Motivation in Game-Based Learning: A Study on Technical Analysis Education

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Abstract: Game-based learning is one of the current themes of the 21st century associated with digital natives. Nevertheless, most university educators do not routinely use gamification and game-based learning. This paper tries to link teaching innovation and game-based learning methodology via a game-based learning innovation in a non-game learning environment. This paper explores the students' motivation for using educational games as their learning medium. A survey on technical analysis students was undertaken specifically focusing on motivation factors as an initial study before proceeding further with full-scale research on game-based learning. This paper is one of the few papers that study game-based learning in finance, specifically the subject of technical analysis. The results indicate that the students have high motivation in game-based related activities and are very interested in using games for learning in the future. Future research can focus on expanding the study to explore other dimensions of the perception of technical analysis students on game-based learning methodology. The outcome of this study will assist educators in the field of finance to understand their students to better serve them specifically in game-based learning matters.

Keywords: *Game-based learning, Gamification, Motivation, Digital Society, Technical analysis.*

1. Introduction

The academic teaching and learning landscape is shifting. The digital revolution, technology enhancement, societal preferences, and not to mention the world crisis related to COVID-19 are shaping the new education industry at a swift pace. Prensky (2001) asserts that to be successful in the twenty-first century, the education industry needs to be reinvented based on the requirements, preferences, and orientations of digital natives. These groups of people were born and raised in the era of information technology, and it makes sense to use technology in their teaching and learning activities. Game-based learning (GBL) or digital game-based learning (DGBL) is one of the current themes of the 21st century (Hui & Mahmud, 2023) contemporary approach concerning digital natives. That could be useful in helping students gain 21st-century skills (Qian & Clark, 2016). The 4 Cs of game-based learning—critical thinking, collaboration, creativity, and communication— are the qualities of games that can be used to teach 21st-century skills through digital learning games.

GBL or 'gamification' describes 'the use of game elements to motivate players to engage in a task they otherwise would not find attractive' (Plass, Homer, & Kinzer 2015). Games can be physical or a more recent development in line with technology advancement creates digital games. It is an environment where game content and gameplay enhance knowledge and skills acquisition, where game activities involve problem-solving spaces and challenges that provide players/learners with a sense of achievement. In education, gamification is a way of playing creative games in the classroom without jeopardizing the scientific nature of a curriculum (Nolan & McBride, 2014) and supports individuals to acquire the potential to develop critical thinking and multi-tasking while training successful 21st-century digital natives (Prensky, 2001; Kapp 2012). Gamification makes learning more entertaining, increasing the motivation of students to learn and study (Muntean, 2011).

Nonetheless, the majority of university educators do not routinely use gamification and game-based learning in their teaching (Lester, Skulmoski, Fisher, Mehrotra, Lim, Lang, & Keogh, 2023). The finance-related course is not spared from this predicament. The motivation to pursue this study lies in the fact that conventional teaching methods in the finance-related Technical Analysis course rarely apply the in-the-trend game-based learning approach, leading us to develop an innovation within this backdrop. A Technical Analysis (TA) in-class innovation project was created for this purpose. Specifically catering to the digital-native audience, we add the elements of 'entertainment', 'competition', and 'incentives' to determine whether these dimensions help motivate learning at its best based on the present surroundings. The game was designed to cater to the initial theoretical part of the course before proceeding to applied-based learning in stock market charting analysis.

To the best of our knowledge, GBL study in the area of finance particularly the technical analysis subject is scarce and worth an exploration. Hence, this study tries to fill the gap in the previous research by presenting a preliminary work on GBL methodology in a technical analysis class for a Bachelor of Business Administration in Finance. We are particularly interested in finding out the 'motivation' factors that these students had on the game-based learning approach. Hence, the purpose of the study is to ascertain whether TA League as a game in a non-game learning setting has an effect from the perspective of technical analysis students. Specifically, it explores the technical analysis of students' motivation for using educational games as their learning medium. The questionnaire items were adapted from Ibrahim, Yusoff Mohamed-Omar & Jaafar (2011) and modified from Masrom (2006). The outcome of this study will assist educators in the field of finance to understand better their audience (students) to better serve them specifically in teaching and learning matters.

2. Game-Based Learning and Motivation Factor

Game-based Learning Theories
Game-based activities can be linked to several theories for instance game-based learning theory, constructivism theory, experiential learning theory, and the flow theory. According to the game-based learning theory, students are more likely to be fully engaged and immersed in an optimal experience when they actively participate in particular class activities. GBL offers excellent activities for learning purposes. Similarly, the constructivism hypothesis states that learning occurs most effectively when students actively create their knowledge through interactions and experiences (Fosnot, 2013). Students can experiment, investigate, and make decisions that affect the game's outcomes through games. This aids in the purposeful construction of their knowledge as well. On the other hand, according to the experiential learning theory, direct experience and reflection are crucial components of the learning process (Kolb & Kolb, 2017). Playing games gives students the chance to experience many situations and think back on their choices, which helps them comprehend the material they are learning more deeply. Lastly, the flow theory describes that when someone is fully absorbed in an activity, they can reach a level of deep engagement and satisfaction (Umirziyaev & Abdurakhmonov, 2022).

These theories emphasize the fun, experience, and engagement that come with game-based learning, which ignites motivation, one of the key components of game-based learning. The potential of game-based or gamified applications to leverage the motivational effect of games is what has led to their adoption. The most well-known theory of motivation is the self-determination hypothesis. Self-determination theory (SDT) takes a more comprehensive and holistic approach, incorporating both intrinsic and extrinsic motives (Altawalbeh, 2023). In contrast to extrinsic motivation, which is behavior carried out to obtain a reward or avoid punishment—that is, when a person seeks to earn something unrelated to the activity—intrinsic motivation, according to Kapp (2012), is when the rewards come from carrying out an activity rather than the result of the activity. Another model that looks at learners' motivation is Keller's four-factor model in determining motivation in games. According to the ARCS Model, for people to become and stay motivated, four fundamental variables must be met: Attention, Relevance, Confidence, and Satisfaction (Keller, 1987).

Motivation Factors
According to Prensky (2003), motivation is necessary for effective learning, and a driven student is impossible to stop! Playing ends and learning stops when there is no motivation. A motivated learner cannot be forced to cease "learning." It is the most important factor that drives learning (Gee, 2003). Hence, motivation plays a huge role in 'learning' and academic research-wise, motivation is one of the most frequently cited reasons to consider digital games for learning (Plass et al. 2015).

Numerous studies in different academic fields have been conducted in recent times. The majority discover that GBL or DGBL affects students' motivation in a good manner (see Nadeem, Oroszlanyova, & Farag, (2023) in engineering; Hui et al. (2023) in mathematics; Zahra, Neo & Hew (2023) in internet applications; Altawalbeh (2023) in humanities and scientific; Camacho-Sánchez, Rillo-Albert & Lavega-Burgués (2022) in education studies.

When compared to traditional online activities, GBL has a more favorable effect on student motivation and engagement in an engineering classroom, according to Nadeem et al. (2023). According to the research, including digital games in engineering classes can effectively inspire students and maintain their interest in the subject matter. Additionally, it was shown that using a scoreboard as a game feature had both positive and

negative impacts, encouraging some students while demotivating others. Hui et al. (2023) claim that the application of GBL in mathematics studies has had a positive effect on students' mathematical learning. It is composed of two categories of cognitive domain (knowledge and mathematical abilities) and five categories of domains (achievement, attitude, motivation, interest, and engagement). The study's findings would more successfully inspire teachers in the classroom.

Zahra et al. (2023) in internet applications introduce games in the online class to enhance students' motivation, engagement, and 21st-century skills. Students can interact with the material more effectively and work together to overcome mutual difficulty by entering the game as a team. The findings of the study showed that it enabled them to think deeply and comprehend the subject matter, which in turn helped them tackle the provided challenge more successfully. This factor ignited their motivation, causing them to become profoundly invested in the issue and devise a successful plan of action for its resolution. According to survey findings and comments, students can be effectively motivated and work together to solve common problems successfully when they use the educational online networks that are available and the games that are integrated into the learning process. Altawalbeh (2023) studied humanities and scientific students and discovered that Kahoot, a game-based learning promoted enjoyment, engagement, motivation, and usefulness for learning. Using Kahoot can help students meet their learning objectives and become more motivated and engaged in the process of learning enjoyably. Similar to Nadeem et al. (2023), striving to be in the top five on the leaderboard adds excitement and motivation to the gameplay. Another study on GBL in education studies was examined by Camacho-Sánchez, Rillo-Albert, and Lavega-Burgués (2022). According to the study's findings, motivation items received great marks from every participant. The study's findings validate the gamified GBL approach as a dynamic teaching tool that aligns with students' active learning and offers insightful, timely feedback on students' efforts, gains in academic achievement, and a high degree of motivation. Finally, Murillo-Zamorano, López, Godoy-Caballero, and Bueno (2021) engaged Business Administration and Management students and came to the conclusion that creating a co-creative, empowered, and gameful experience that supports students' overall value creation results in satisfactory active learning setups without sacrificing academic achievement and allows for the development of many skills that are particularly relevant for professionals in the twenty-first century.

Premise on the above, despite many GBL studies in the fields of engineering, mathematics education studies, internet applications, humanities, and education studies, GBL studies in the area of finance particularly the technical analysis subject are scarce and worth an exploration.

Technical Analysis League (TA League) Game
This study was conducted after a game-based competition in a technical analysis course enrolled by 50 so-called 'digital natives' population at Universiti Teknologi MARA, Melaka, Malaysia. The aim is to stimulate learning in the Technical Analysis course. The description of the technical analysis course is as follows:

Table 1: Course Content

TECHNICAL ANALYSIS COURSE DESCRIPTION	OBJECTIVES	NO OF CHAPTERS	TIME FRAME
The course will introduce to the students the concept and the application of technical analysis, the various technical indicators, and investment decisions using technical tools. It emphasizes various techniques and strategies used in technical analysis software employing both basic and advanced technical indicators in analyzing investment decisions of a single asset.	• Illustrate the various types of investment decisions with an emphasis on techniques and strategies used in technical analysis. • Build hands-on skills and knowledge through technical analysis software package(s).	10	14 weeks

Unlike common finance courses dealing with numbers, this course deals with charts specifically stock market price movement charts, where theoretical knowledge, and charting skills coupled with common sense and intuition are blended to make up a good so-called technical analyst.

Innovation in Teaching and Learning

Applying the most popular free gamification application, Kahoot together with Quizizz, we proceeded to design a quiz competition named the Technical Analysis League (TA League), discounting the important theoretical chapters that build up the fundamentals of technical analysis. In this game, points are awarded to teams based on where they finish in each quiz. Adopting the F1 ranking methodology, the winner receives 25 points, the second-place finisher 18 points, with 15, 12, 10, 8, 6, 4, 2 and 1 points for positions 3 through 10, respectively. The winner is the team with the most points.

Figure 1: Screenshots from the games
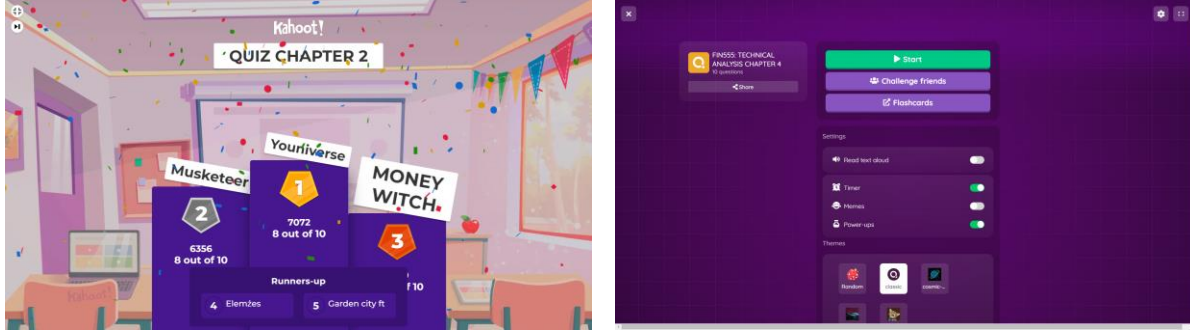
Ten chapters were included in a time frame of 10 weeks out of the 14-week course period, and the game was scheduled to be played weekly, in line with the course lesson plan. These activities augment the present lesson design, consistent with the course learning outcomes. As a result, finishing these tasks will assist pupils in meeting the learning objectives. Part of the incentives is to reward the winners with cash prizes, as well as a certificate of award to recognize the individual's achievement, suited well to strengthen the students' resumes.

Table 2: TA League List of Activities

Game Round	Week	Platform	Topic	No of Questions
1	1	Kahoot	Introduction to Technical Analysis	10
2	2	Kahoot	Financial Market	10
3	3	Kahoot	Dow Theory	10
4	4	Kahoot	Intermediate Trend	10
5	5	Kahoot	Support & Resistance	10
6	6	Quizizz	Trendline	10
7	7	Quizizz	Volume	10
8	8	Quizizz	Classic Price Patterns	10
9	9	Quizizz	Small Price Patterns	10
10	10	Quizizz	Moving Average	10

3. Methodology

Data Collection and Analysis Procedures: In this empirical study, we measure players' feedback upon participation in the TA League game, adopting the items developed by Ibrahim et al. (2011), modified from Masrom (2006) as cited in the literature. The survey consists of a set of questionnaires within a motivation construct.

Table 3: Survey questions

Number	Description
Question 1	I think this activity gives me lots of benefits.
Question 2	I prefer to answer questions this way compared to using books or paper.
Question 3	I am very interested in using games for learning in the future.
Question 4	I prefer to do quizzes using games rather than physical quizzes (manual) during class.
Question 5	The usage of games makes this subject more interesting.

These questionnaires serve as a preliminary study before proceeding with a full-scale survey of the topic under review. Therefore, the scope of research and discussion revolves around this construct.

Data Analysis: The poll was created using Google Forms, and students responded online in 2023. Students' responses were rated on a five-point Likert scale ranging from one (strongly disagree) to five (strongly agree). Similar to Ibrahim et al. (2011) we deployed a descriptive analysis using SPSS Version 23, to analyze the players' motivation. The findings are based on a descriptive study of demographics and items designed to assess player motivation (percentage, mean, and standard deviation-SD). Table 4 shows the mean score interpretation adapted from Alkharusi (2022).

Table 4: Interpretation of the Mean Score

Level	Mean score	Interpretation
Strongly Disagree	1.00 to 1.80	Very low
Disagree	1.81 to 2.61	Low
Neutral	2.62 to 3.42	Moderate
Agree	3.43 to 4.23	High
Strongly Agree	4.24 to 5.00	Very high

4. Results and Discussion

Demographics of Respondents: The sample consisted of 30 females (60.0%) and 20 males (40.0%), Bachelor of Business Administration (Finance) students from Universiti Teknologi MARA, Melaka, Malaysia. These students enrolled in the FIN555 Introduction to Technical Analysis class as part of their core subject requirement for the semester. The respondents' age ranges from 20-22: 15/30%; age 23-25: 35/ 70%; and 25-30: 0%.

Descriptive Analysis: Table 5 shows the findings for the means and SD values of each component. Overall, the total means for the motivation component was between 4.18 and 4.56, while the total SD was between 0.49 and 0.98. For these five components, 1, 2, 3, 4, and 5, the mean values (with corresponding standard deviations in parentheses) were 4.36 (0.52), 4.28 (0.66), 4.56 (0.53), 4.18 (0.98) and 4.48 (0.49) respectively.

Table 5: Means and Standard Deviations of Students' Motivation of Using Game-based Learning

Questions	SD (%)	D (%)	M (%)	A (%)	SA (%)	Total N	Mean	Std. Dev.	Level
1. I think this activity gives me lots of benefits.	0 -	0 -	1 2%	30 60%	19 38%	50	4.36	0.52	Very High
2. I prefer to answer questions this way compared to using books or paper.	0 -	0 -	6 12%	24 48%	20 40%	50	4.28	0.66	Very High
3. I am very interested in using games for learning in the future.	0 -	0 -	1 2%	20 40%	29 58%	50	4.56	0.53	Very High
4. I prefer to do quizzes using games rather than physical quizzes during class.	1 2%	2 4%	4 8%	22 44%	21 42%	50	4.18	0.98	High
5. The usage of games makes this subject more interesting.	0 -	0 -	0 -	26 52%	24 48%	50	4.48	0.49	Very High
Total							4.37	0..68	Very High

Note: Strongly Disagree (SD); Disagree (D); Moderate (M); Agree (A); Strongly Agree (SA).

Generally, all data register above 80% mean value, suggesting a high degree of agreement towards the questions posted. The average mean for the Motivation construct of 4.37 indicates a very high perception of motivation. Interestingly, all items in the motivation construct, with a mean ranging from 4.18 to 4.56, are above 4 or 80%

in line with the results of Ibrahim et al. (2011). Hence, it gives a clear idea that all the students are motivated to use and learn technical analysis subjects via games. Generally, the motivation to use games as a learning tool remains as high as a decade ago, again highlighting the promising future of game-based learning. The positive reaction that students have shown to digital game-based learning activities suggests that including such games in instruction can increase student engagement while also making learning pleasurable.

The motivation component shows that item 3 (I am very interested in using games for learning in the future) has the highest score (mean 4.56) indicating students' high interest in the game-based learning approach. High motivation to use games was particularly because games make the subject more interesting. Although the method of gamification via Kahoot and Quizzizz is simple, the approach has captured the students' interest to learn more repeatedly. Such a situation implies a good demand and indirectly suggests future potentials of a game-based approach to learning. As indicated by Gee (2003), game-based learning provides an experience that the students enjoy and want to continue doing. Perhaps the students appreciate the engagement and as indicated by Nadeem et al. (2023), successful engagement may also encourage students to remain motivated in the future.

The 2nd highest is item 5 (The usage of games makes this subject more interesting) with a mean of 4.48 indicating the students' high interest in using games because the game itself makes the subject more interesting (Ibrahim et al. 2011). In this context, the incentive elements provided by this game such as scores, leaderboard, cash reward, and certificate of award motivate the students to try their level best to perform better than others. Such behavior is especially true when competing with rivals in class. This is consistent with the study of Nadeem et al. (2023) who found out that the incorporation of a leaderboard as a game element, although sometimes mistakenly judged, forms an initial path leading to learning. Learning in this case may be subconscious without the students realizing that they are actually in the process of learning. Such positive results should stimulate students' interest in learning technical analysis subject.

This is followed by item 1 (I think this activity gives me lots of benefits) with a mean of 4.36, item 2 (I prefer to answer questions this way compared to using books or paper) with a mean of 4,28, and finally item 4 (I prefer to do quizzes using games rather than physical quizzes (manual) during class) with a mean of 4.18. Perhaps items 1, 2, and 4 can be attributed to Keller's four-factor model. The participants start to realize the good content and get interested in it (Attention). Next, the participants gather new knowledge (Relevance); the students feel that they can achieve success and are subsequently motivated to learn more (Confidence), and finally, the learners feel that the learning has value and is worth the continued effort (Satisfaction).

5. Conclusion

Overall, the level of motivation of the technical analysis students towards the GBL approach is at a very high level sparking demand on the part of the users. This preliminary study, although limited to the motivation construct only, can be a good basis to explore further the topic under study. Notwithstanding the foregoing, we must acknowledge that the study's findings might not be representative of other student bodies studying technical analysis because it was conducted at a single university with a small sample size. Nevertheless, this is a small effort to explore the motivation factor for using game-based learning on a different group of learners which was rarely experimented with. The results presented herein may provide a good starting point for those interested in game-based learning studies.

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