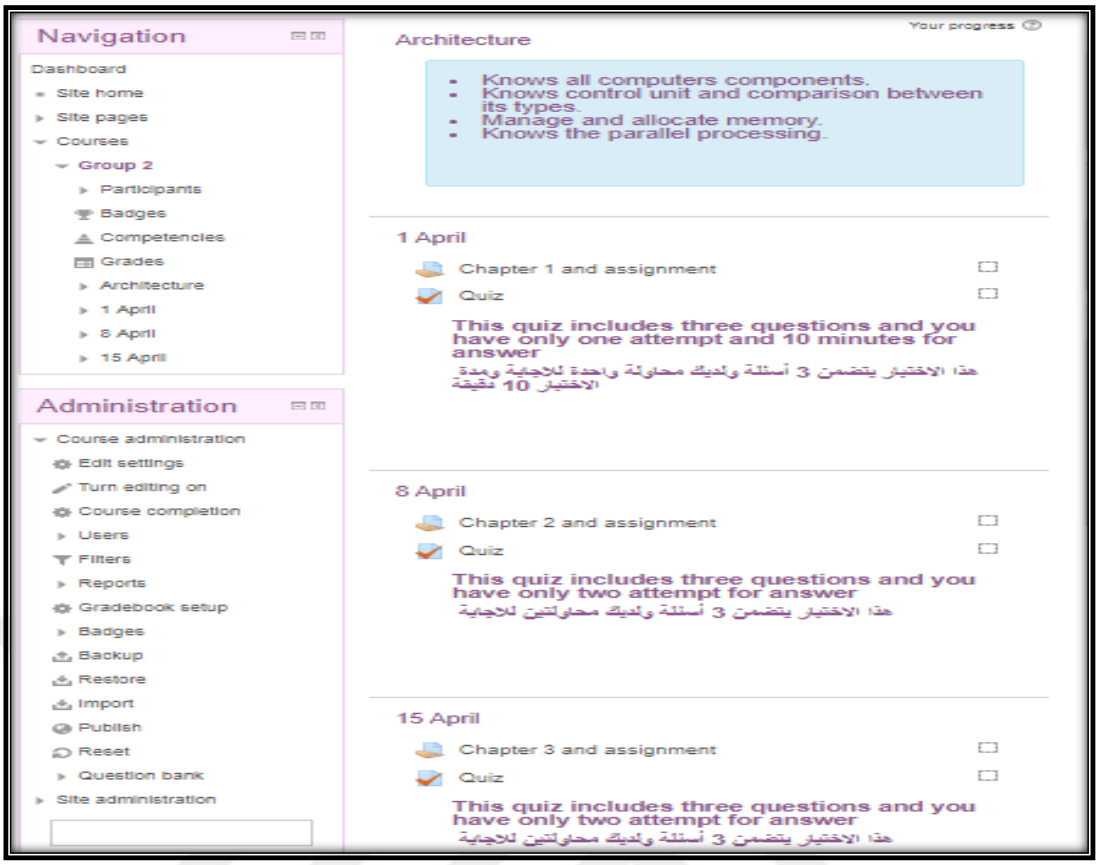


Figure 43: Assignment and Quizzes in Online Architecture Course in Moodle system

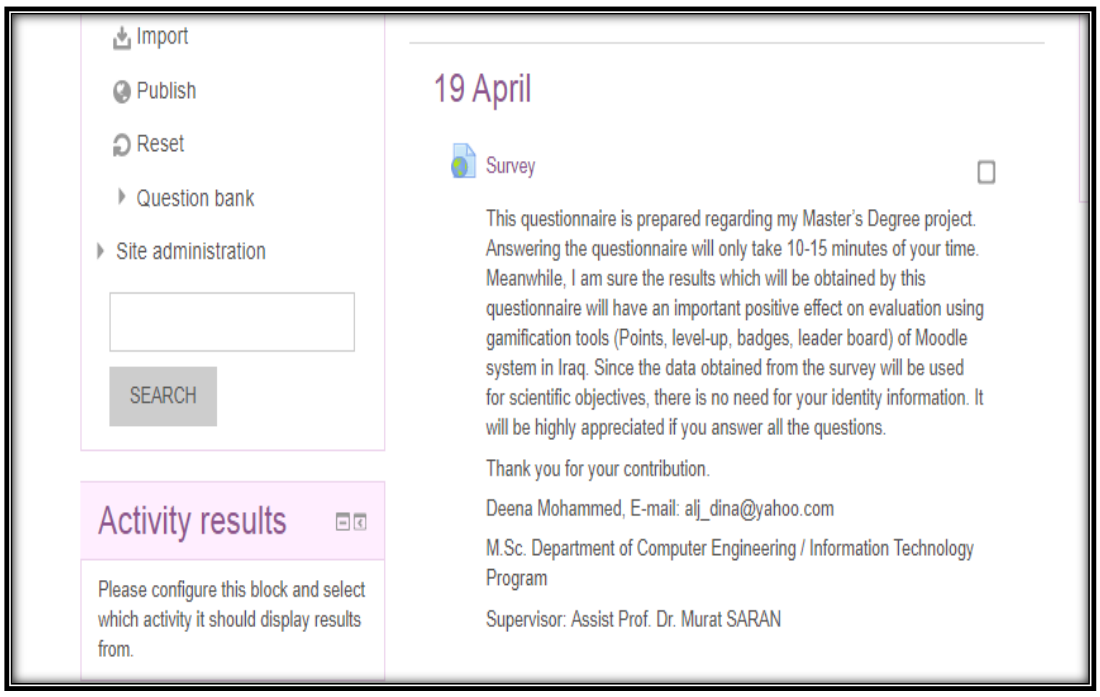
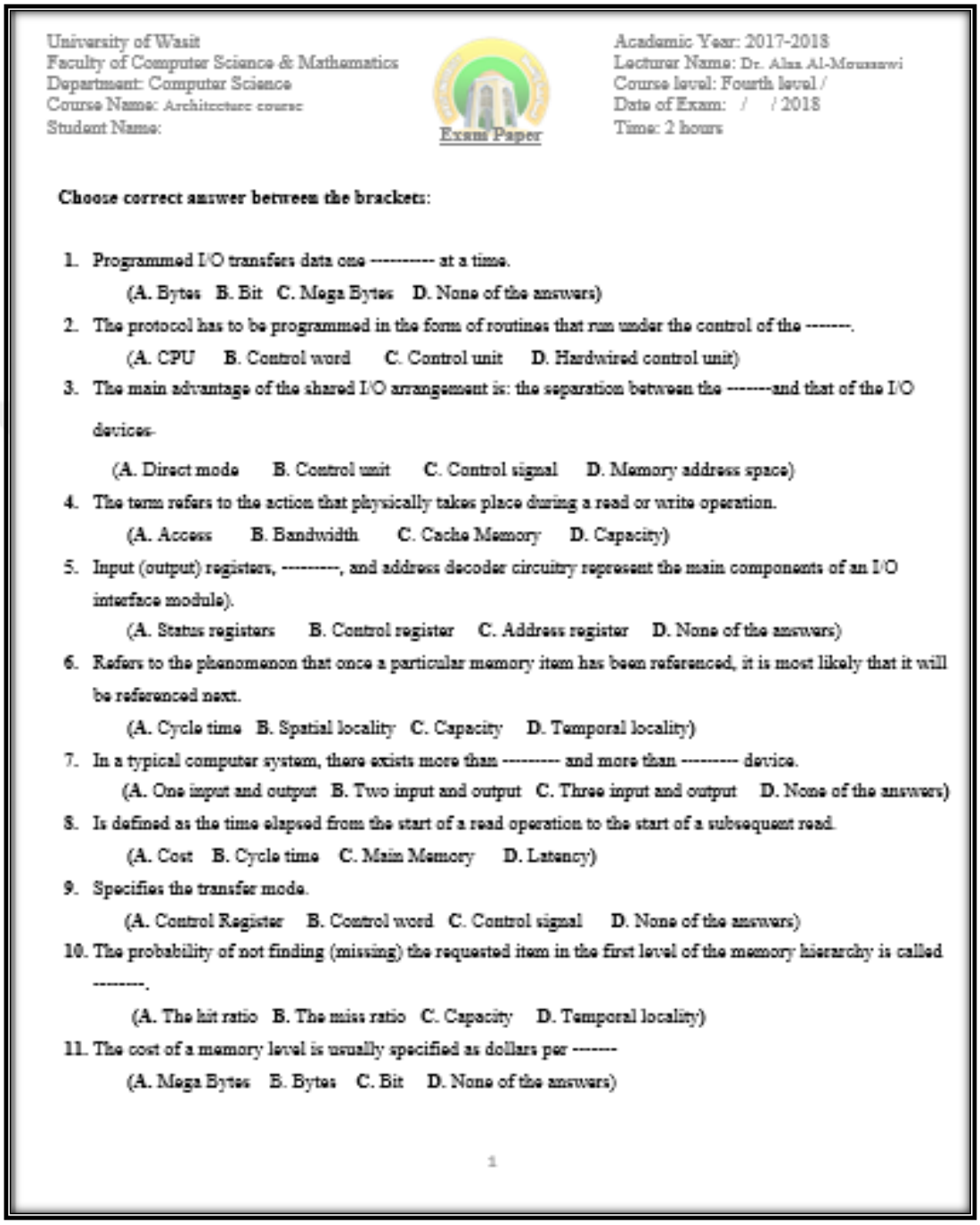


Figure 44: Survey of Experimental Group in Moodle system

APPENDIX B

Exam papers (Pre-and Post-Test)



University of Wasit
Faculty of Computer Science & Mathematics
Department: Computer Science
Course Name: Architecture course
Student Name:

Exam Paper

Academic Year: 2017-2018
Lecturer Name: Dr. Alaa Al-Moussawi
Course level: Fourth level /
Date of Exam: / / 2018
Time: 2 hours

Choose correct answer between the brackets:

1. Programmed I/O transfers data one ---------- at a time.
   (A. Bytes B. Bit C. Mega Bytes D. None of the answers)
2. The protocol has to be programmed in the form of routines that run under the control of the -------.
   (A. CPU B. Control word C. Control unit D. Hardwired control unit)
3. The main advantage of the shared I/O arrangement is: the separation between the -------and that of the I/O devices.
   (A. Direct mode B. Control unit C. Control signal D. Memory address space)
4. The term refers to the action that physically takes place during a read or write operation.
   (A. Access B. Bandwidth C. Cache Memory D. Capacity)
5. Input (output) registers, ---------, and address decoder circuitry represent the main components of an I/O interface module).
   (A. Status registers B. Control register C. Address register D. None of the answers)
6. Refers to the phenomenon that once a particular memory item has been referenced, it is most likely that it will be referenced next.
   (A. Cycle time B. Spatial locality C. Capacity D. Temporal locality)
7. In a typical computer system, there exists more than --------- and more than --------- device.
   (A. One input and output B. Two input and output C. Three input and output D. None of the answers)
8. Is defined as the time elapsed from the start of a read operation to the start of a subsequent read.
   (A. Cost B. Cycle time C. Main Memory D. Latency)
9. Specifies the transfer mode.
   (A. Control Register B. Control word C. Control signal D. None of the answers)
10. The probability of not finding (missing) the requested item in the first level of the memory hierarchy is called --------.
    (A. The hit ratio B. The miss ratio C. Capacity D. Temporal locality)
11. The cost of a memory level is usually specified as dollars per -------
    (A. Mega Bytes B. Bytes C. Bit D. None of the answers)

1

Figure 45: Exam Paper

University of Wasit
Faculty of Computer Science & Mathematics
Department: Computer Science
Course Name: Architecture course
Student Name:

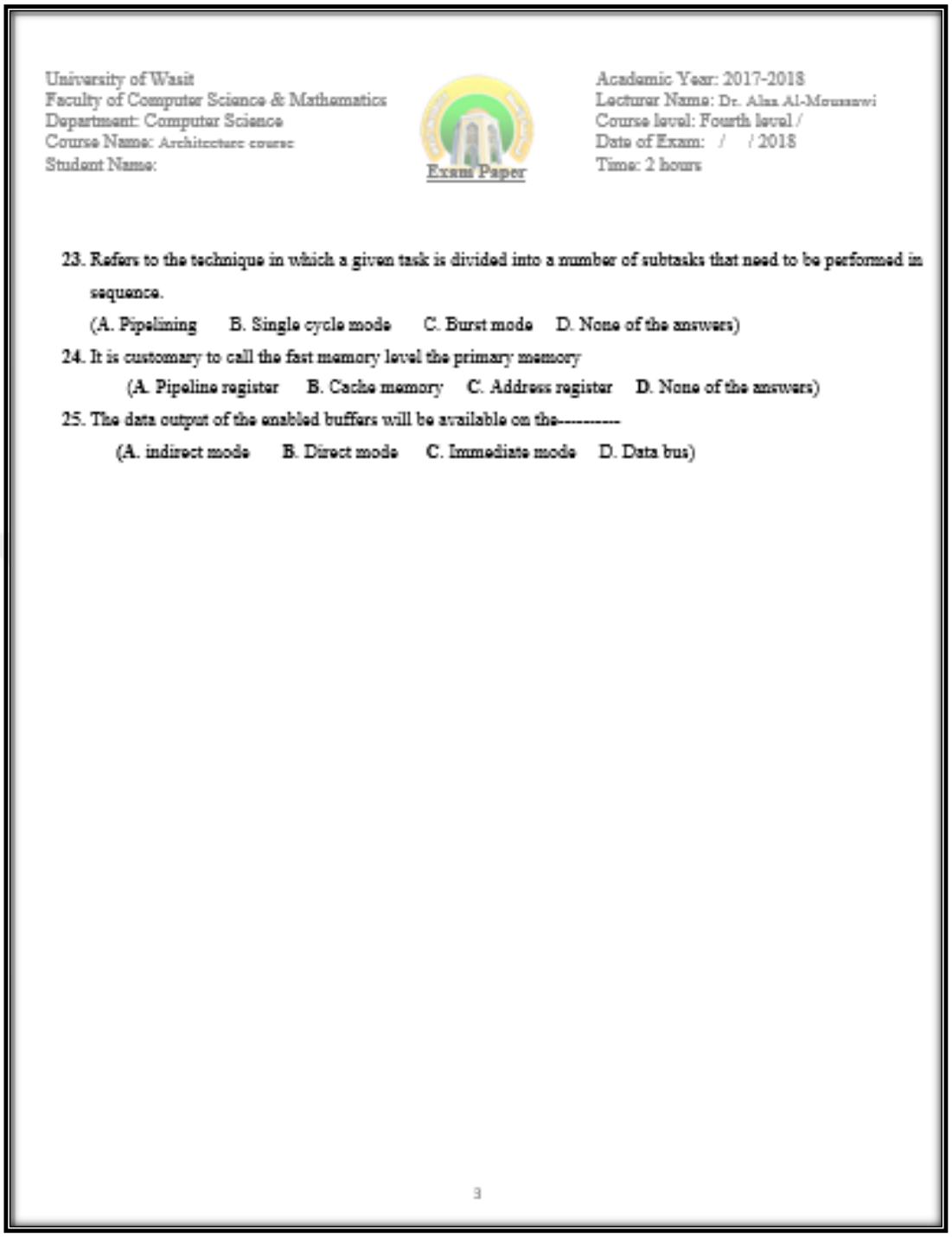
Exam Paper

Academic Year: 2017-2018
Lecturer Name: Dr. Alaa Al-Moussawi
Course level: Fourth level /
Date of Exam: / / 2018
Time: 2 hours

12. This principle is possible due to a phenomenon called ----------
(A. locality of reference B. random access C. Capacity D. Temporal locality)
13. Is defined as the time interval between the request for information and the access to the first bit of that information.
(A. Main Memory B. Bandwidth C. Latency D. None of the answers)
14. The probability of finding the requested item in the first level in memory is called------.
(A. The hit ratio B. The miss ratio C. Capacity D. Temporal locality)
15. The capacity of a memory level is usually measured in ------.
(A. Bytes B. Bit C. Mega Bytes D. None of the answers)
16. It allows devices to transfer data to or from the system's memory without the help of the processor.
(A. CPU B. The DMA controller C. Single cycle mode D. None of the answers)
17. The term refers to the fact that any access to any memory location takes the same fixed amount of time regardless of the actual memory location and/or the sequence of accesses that takes place.
(A. Random-access B. Cycle time C. Spatial locality D. Capacity)
18. Provides a measure of the number of bits per second that can be accessed
(A. Cost B. Bandwidth C. Vectored Interrupt D. None of the answers)
19. The main advantage of the memory-mapped I/O is the use of the ----------of the processor to perform the input and output operations, respectively .It eliminates the need for introducing special I/O instructions.
(A. Relative mode B. Auto decrement mode C. Read and write instructions D. Auto increment mode)
20. The first level of the memory hierarchy is to keep the information expected to be used more frequently by the CPU (a small high-speed memory that is near the CPU).
(A. Capacity B. Bandwidth C. Cache Memory D. None of the answers)
21. The deal with input and output registers as if they are regular memory locations
(A. Memory-mapped I/O B. Memory cash C. Control signal D. Memory address space)
22. Is the next level down in the hierarchy, satisfies the demands of caches and serves as the I/O interface, as it is the destination of input as well as the source for output.
(A. Latency B. Main Memory C. MAR D. Spatial locality)

2

Figure 46: Exam Paper



University of Wasit
Faculty of Computer Science & Mathematics
Department: Computer Science
Course Name: Architecture course
Student Name:

Exam Paper

Academic Year: 2017-2018
Lecturer Name: Dr. Alaa Al-Moussawi
Course level: Fourth level /
Date of Exam: / / 2018
Time: 2 hours

23. Refers to the technique in which a given task is divided into a number of subtasks that need to be performed in sequence.

(A. Pipelining B. Single cycle mode C. Burst mode D. None of the answers)

24. It is customary to call the fast memory level the primary memory

(A. Pipeline register B. Cache memory C. Address register D. None of the answers)

25. The data output of the enabled buffers will be available on the----------

(A. indirect mode B. Direct mode C. Immediate mode D. Data bus)

3

Figure 47: Exam Paper

APPENDIX C

Screenshots of Experimental Group Questionnaire

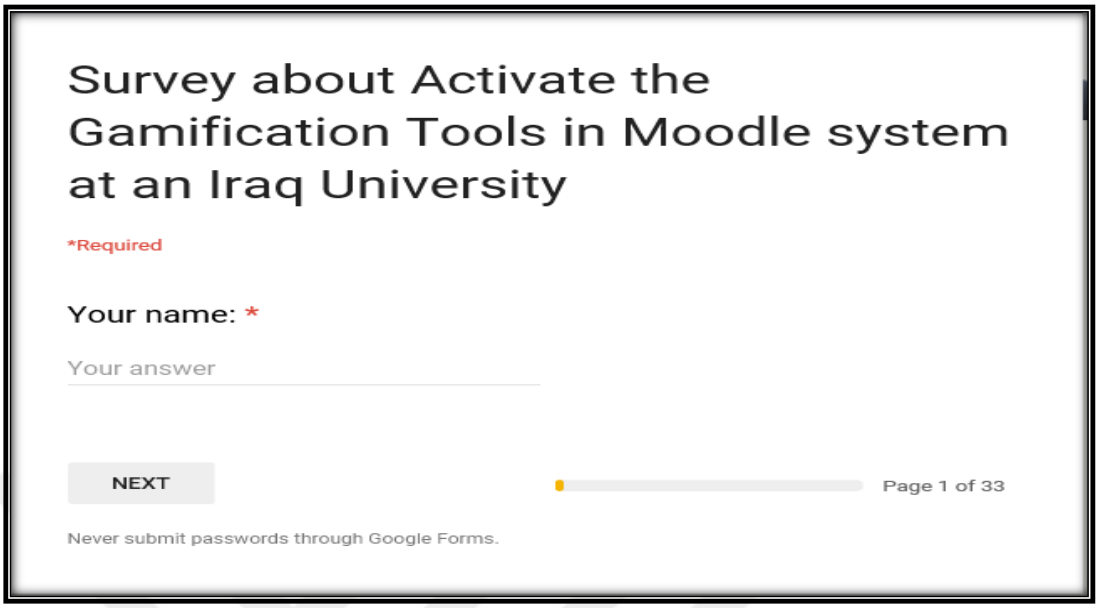


Figure 48: Ask Students about their Name

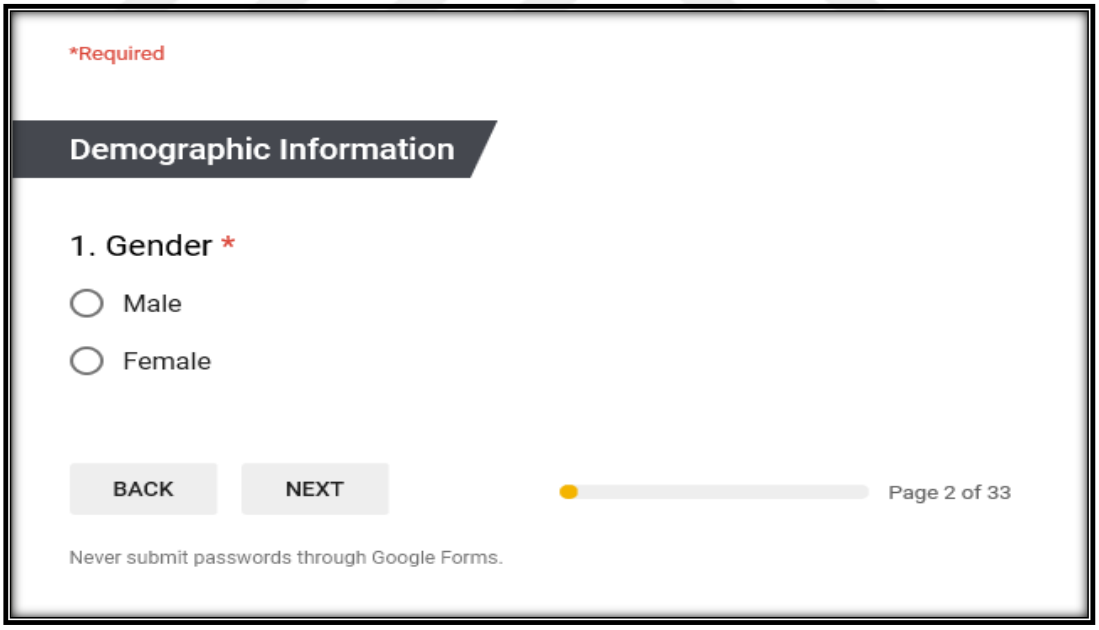


Figure 49: Question 1 in the Experimental Group

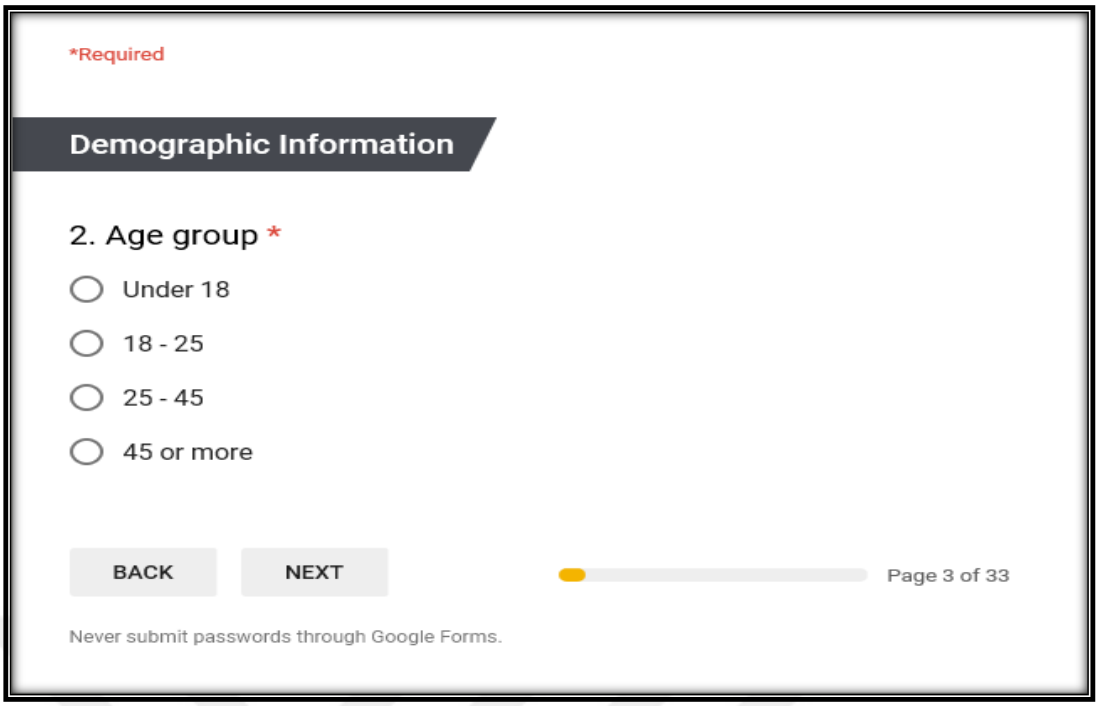


Figure 50: Question 2 in the Experimental Group

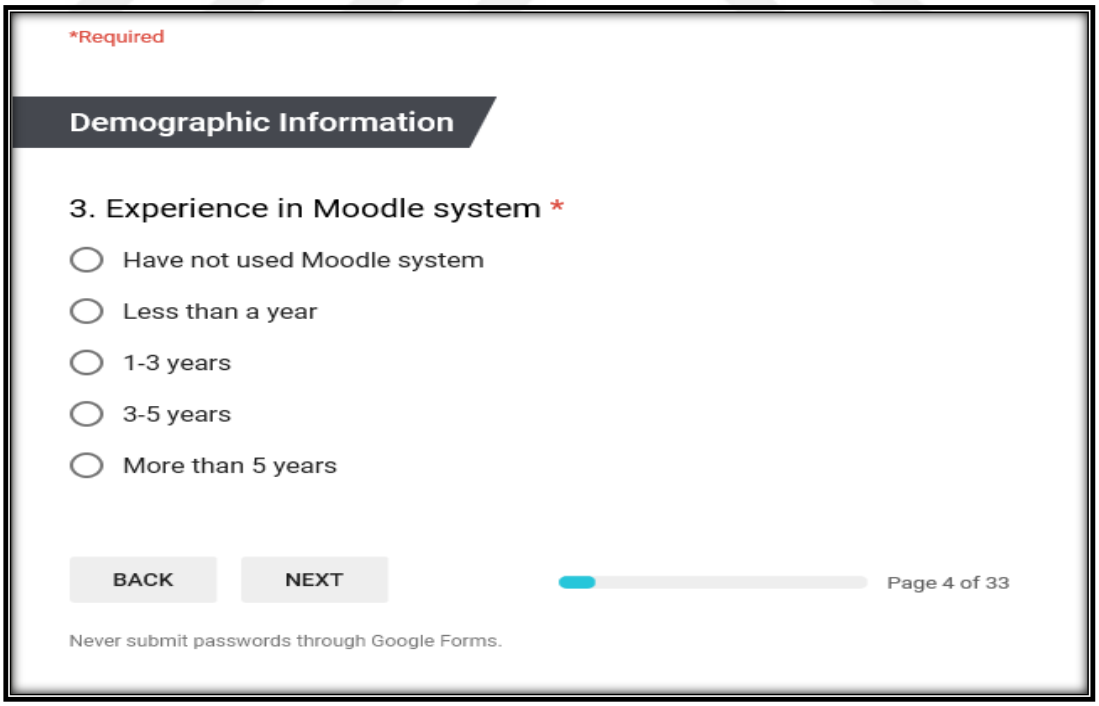


Figure 51: Question 3 in the Experimental Group

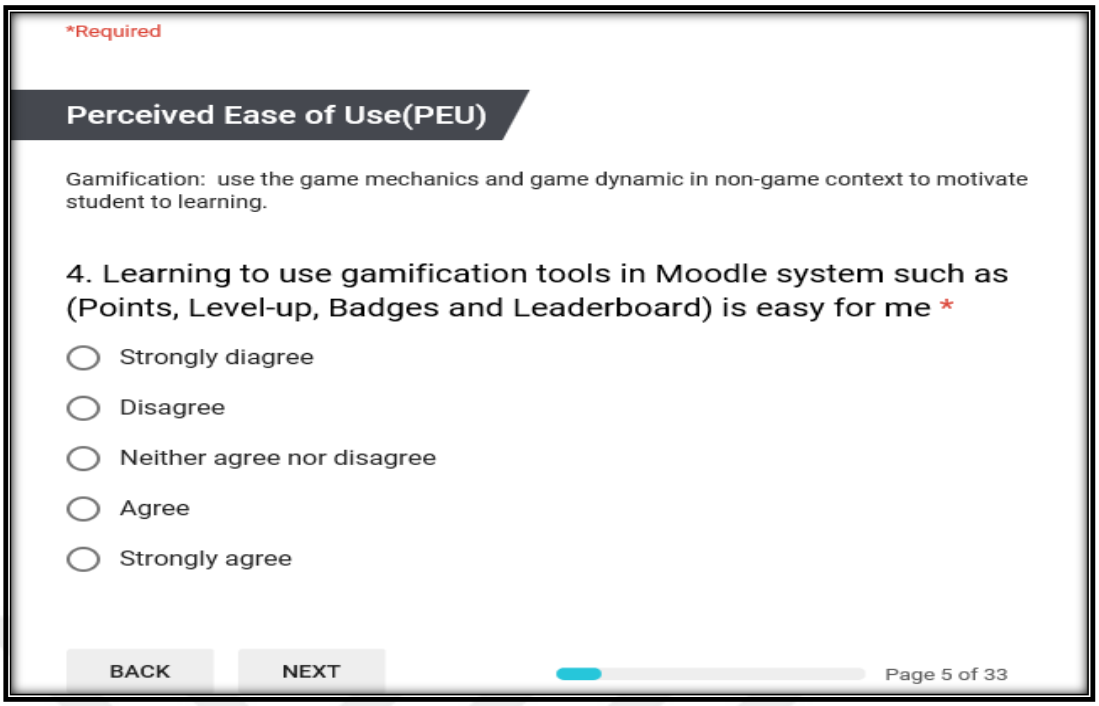


Figure 52: Question 4 in the Experimental Group

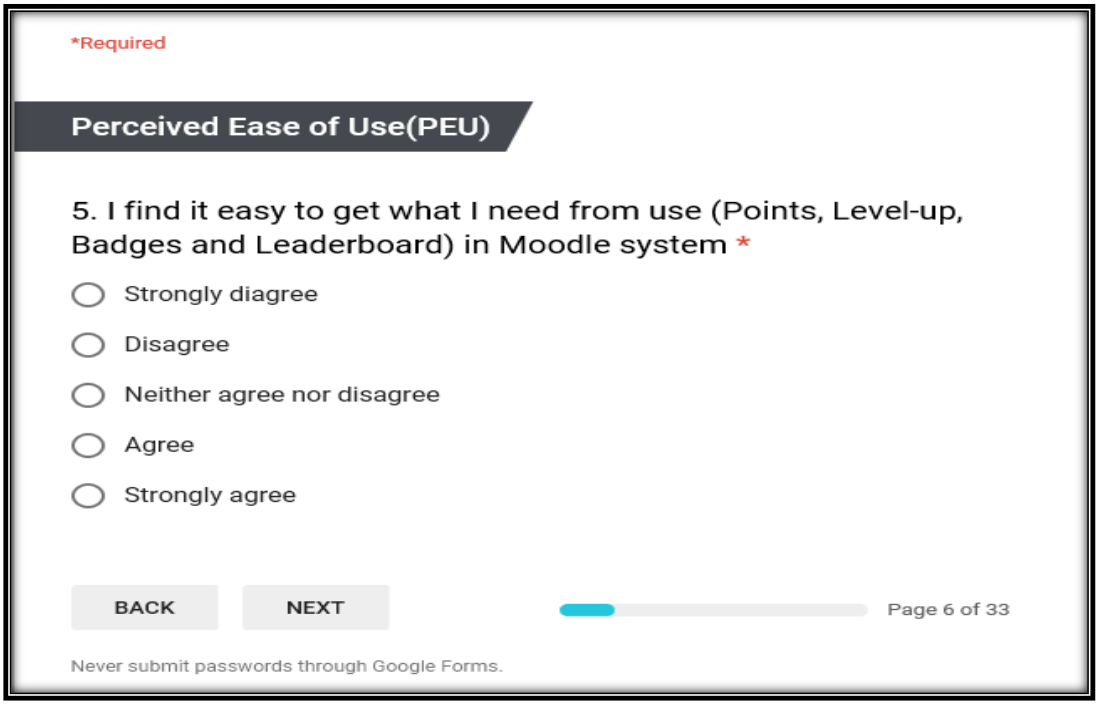


Figure 53: Question 5 in the Experimental Group

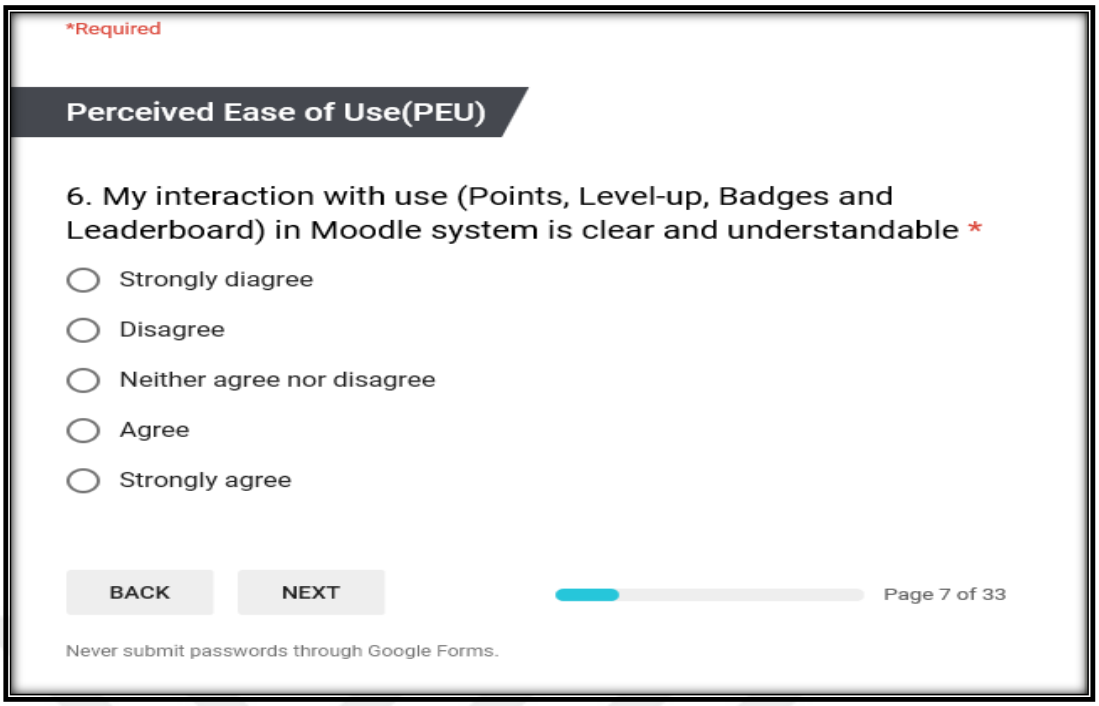


Figure 54: Question 6 in the Experimental Group

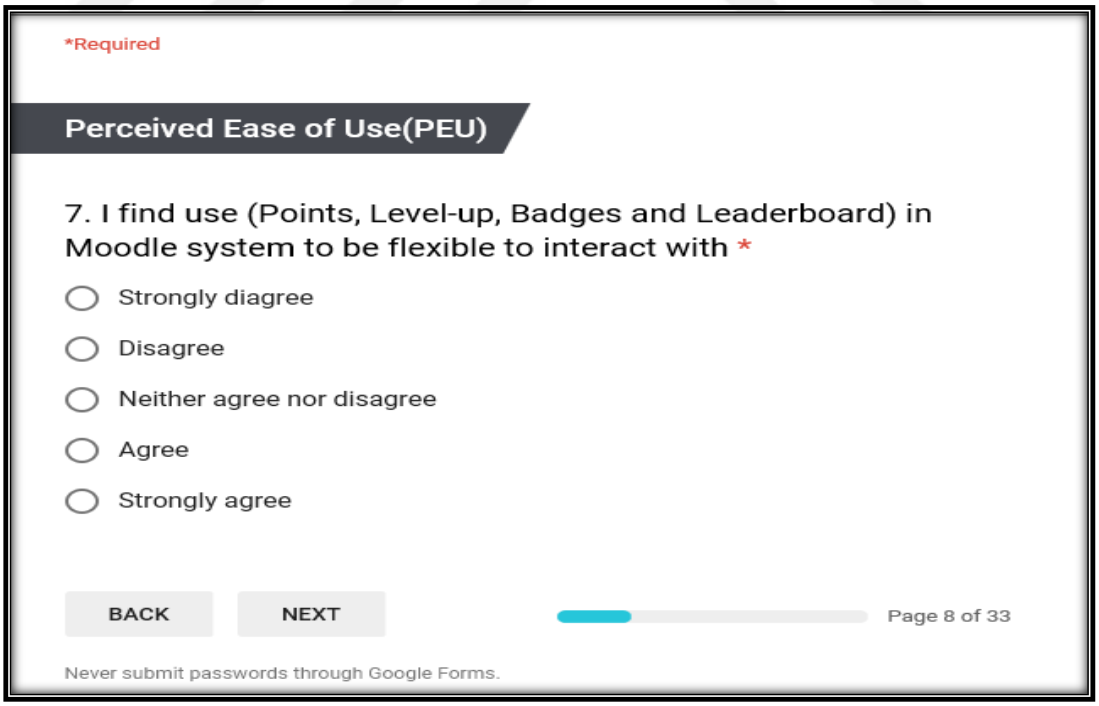


Figure 55: Question 7 in the Experimental Group

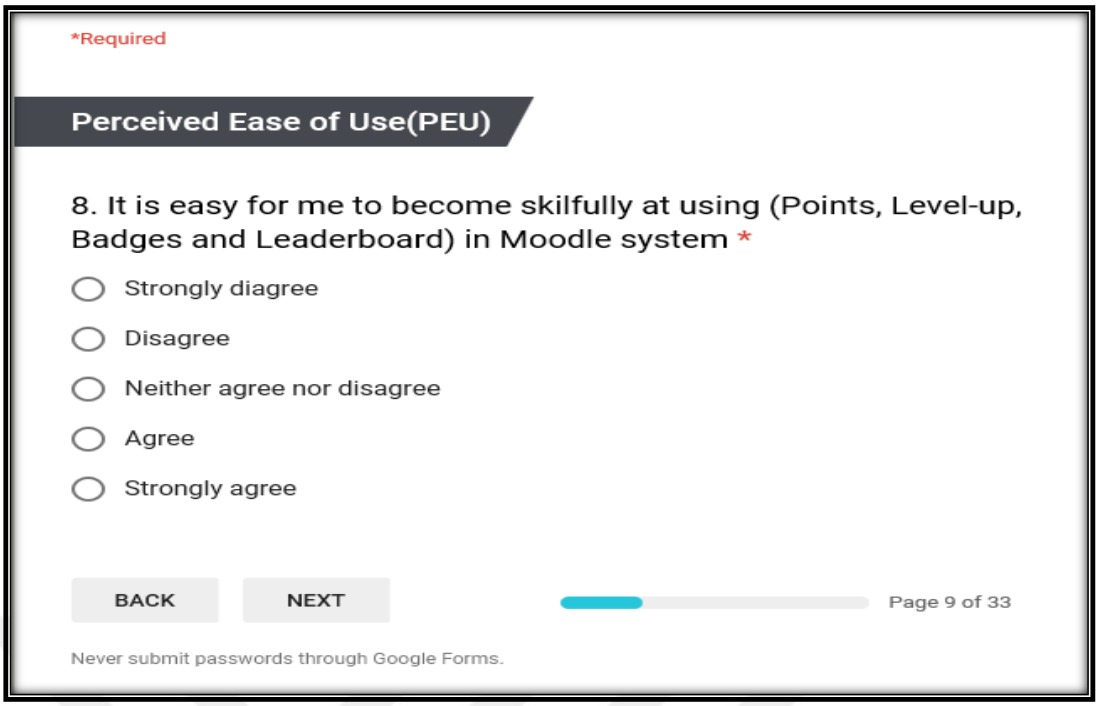


Figure 56: Question 8 in the Experimental Group

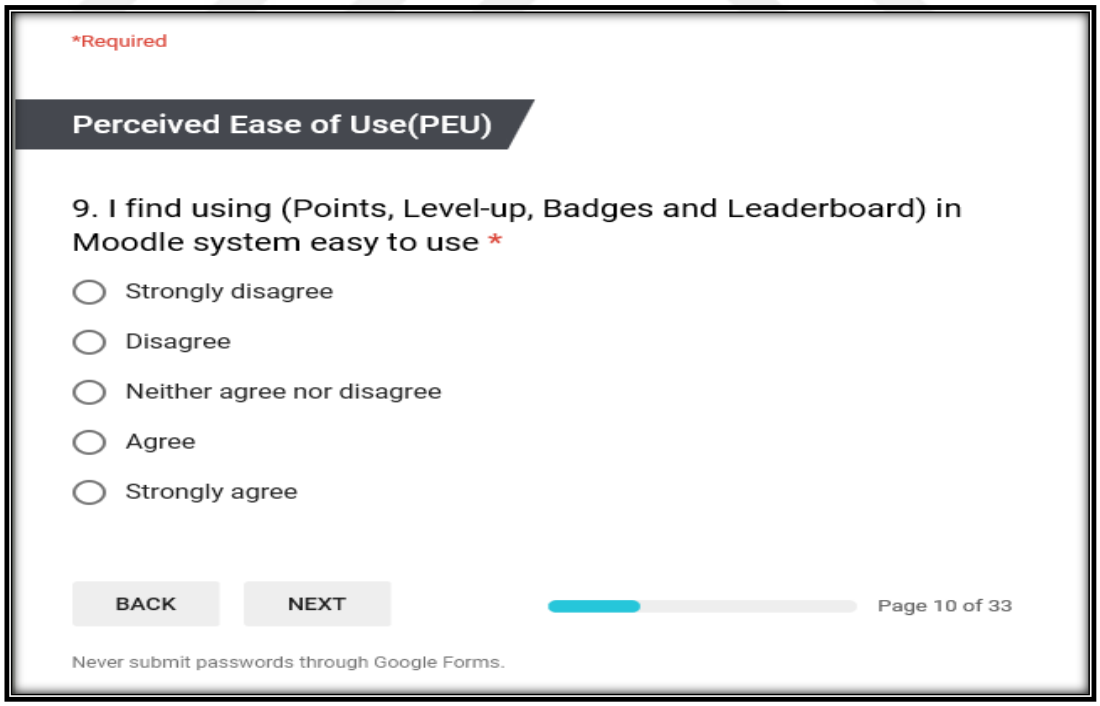


Figure 57: Question 9 in the Experimental Group

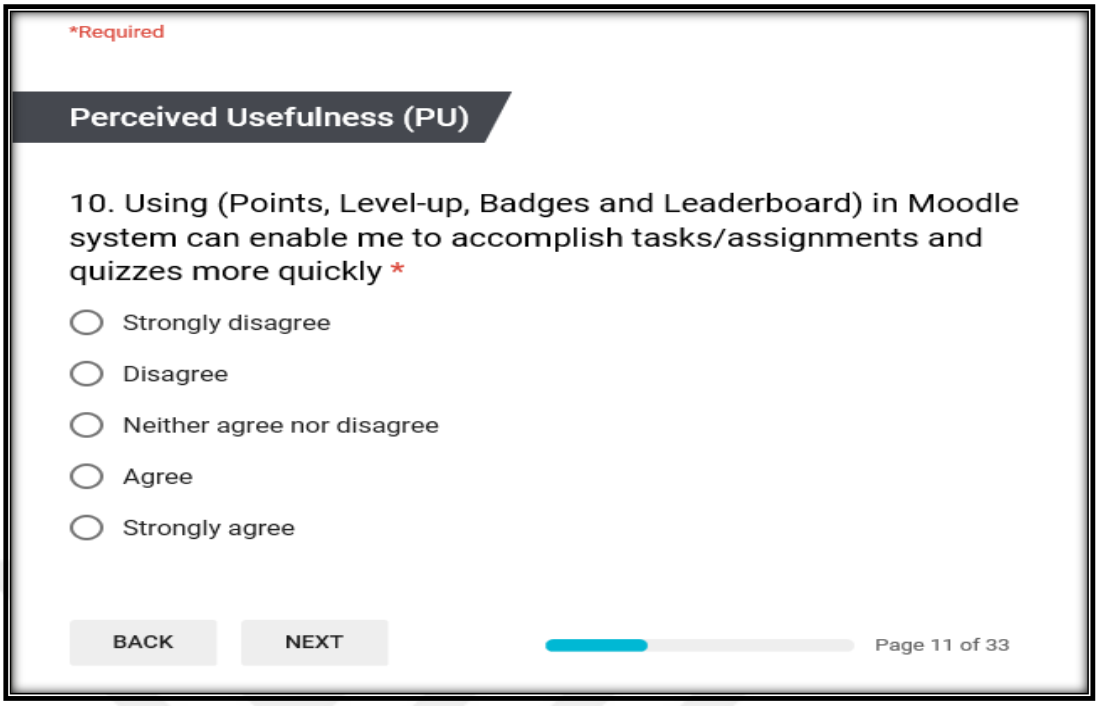


Figure 58: Question 10 in the Experimental Group

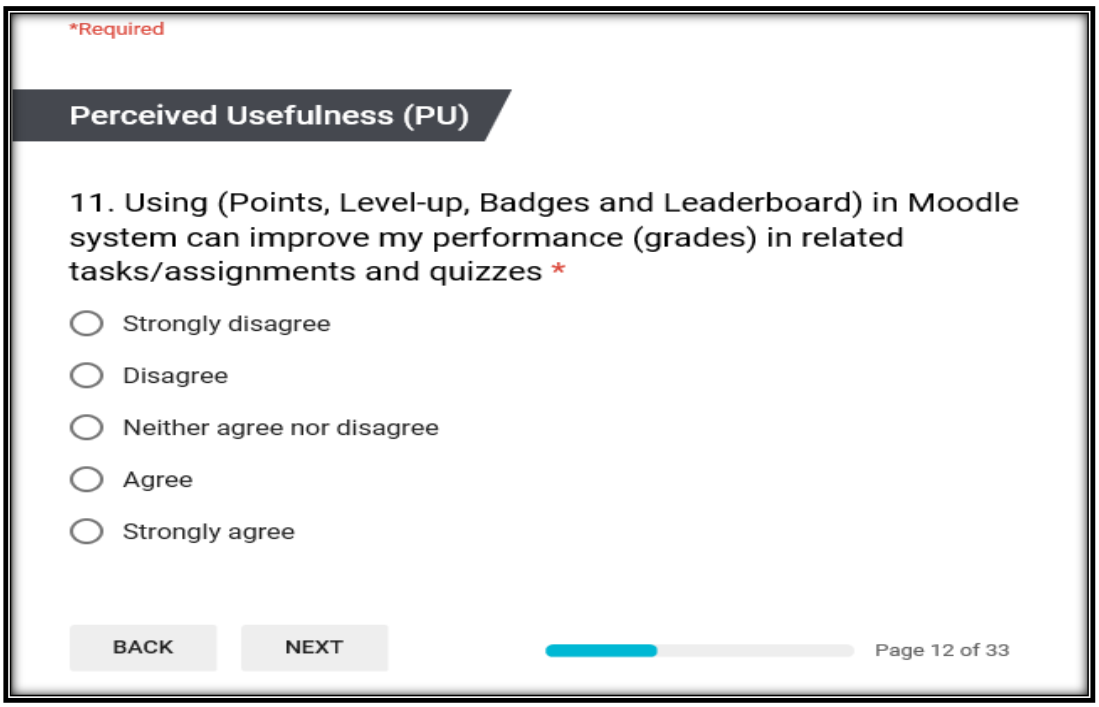


Figure 59: Question 11 in the Experimental Group

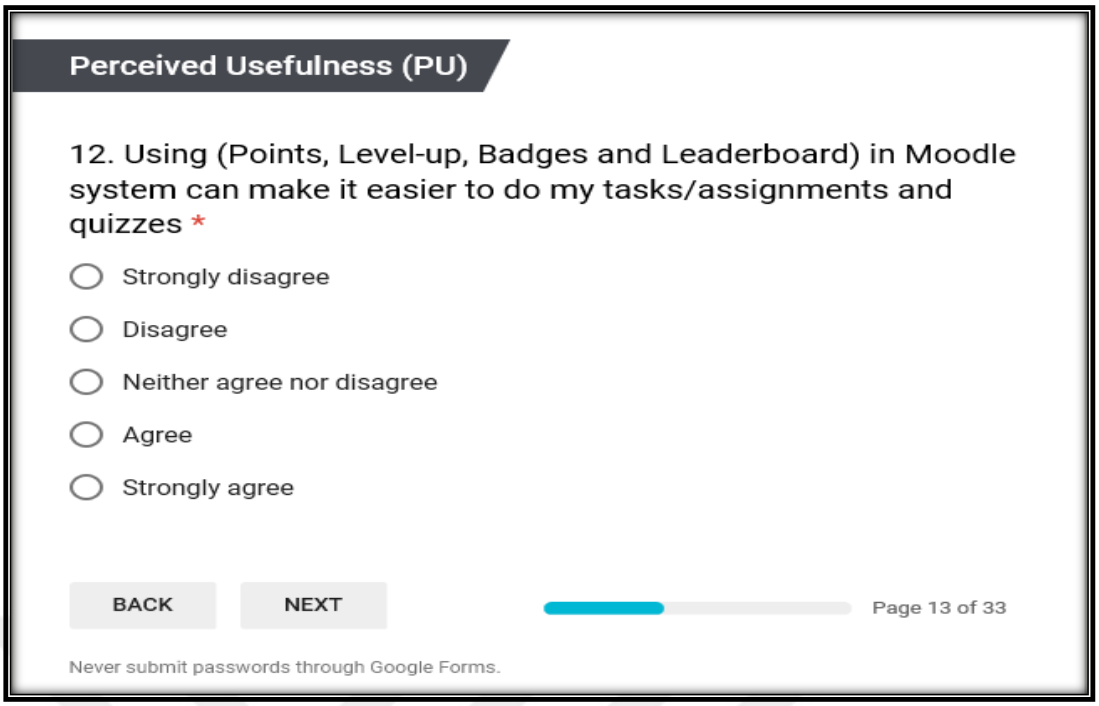


Figure 60: Question 12 in the Experimental Group

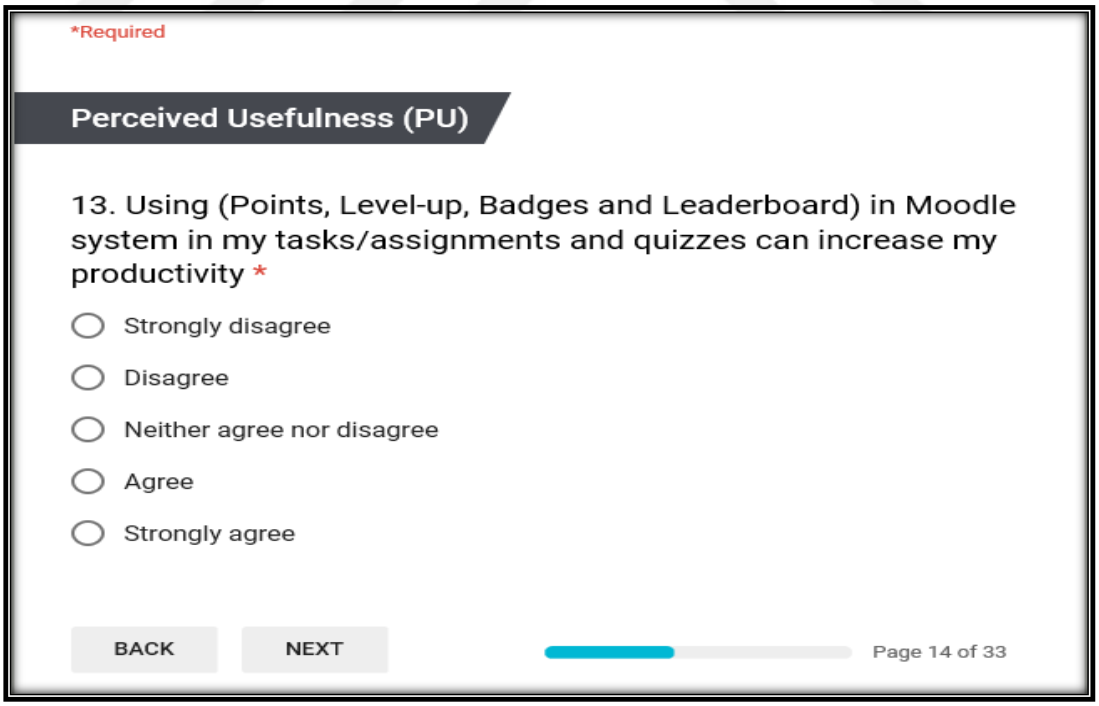


Figure 61: Question 13 in the Experimental Group

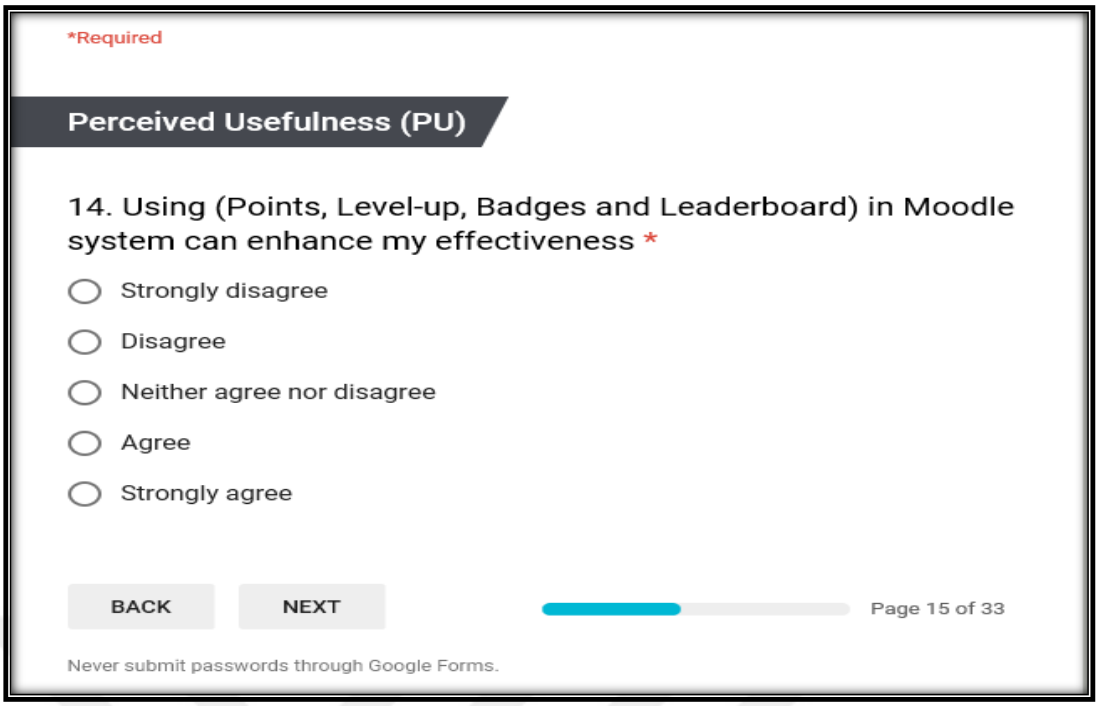


Figure 62: Question 14 in the Experimental Group

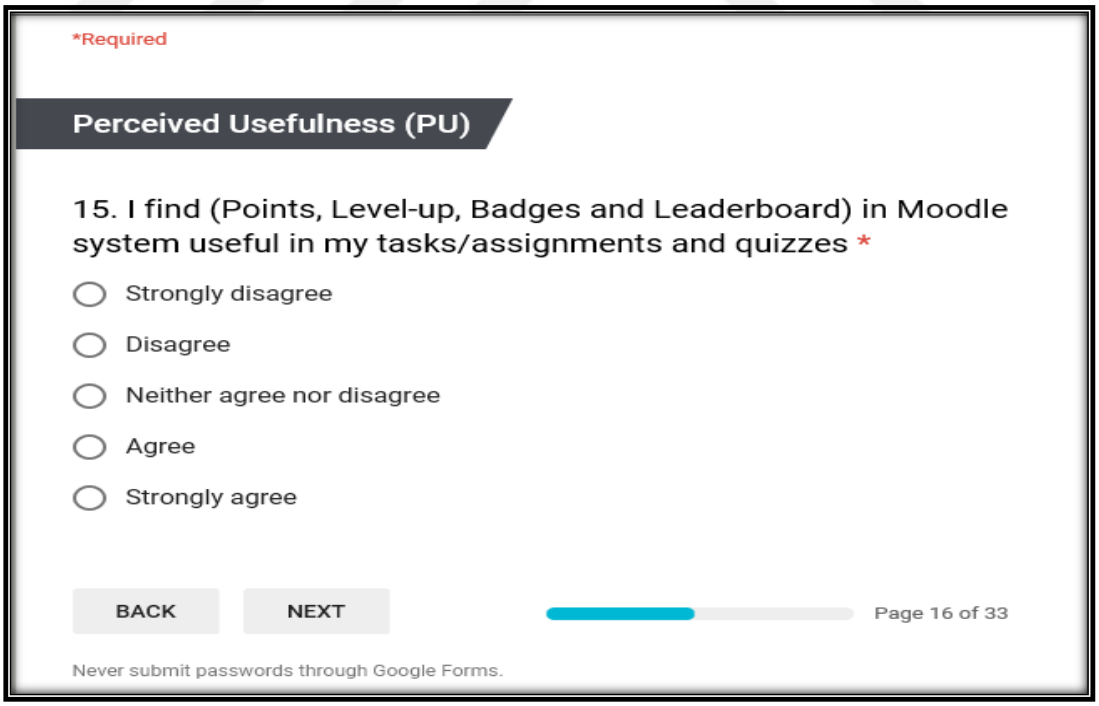


Figure 63: Question 15 in the Experimental Group

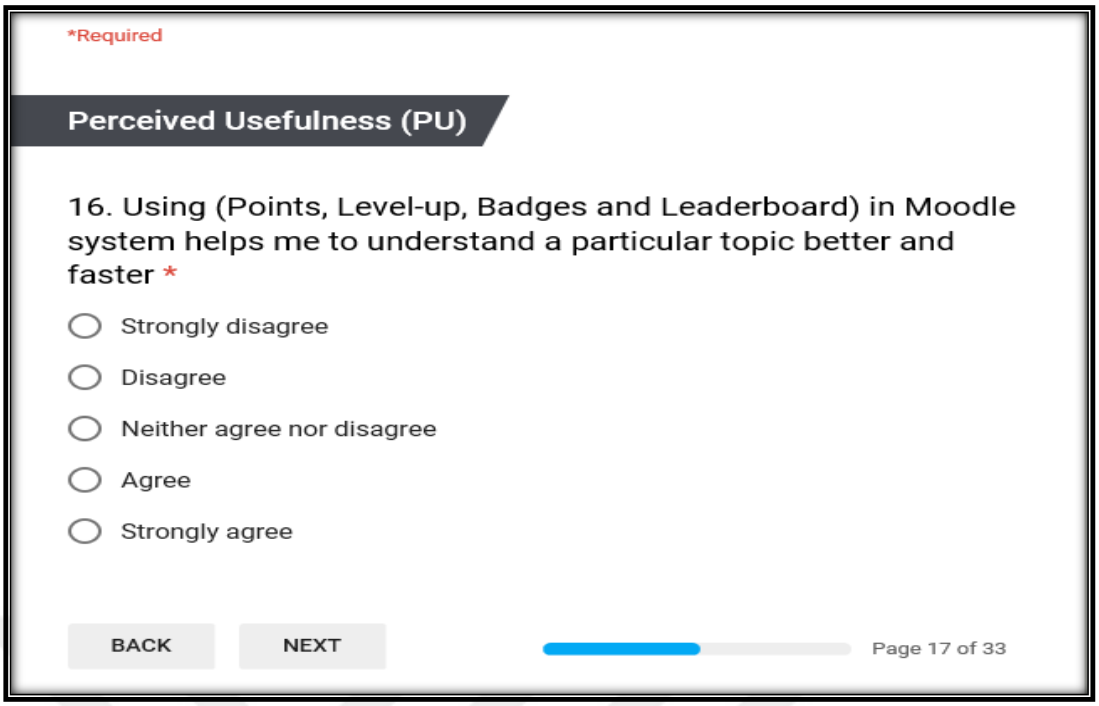


Figure 64: Question 16 in the Experimental Group

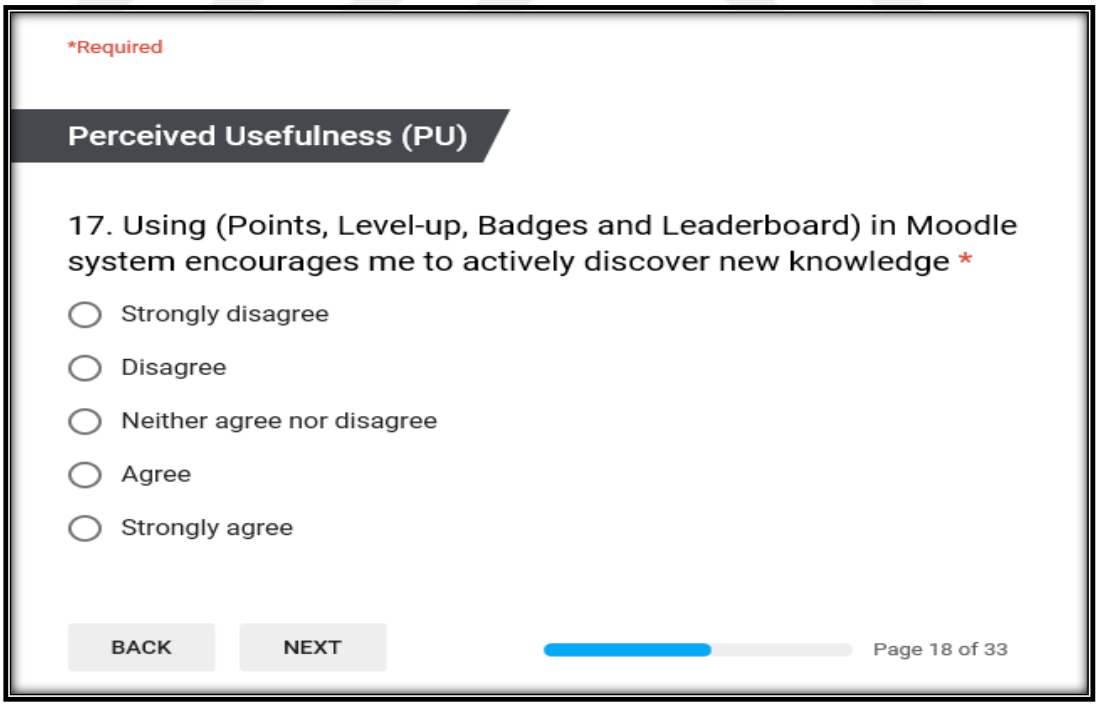


Figure 65: Question 17 in the Experimental Group

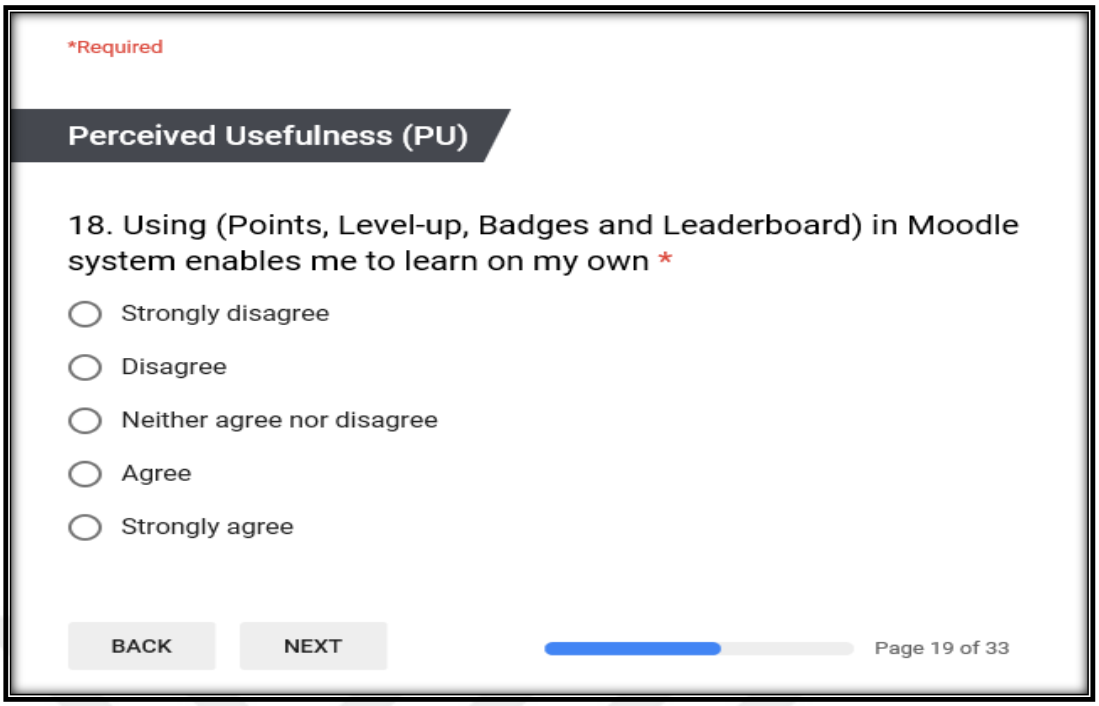


Figure 66: Question 18 in the Experimental Group

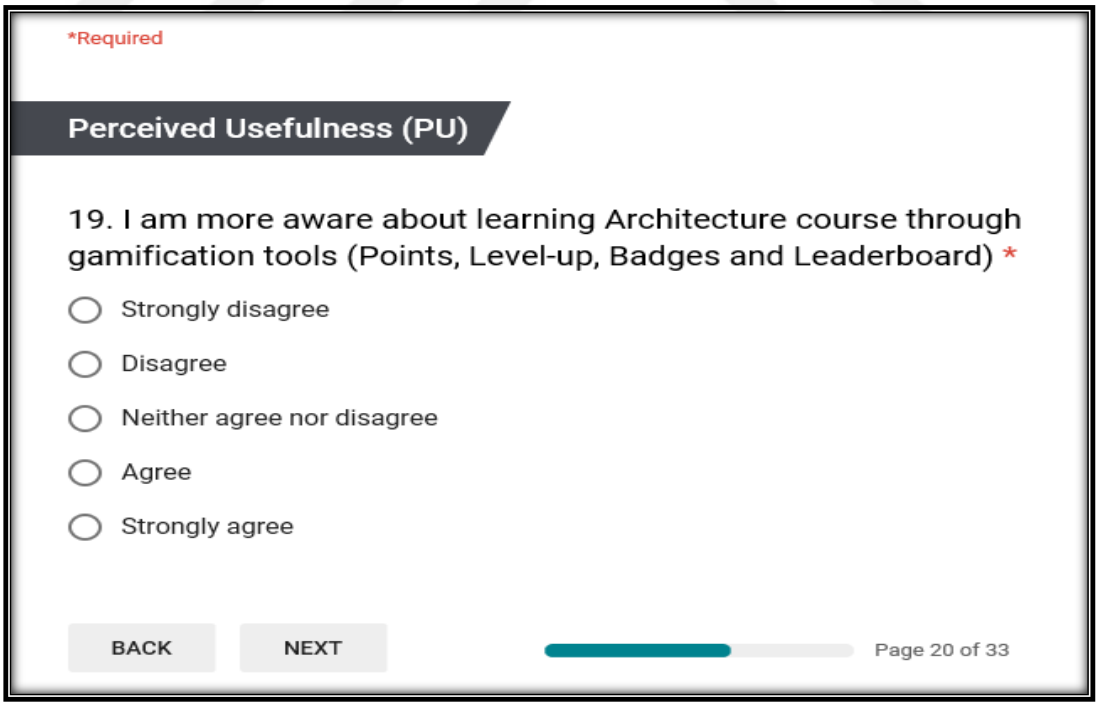


Figure 67: Question 19 in the Experimental Group

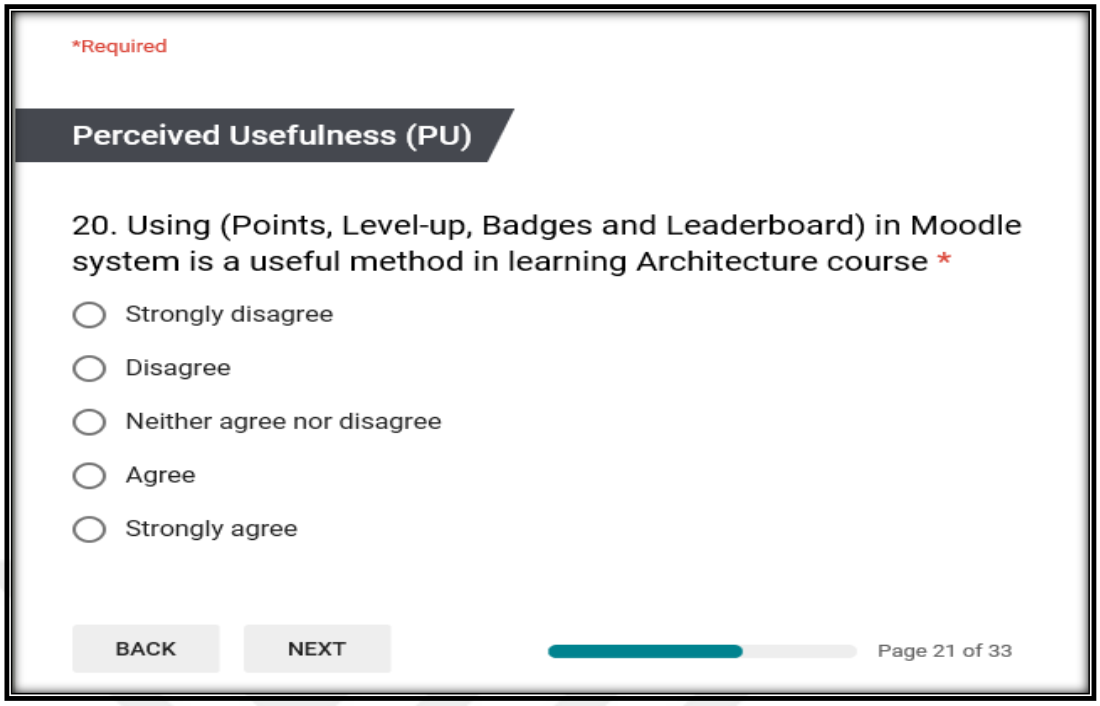


Figure 68: Question 20 in the Experimental Group

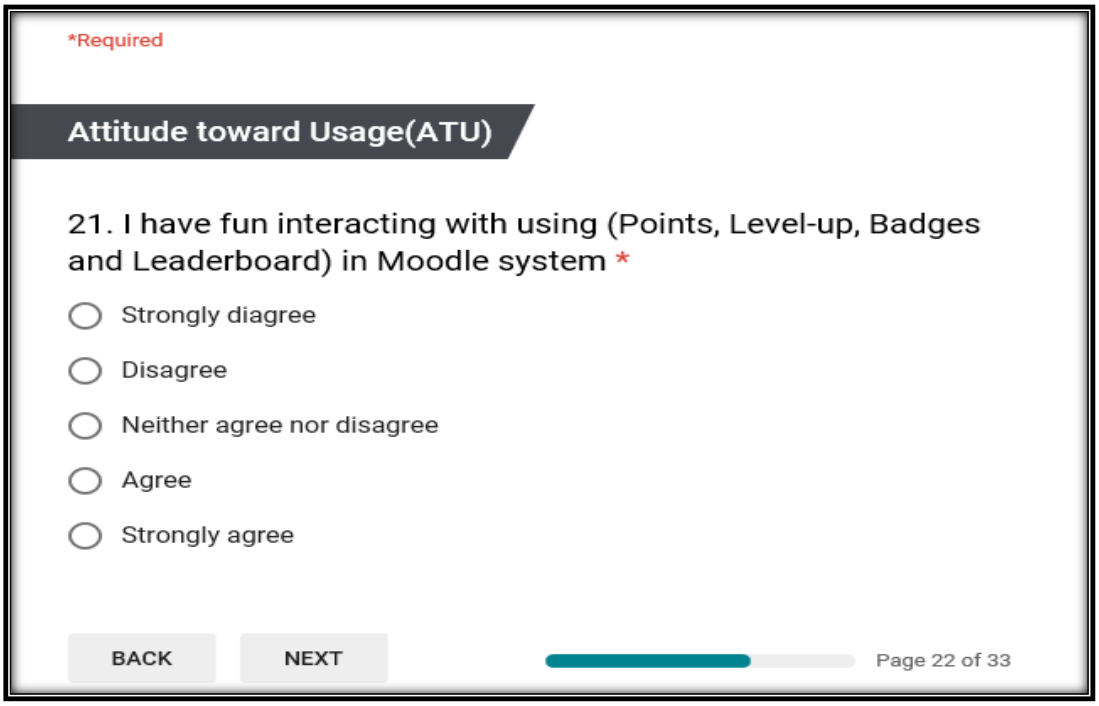


Figure 69: Question 21 in the Experimental Group

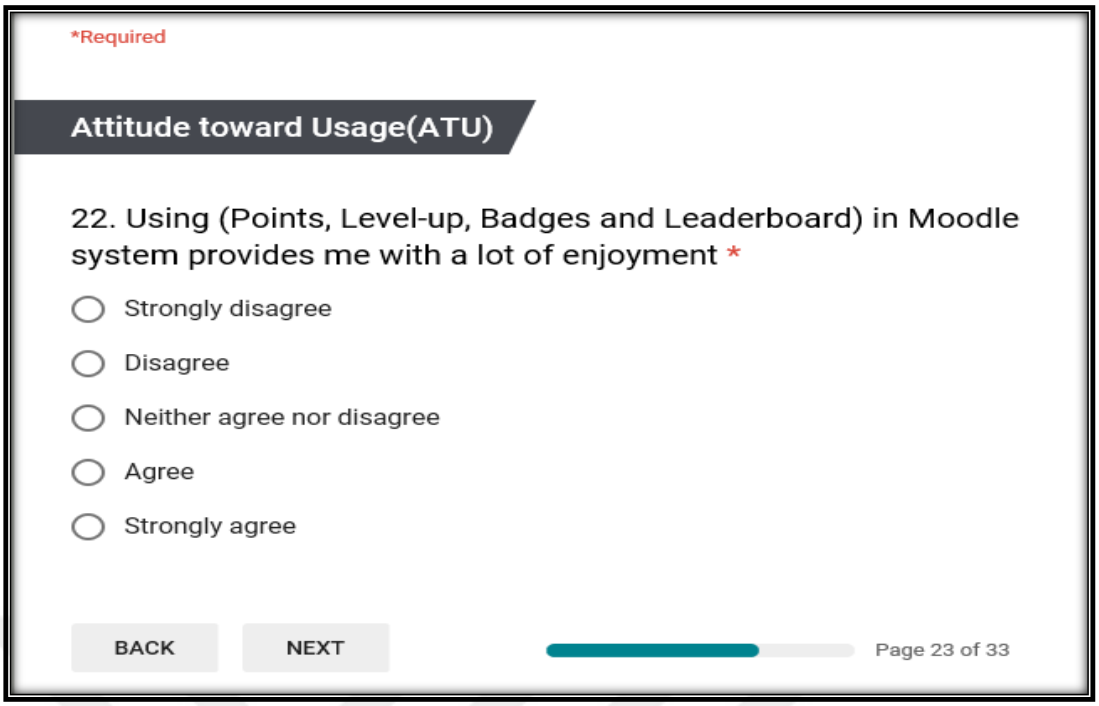


Figure 70: Question 22 in the Experimental Group

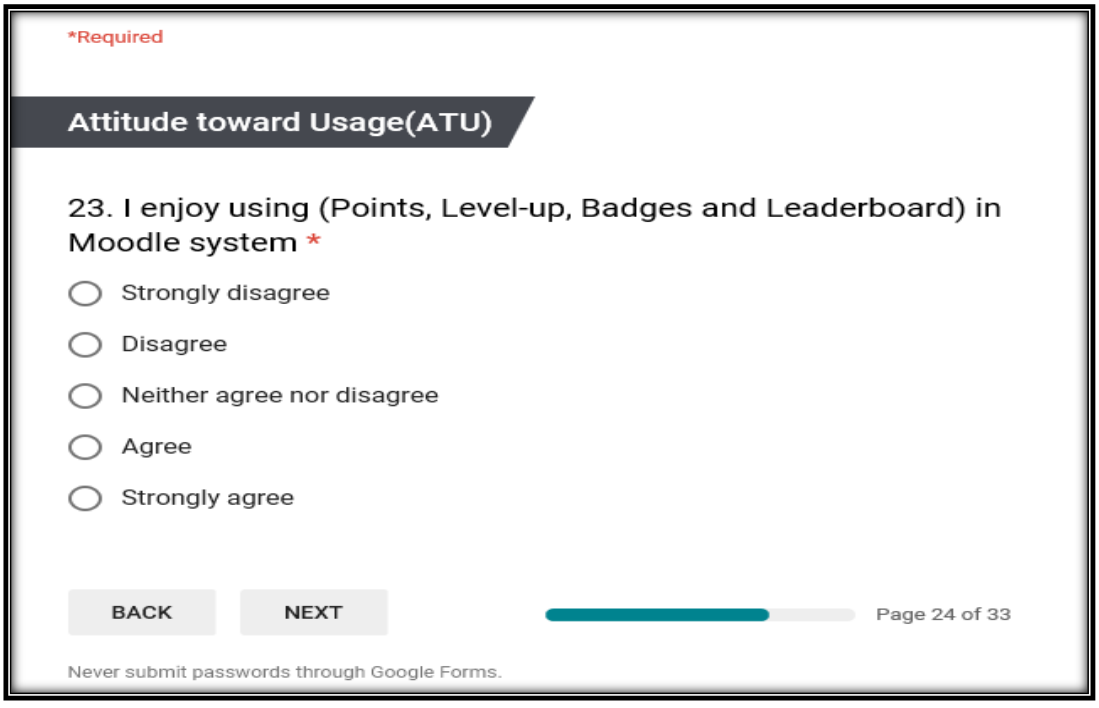


Figure 71: Question 23 in the Experimental Group

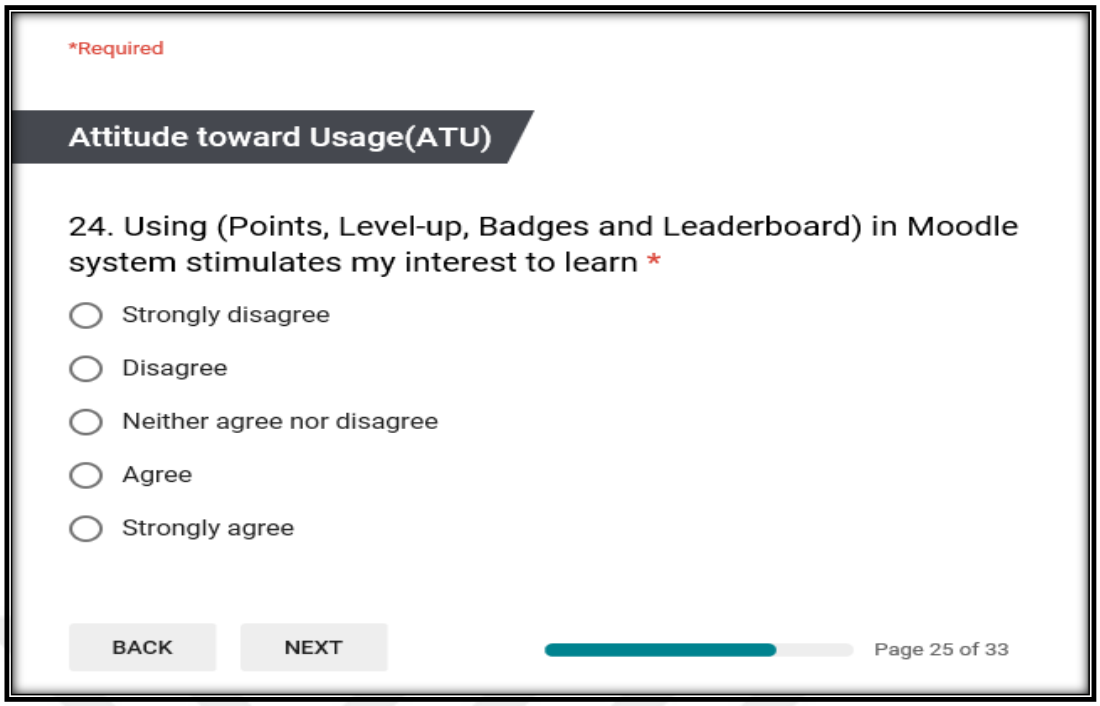


Figure 72: Question 24 in the Experimental Group

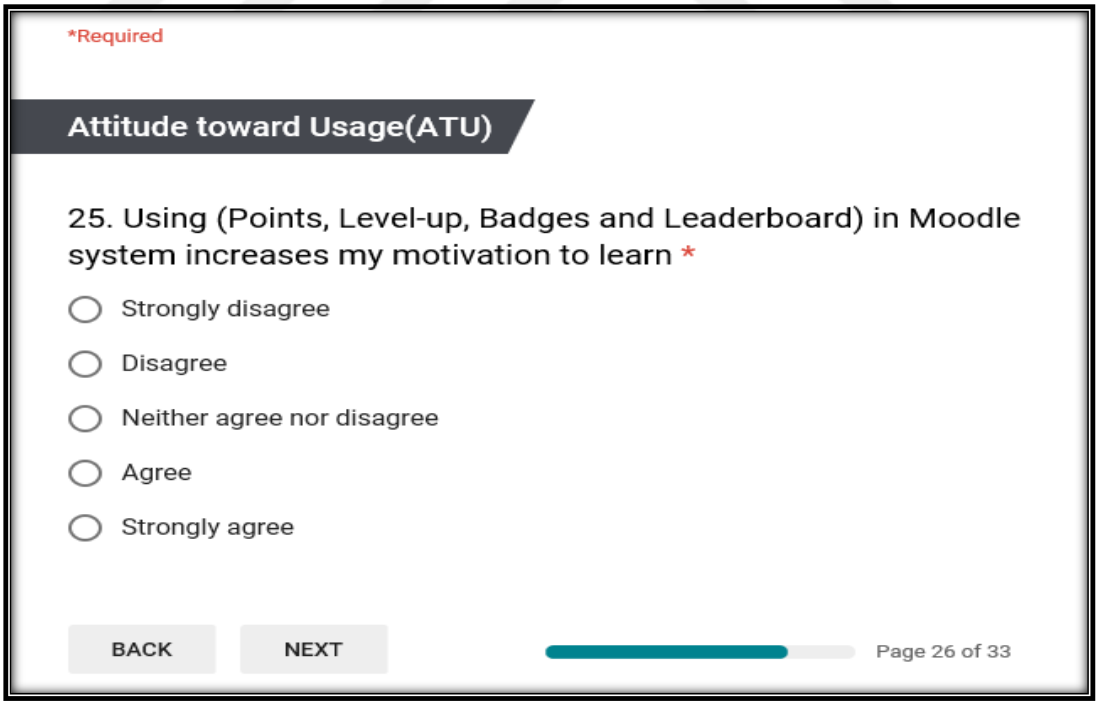


Figure 73: Question 25 in the Experimental Group

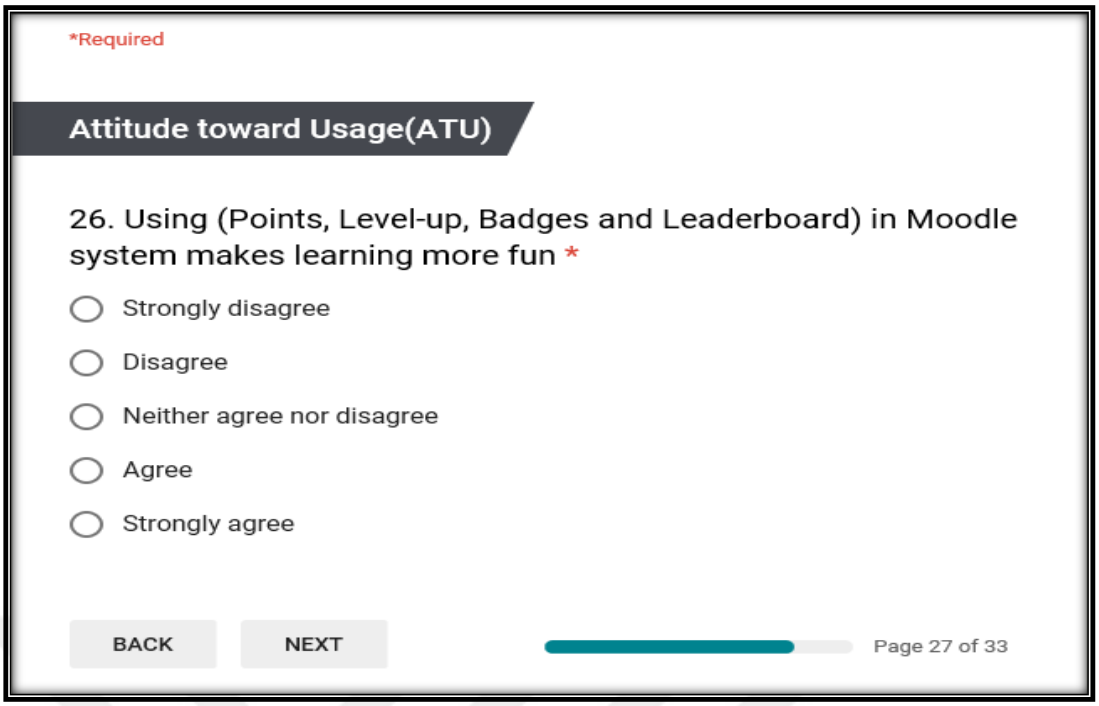


Figure 74: Question 26 in the Experimental Group

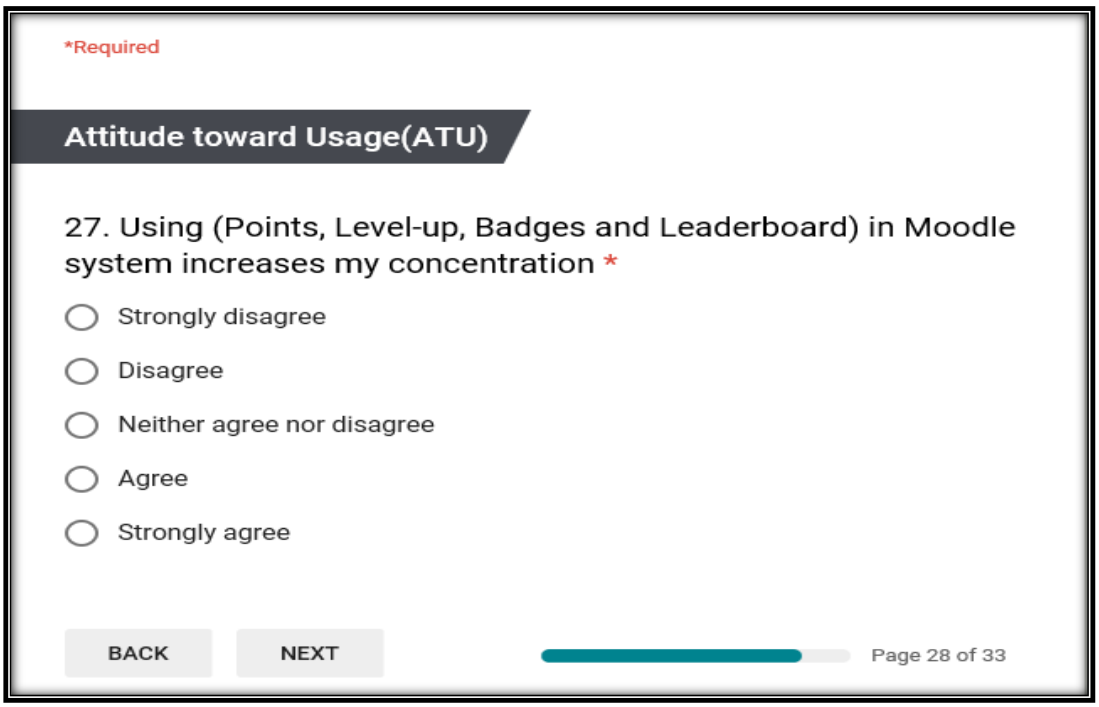


Figure 75: Question 27 in the Experimental Group

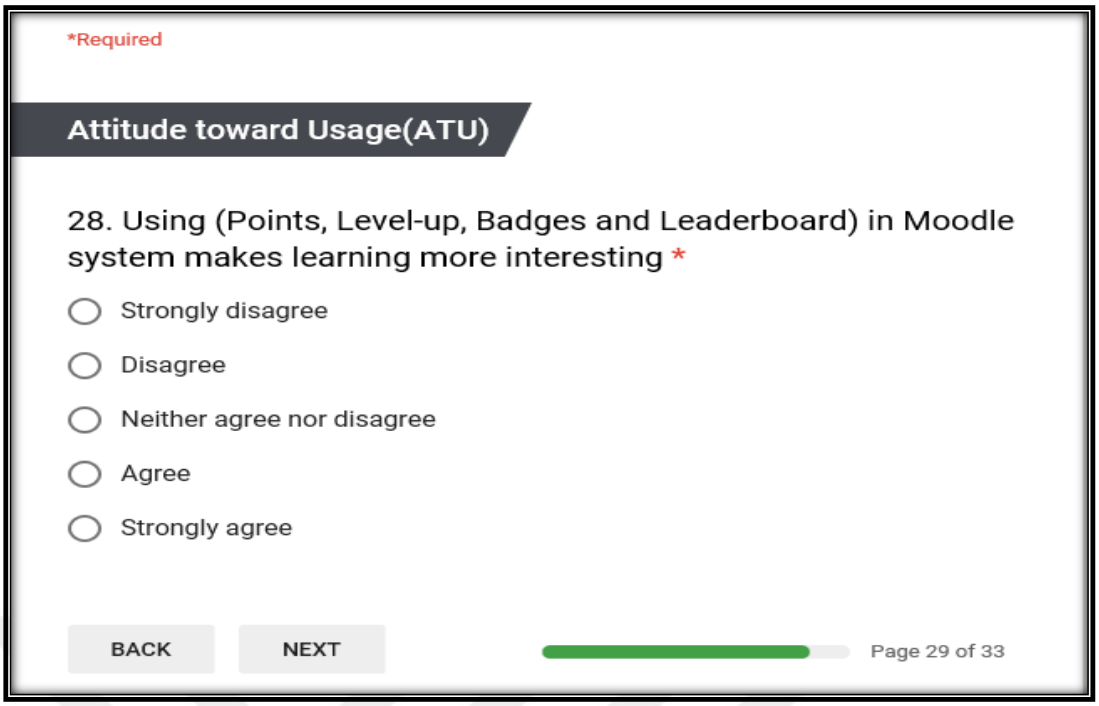


Figure 76: Question 28 in the Experimental Group

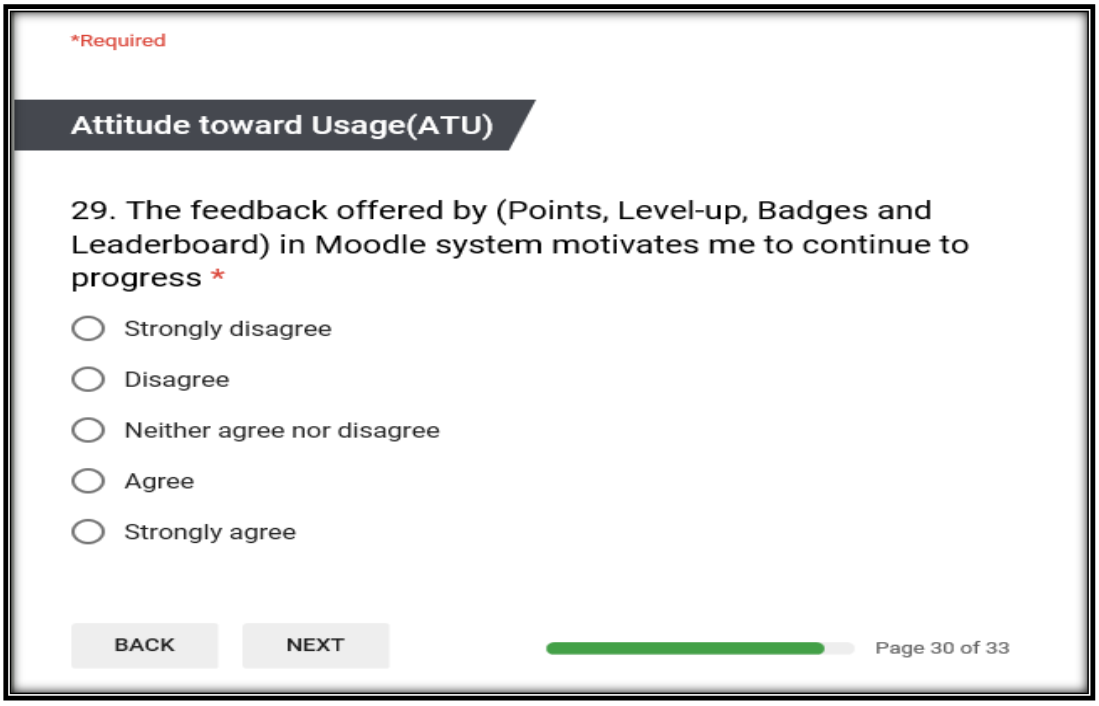


Figure 77: Question 29 in the Experimental Group

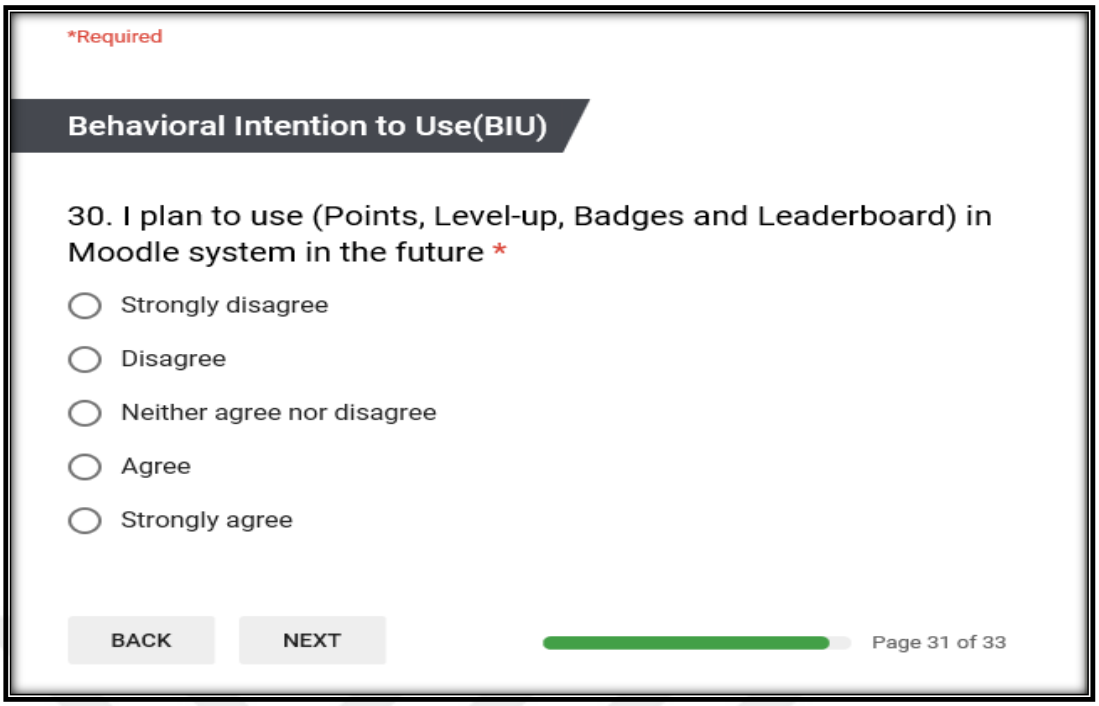


Figure 78: Question 30 in the Experimental Group

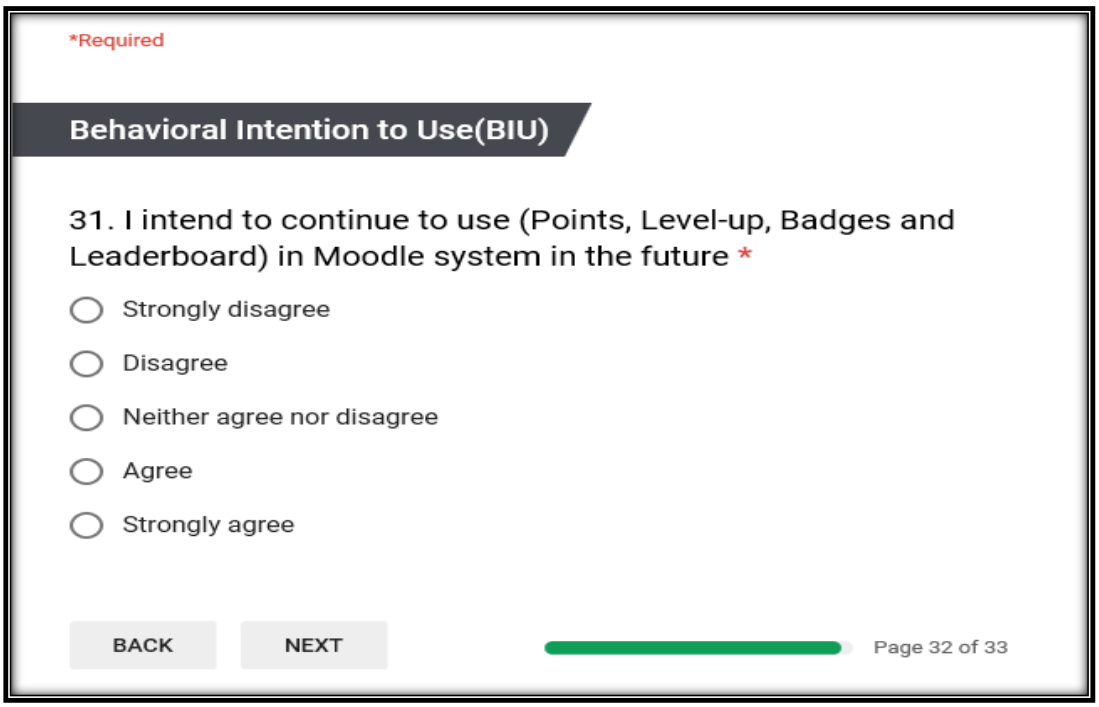


Figure 79: Question 31 in the Experimental Group

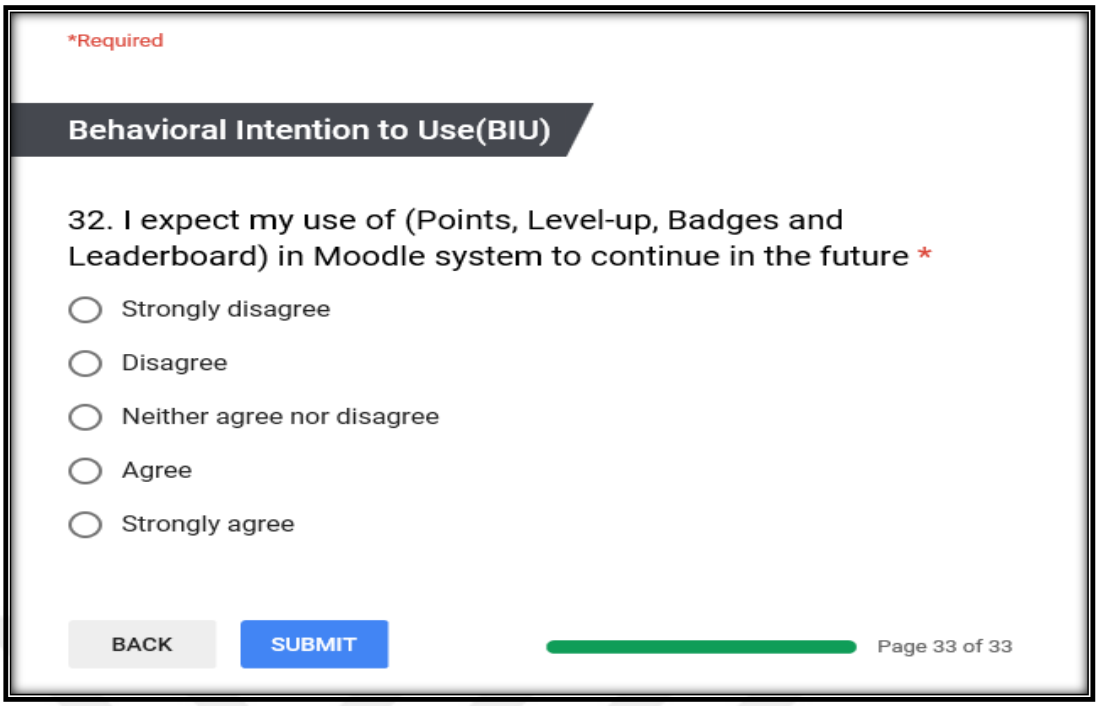


Figure 80: Question 32 in the Experimental Group

APPENDIX D
CURRICULUM VITAE

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Degree	**Institution, Department**	**Year of Graduation**
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M.Sc.	University Çankaya	2018

WORK EXPERIENCE

Year	**Place**	**Position**
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