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The Long-Term knowledge Effects Of Gamification
Case study in Finance Contexts

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Abstract:
With the modern interest of involving new approach to increase students engagement, gamifiaction in education has been introduced. Gamification is a game based learning approach to help participant to achieve a certain goal. The involvement of gamification in classroom has shown some impact on students. This research paper tests the influence of gamification in finance topics and to what extent this knowledge learnt would be remembered. Furthermore, the paper shows the limitation of gamification and suggests a context for successful approach. The study is conducted in a private university with small group in different semesters and finance topics. The study agrees with pervious research findings and added further recommendation for higher effectiveness for applying gamification in finance topics.

Key words: Gamification, Education in Finance, long-term knowledge effect of gamification.

1- Introduction

Gamification is a teaching strategy that caught the attention of scholars recently. Introducing games in classrooms is an innovative way of teaching and interacting with students. This research is developed to test the long-term knowledge effects of gamification in finance context. The paper is testing the first level of Bloom's taxonomy of finance knowledge for sophomore students who are studying at A private university.

2- Literature Review

2.1 Definition of Gamification

Gamification came from the root word game, Salen and Zimmerman (2003) "A game is a system in which players in an artificial conflict, defined by rules, that results in a quantifiable outcome". Any game-like and fun learning process that provokes engagement and motivation can be called gamification. According to google dictionary defined Gamification as the application of typical elements of game playing (e.g., point scoring, competition with others, rules of play) to other areas of activity, typically as an online marketing technique to encourage engagement with a product or service. Gamification also defined by Deterding et al (2011) as " the use of game design elements in non-game context". Gamification is design for gameful experiences, with high level of subjectivity and contextuality.

2.2 **Why Games in education**?

Gamification programs can increase the use of a service and change behavior (Zichermann &Cunningham, 2011, p.27). According to Kiryakova, Angelova, & Yordanova (2014) Gamification is not directly associated with knowledge and skills, Gamification affects students' behavior, commitment and motivation, which can lead to improvement of knowledge and skills. It increases not only engagement, motivate and promote learning, also it facilitates the development of sustainable life skills (Buckley & Doyle, 2017) and improve user's experience (Deterding et al, 2011).

The literature review suggests short-term and long-term effects. Short-term effects are limited to the classroom of commitment, motivations and behavior. The claimed permanent effects are improved knowledge and skills. The short-term effects must be positive to ensure the long-term effects. This paper tests the long-term knowledge effect of gamification in finance context.

While students learn better by taking test than studying for test (Wilkens, 2011), Students learn from their mistakes and need feedbacks to close the gaps and wholes in knowledge. Playing games stimulates learning, Landers (2015) explained that games influence learning-related behaviors or attitudes by one or two processes: by the clear linkage between instructional design quality and outcomes (moderator), and/ or influencing learning directly (mediator). Students learn by experiential learning (Lowy& Hood, 1985). Gamification is one of the modern approaches, which move education from formal institutional learning to informal situations and natural settings. Student's class participation triggers student's mind and make them think of the knowledge given, which leads to an active learning process and achieve different level of knowledge and skills. Nevertheless, As of the different participant's personality traits and learning style some will be less motivated (Buckley & Doyle, 2017). Furthermore, Ibanez, Di-Serio & Delgado-Kloos (2014) reported moderate results of gmification effect on students. Hamari, Koivisto & Sarsa (2014) claimed

gamification provides positive effects, however, the effects are highly dependent on the context in which the gamification is being implemented.

Some common pain points in education that can be addressed by gamification Huang & Soman (2013):

I. Younger students tend to have a hard time keeping on attention and not being distracted.
II. Learners of new concept may lack needed skill or knowledge to complete a task.
III. Physical, Mental and emotional factors surrounding the environment can directly influence student's learning ability.
IV. Young adults could loose motivation to finish a task if it is not interesting or too hard.
V. Adult students may believe that they already know what is being taught.
VI. Learning environment and nature of the course has an impact on student's learning.

2.3 How Gamification in education?

Kapp (2012) highlighted in his book that in game construction number of elements must be considered to achieve the intended learning experience and objectives. According to Kiryakova, Angelova & Yordanova (2014) remarked the **game's elements as follows:**

- **Users: all participants (students, or group of students)**
- **Challenges/ tasks: that students perform to achieve specific learning outcome (problems, case studies).**
- **Points: Those are accumulated as a result of executing tasks (number of correct answers, as maximum points as the number of problems in the game)**
- **Levels: which students pass depending on the points (easy, standard, hard)**
- **Badge: which serve as a reward for completing actions (certain percentage of marks)**
- **Ranking of students: according to their achievements.**

Meaningful gamification focuses on introducing elements of play instead of elements of scoring through information and external motivation, and it contributes to the long-term and deeper engagement between participants (Nicholson, 2012)**.** Gamification can help educators in delivering knowledge to learners by triggering learner's motivation. When deciding to gamify a learning activity or process, according to Huang, & Soman (2013) explained five-step process; Understanding the targeting Audience and the Context, Defining leaning objectives, Structuring the experience, Identifying resources, and Applying gamification elements. First, Game designer should understand the target audience in term of age group, learning abilities; current skill-set, etc. context should be analyzed to know the details of student group size, environment, sequencing skills and the time frame. Second, Instructors should clearly set learning objectives from implementing games in classrooms. Clear learning outcome helps instructors to measure it and spot it on students learning process. Then, Game activates should be structured by making stages and

milestones to enable instructors to measure the process. This case designed with easy, medium to hard, and hard financial problems. In another game, it is broke into five different families/ steps. In fourth and fifth steps, it is useful to apply the above elements of game on the intended topic and find a game mechanism that match student's skills and background. Designing games with difficult tasks or too challenging, it may backfire on the structure. Thus, users of games should understand the five steps well (Huang, & Soman, 2013). Glover (2013) suggested useful questions in structuring games: **Is motivation actually a problem?** Gamification can solve this issue in classroom by making clear, moderate, and relevant game activity. In the case of A private university, motivation is a problem in financial courses especially for core and elective courses; where all business majors are subject to take them. **Are there behaviors to encourage or discourage?** Games are designed with incentives to gain points and then award. Incentives can encourage students to effective teamwork, and however, discourage distractions and interruptions. In this case students where set in groups to work in teams, in order to finish fast with accuracy. **Can a specific activity be gamed?** Activities with clear specific goals, and clear points to achieve, can be gamed. Gamification did not work with many finance topics, some topics can be gamified. **Am I creating a parallel assessment route?** Gamification should only be used to increase motivation and should not be another mechanism by which to grade learners. **Would it favor some learners over others?** Some students would prefer to gamify their learning, and some students would not prefer, therefore, making the game optional would solve the issue. **What rewards would provide the most motivation for learner?** In order to ensure that everyone will be motivated, different reward is suggested, as they serve different learners. **Will it encourage learners to spend disproportionate time on some activities?** It depends on the activity, it is may be advised to set time limit on some activity. In this case class timing was the limit. **Are rewards too easy to obtain?** Having desirable rewards for learners would encourage motivation. Rewards should be obtained by achieving sufficient level of effort, but not so easy that all students obtain it.
In this experience, participation marks were used as badges, however, every participant gets the full mark, there is no variation in rewards, thus with little effort from students, participation marks can be obtained easily.

Gmification in finance is a neoliberal model of rationality and system optimization excluding risk and ethics; it is useful for sustaining metaphor for financial capital (Hutton, 2014). Thiebes, Lins & Basten (2014) recommended concrete implantation and investigation on the long-term effects. This paper is investigating on the long-term knowledge effects of gamification in finance contexts, after documenting a satisfactory level of games constructions and implementations.

3- Gamification in Finance Context (Case Study)

3.1 Monopoly game.

Real estate management is an elective course for banking& finance and none banking & finance students. The students struggled in understanding the course, as it was very technical course for them. The class had 12 students from different majors in business. The Banking & Finance students were in their sophomore year. The temptation of boredom was mastering the classroom, and students needed some motivation and encouragement to understand such subject. One of the course Student learning Outcomes, is real estate portfolio decision-making. From this objective the instructor implemented the idea of monopoly game.

The student's experience in the classroom was limited to the intended objectives. Students did not play the monopoly game in the classroom as it is assumed that the students are aware of this game previously. They had been introduced to the game rules and parts, and linked to different concepts in the course. Investment strategies in real estate was covered through game, for example, one of the investment strategies is Investing in core properties; it can be as if investing in the blue lands or close-to-corners lands, because there is a high temptation of stopping by the lands on the corners, hence, they become significant properties. Property sector investing is another example, such as investing in train stations only, (Check image 1).

Students learned the definition of real estate investment strategies and real estate portfolio well. The experience, however, was satisfactory as it linked concepts to the game.

In light of the game's element, the experience can be as follows:

- **Users: individual students**
- **Challenges/ tasks: choose a real estate investment strategy and show it on the monopoly board.**
- **Points: on explaining the strategy and linking it to the game correctly or not.**
- **Levels: was not activated**
- **Badge: every participant got 2 marks**
- **Ranking of students: was not activated**

From the above illustration of game's elements, the level and Ranking features of the monopoly game was not used. Therefore, student's boredom in classroom was not solved, student's understanding, however, were increased. Rewarding student's efforts and achieved results by award was the limitation of this learning activity.

3.2 The investigator Game and the TVM Game.

Financial Management course is a core course for all business students. Sophomore students take this course after accounting course. Generally, the course was hard as students are been introduced to the financial concepts for the first time.

In fall semester of 2015/16 Financial management level I course had 3 sections, section one had 12 students, section 2 had 7 students, and section 3 had 10 students. In all sections, there are 3 students in probation, and around 4 students with low GPA.

Two games had been designed to enhance two topics in the course; these two chapters were the only chapters that were included in the midterm. The first game is regarding financial ratios chapter, and the second game is regarding Time Value of Money.

3.3 Investigator Game

The Financial Ratio game is called the investigator game, where students play the investigator role and investigate 5 different families, each family provokes financial issue, which is related to a company's financial health.

The game elements as follows:

- **Users: individual students**
- **Challenges/ tasks: a given case to analyze a company's financial health, by getting the help from the game board.**
- **Points: not activated**
- **Levels: not applicable**
- **Badge: every participant gets some participation marks, and some grads from the major project.**
- **Ranking of students: not activated**

This learning activity simplified and structured the steps to financial ratios analysis for the students. The students' learning progress achieved through playing this game and reflecting it on the major project, which was choosing a publicly listed company in the Saudi market, and studying the financial health of it.

The limitation of this game was shown in some students, who could not fill the gap between using the results from the game and turn them into a paragraph of analysis. This short outcome was spotted on the major project, while it was hard to spot it in the classroom, because of the time limit.

3.4 The TVM game.

The idea of the game is linked to the idea of train destination; when the train dose not stop to the final station is called lump sum timeline, when the train stops and forgo an equal number of passengers is called Annuity timeline, and when the train stops and forgo an unequal number of passengers is called an uneven timeline. The game is taking the shape of the Monopoly game, where the lands present problems of TVM .The propos of the game is to make students solve as many problems regarding TVM as possible in classroom.
Following is the implementation of the game elements.

- **Users: group of students.**
- **Challenges/ tasks: TVM problems.**
- **Points: on correct answers one point.**
- **Levels: easy: lump sum timeline problems, medium to hard: Annuity timeline problems, and hard: uneven timeline problems.**
- **Badge: every participant gets some participation marks.**
- **Ranking of students: according to the achieved points.**

TVM game had increased some skills in some students, such as carefully reading fast the questions, extracting the outputs, using the financial calculator, working in a team, and spotting the key words.

The drawback of practicing this game was in the number of students, which was high so they played in groups, which did not allow each student to practice individually in all the problems. They divided themselves as one student reads the problem, one solves, and one writes on board the answers.
The results of the two games, described above, were shown on the midterm results. Below are the midterm reports for the three sections with a full mark of 20 (2015):
Table (1)
Midterm students results on the topics that had classroom gamification activities

Section	Highest	Average	Lowest	Comments
1	18.75	12-14	5.5	Flat peak
2	19	18	5.5	The curve skewed to the left
3	17	16	5	The curve skewed to the left

- ❖ Highest: full mark is 20 marks
- ❖ Average: the mode
- ❖ Lowes: lowest achieved grade

Midterm results comparison between the spring semester 2014/15, when the games were not introduced and the fall semester 2015/2016, when the games were used:

Table (2)
Comparison of midterm students ratios on the topics that had classroom gamification activities in Fall and none classroom activities in Spring.

Section	Highest ratio		Average ratio		Lowest ratio	
	Spring	Fall	Spring	Fall	Spring	Fall
1	1	0.92	0.8	0.6-0.7	0.66	0.28
2	1	0.95	0.8	0.9	0.5	0.28
3	0.85	0.85	0.8	0.8	0.45	0.25

The Spring 2014/15 semester had approximately 4 low preforming students cross-sections. The end results for the Fall 2015/16, from the total 7 students with low performance, 3 did not pass the course.
The three temptations of playing games that explained were done in classrooms for motivating behavior to deeper understanding of the topics. The midterm results of the students who practiced in the investigator game and the TVM game, however, did not show better results than the semester before, where games were not used.

Gamification experience affected the students' behavior and motivation in classroom. The implementation had shortages; the badges in games were given equally to all participants. Equal badges dose not provoke learners to deeper knowledge (Glover, 2013). Moreover, the games helped in solving number of financial problems in classroom with regard to the class time limit, and for some students it increases some skills such as carefully **reading fast the questions, extracting the outputs, using the financial calculator, working in a team and spotting the key words**. Gamification was used in finance topics, because of increasing student's knowledge and skills. The midterm results, however, showed no better results than the previous semester, which gamification is not used. These results confirm previous paper's finding, gamification only affects student's behavior motivation and commitment then it may lead to improve knowledge and skills. The experience has decreased complains of boredom in classroom and hardness of the subject. Gamification experience at a private university is conducted with a satisfactory level of designing and practicing the finance games in classroom.

4- Methodology

However, Kiryakova, Angelova, &Yordanova, (2014) claimed that gamification is not directly associated with knowledge and skills. Gamification affects students' behavior, commitment and motivation, which can lead to improvement of knowledge and skills. The long-term knowledge effects of the gamification experience are tested on number of students at a private university. Questionnaire with a set of questions were distributed between different year's level of students. The questions were developed to test student's participation, admiration and enjoyment, and linking them to basic finance knowledge.

Atkinson, Murrell & Winters (1990) suggested relationship between Holland's personality types and Kolb's learning styles, Holland's Personality types; Realistic, investigative, Artistic, Social, Enterprising, and Conventional. Kolb's (2012) learning styles are; Concert Experience, Reflective Observation, Abstract Conceptualization, and Active Experimentation. Vincent & Ross (1994) and Jessee et cl (2006) claimed different personalities and learning styles requires different teaching strategies, therefore, the study should show variable results through different surveyed students answered.

Furthermore, Dunegan (2010, P. 4) reviewed bloom's taxonomy and justified the cumulative hierarchical framework consisting of six categories each requiring achievement of the prior skill or ability before the next, more complex, one, remains easy to understand. Questionnaire was developed to test first level of bloom's taxonomy and linking it with participation, admiration and enjoyment.

The sample of the study was testing students who covered some of finance concepts in class through games. The sample size was not high enough. The sample students have completed the games seven month past or more before answering the questionnaire. Ideally, Custers (2008) and Beers & Bowden (2005) have used one year past to test knowledge retention.

Student's responds for each question were compared to their respond to the first level knowledge question, forming depending variable. First level of knowledge was tested through identifying the finance concept principles, then comparing them with independent variables; participation, admiration, and enjoyment.

5- The findings

- There is an absolutely adverse relationship (Beta -2.2) between feeling good about playing game in class , and knowing the basic elements of the concept learnt through game. Moreover,
- This finding complies with further findings that there are an opposite relationships between enjoying; the problem solving (Beat -1.6), the design and art (Beta -1.7), the analysis and evaluation (Beta -2.2), the structure and the concept (Beta -1.8), and the group work (Beta -0.7) parts of a game played in class, and knowing the basic concept through game.
- The class general participation in playing game has an adverse relationship (Beta -0.6) with knowing the basic elements of the concept learnt through game, however, there is a constructive relationship (Beta 0.4) between individual specific participation in playing game and knowing the basic elements.
- The admiration of evaluation and analysis through participating in game and simulating thinking through game have an opposite relationships, (Beta -0.7 and -0.4) respectively, with knowing the basic elements.
- The study found a highly cooperative relationship (Beta 1.5) between learning through observing the game and knowing the basic elements of the concept learnt through game.

6- **Conclusion**

Gamification is a new learning method; it caught educator's attention for updating their teaching strategies. As proposed by Atkinson, Murrell & Winters (1990) different personalities of students requires different learning style, the paper testing gamification which is being applied to cover; Reflective Observation, Abstract Conceptualization, and Active Experimentation learning styles. Therefore, different learning needs to acquire knowledge is being considered in the study. The case study finds that the long-term effect of knowledge through gamification in classroom is obtained in individual student participation not as a group activity. Moreover, students showed long-term knowledge through only observing the game in classroom. On the other hand, students with high admiration and enjoyment of classroom games showed less result for long-term knowledge of basic finance concept learnt through gamification. The study has some limitations; regarding the sample size, the construction of games and the period of time between playing the game and conducting the survey. The study agrees with Kiryakova, Angelova, & Yordanova (2014) Gamification is not directly associated with knowledge and skills, Gamification affects students' behavior, commitment and motivation, which can lead to improvement of knowledge and skills. The study suggested a context to long-term knowledge effect through individual participation and or observation. The study slightly disagree Buckley & Doyle (2017) and Deterding et al (2011) in gamification increases not only engagement, motivate and promote learning, also it facilitates the development of sustainable life skills and improve user's experience, as the result did not show life long skills in solving basic knowledge check question.

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