**Evaluating the Impact of Usability Components on User Satisfaction in Educational Board Games using the MEEGA+ Framework**

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**Abstract:** Conventional instructional methods often fail to achieve significant learning outcomes and user satisfaction, making educational board games (EBGs) a dynamic and engaging alternative. This study aims to analyze the impact of usability components (aesthetics, learnability, and operability) on user satisfaction in EBGs using the MEEGA+ framework. A purposive sampling technique was used to select bachelor's degree students enrolled in the Personal Financial Planning (PFP) subject. A quantitative study was conducted using self-administered questionnaires, and the data were analyzed using SPSS version 29.0. The findings indicated that usability components (aesthetics, learnability, and operability) significantly influenced user satisfaction in EBGs for PFP students. The study suggests incorporating game-based learning into curricula to enhance understanding and satisfaction. It also highlights the importance of usability components in EBGs, providing a theoretical framework for future research in game theory, cognitive, and pedagogical approaches.

**Keywords:** *Usability, User Satisfaction, MEEGA+, Educational Board Game (EBG), Personal Financial Planning.*

## 1. Introduction

Over the years, there has been a significant evolution in educational practices (Onofrei & Ferry, 2020; Qiao, Yeung, Zainuddin, Ng, & Chu, 2023). Traditional teaching methods, which often involve lectures, textbooks, and teacher-centered instruction, have been widely used for centuries and have shaped the foundation of education (Tadayon & Pottie, 2020). However, the landscape of education is changing rapidly due to a deeper understanding of cognitive science and the recognition of diverse learning styles (Gilliam, Hill Jaworski, Sparrow, Jones, & Jagoda, 2019). In recent decades, there has been a shift towards more student-centered and active learning approaches (Hendrix, Hojnoski, & Missall, 2020; Onofrei & Ferry, 2020; Wong, 2018; Qiao et al., 2023; Vlachopoulos, Jan, & Buckton, 2020).

These approaches emphasize engagement, collaboration, and critical thinking to enhance the learning experience (Gilliam et al., 2019; Mao, Cui, Chiu, & Lei, 2022). This shift has raised questions about the effectiveness of traditional teaching methods in meeting the evolving needs of today's students. However, the quality of education is significantly contingent upon the level of student satisfaction. When students are satisfied with their learning experiences, they are more likely to be engaged, motivated, and successful (Lin et al., 2021). Lower satisfaction, on the other hand, can lead to disengagement, reduced learning outcomes, and attrition. Furthermore, an overemphasis on memorization and assessment-centered learning can create a stressful environment, detracting from the joy of learning and reducing overall satisfaction. To enhance student satisfaction in the realm of education, a new approach has been introduced, characterized by an experiential perspective (Poole et al., 2019). Incorporating this perspective into education has led to the emergence of an innovative tool, the educational board game (EBG).

EBGs serve as interactive learning tools, allowing users to explore, experiment with, and reflect upon traditional teaching methods in a simulated classroom setting (Barbara, 2019; Gkogkidis & Dacre, 2020; Wong, 2018). EBGs provide a dynamic approach to learning, blending entertainment with education to engage learners of all ages (Tan et al., 2022). Users take on dual roles as educators and students, making decisions about teaching methods within the game, much like educators do in real classrooms (Hou et al., 2023). Users can directly apply theoretical knowledge in a practical setting, improving comprehension and retention (Ramos et al., 2023). This comprehension reinforces user satisfaction as they witness their progress and increased knowledge. Furthermore, active participation keeps users' attention and interest, directly influencing user satisfaction.

An EBG with aesthetic appeal is designed with visually engaging elements that stimulate interest and foster a conducive learning environment (Sun, 2023). The EBG incorporates clear instructions, intuitive mechanics, and progressive levels of complexity that scaffold the learning process. It employs pedagogically sound approaches, such as providing informative feedback and utilizing scaffolding techniques, to optimize knowledge acquisition (Azizan et al., 2018). Moreover, the game's content is aligned with educational objectives, fostering a seamless integration of learnability and operability into the gameplay experience (Cooke, 2016). Enhanced learnability results in more efficient learning experiences and higher user satisfaction. In contrast, operability refers to how easily players can engage with the game. It entails user-friendly interfaces, accessible rules, and intuitive game dynamics that minimize cognitive load and maximize user satisfaction (Daud, Osman, Abu Yazid, Md Taib, & Mohd Nor, 2021).

EBGs have been implemented to influence learning activities across various fields, such as environmental science, accounting, history, parenting, cultural studies, and libraries (Barbara, 2019; Begy, 2017; Cardinot & Fairfield, 2022; Fjaellingsdal & Klockner, 2020; Tadayon & Pottie, 2020). However, studies in EBG focused on Personal Financial Planning (PFP) are lacking in assessing the effectiveness of EBG in improving personal finance knowledge and financial behavior. Additionally, a notable research gap in the study of EBG and user satisfaction lies in the limited exploration of the specific design elements and mechanics for the PFP subject. While there is a growing interest in assessing overall user satisfaction, there is a need for more in-depth investigations into game features (e.g., game mechanics, aesthetics, feedback systems) that have the most significant impact on user satisfaction. Furthermore, the application of the MEEGA+ framework to enhance user satisfaction is limited in the empirical studies that rigorously evaluate the effectiveness of usability components, including aesthetics, learnability, and operability in EBGs for improving user satisfaction.

In summary, this study aimed to examine the effects of aesthetics, learnability, and operability on user satisfaction in EBGs for the Personal Financial Planning (PFP) subject. The findings are significant for educators and researchers as they can improve the quality of education, making it more dynamic, engaging, and user-friendly for students. There is a gap in the research that necessitates broader studies involving various instructional methods and interactive tools to better understand their effectiveness and determine best practices for enhancing learning outcomes and user satisfaction.

## 2. Literature Review

**Educational Board Game (EBG):** EBGs have experienced a surge in popularity within the field of education in recent years, owing to their unique ability to offer engaging and immersive learning experiences (Christopoulos & Mystakidis, 2023). These games, often designed with educational objectives in mind, combine entertainment with structured learning, creating a powerful tool for educators to engage students dynamically and interactively (Rogerson et al., 2018).

Many studies have investigated the effectiveness of board games in enhancing learning outcomes (Laski & Siegler, 2014; Carter et al., 2014; Cutumisu et al., 2019). Board games can aid in various disciplines and abilities (Lo & Chen, 2023). Bayeck (2020) suggests that board games serve as venues where individuals can acquire a variety of skills, including mathematics. Board games promote various types of interactions, including creative thinking, teamwork, and computational thinking (Tsortanidou, Daradoumis, & Barberá, 2021). Additionally, playing board games can simplify complex concepts and processes (Ezezika, Fusaro, Rebello, & Aslemand, 2023).

One of the standout features of EBGs is their innate capacity to motivate and engage players (Morais & Silva, 2023). Unlike traditional teaching methods that may struggle to maintain student interest, board games captivate learners through their inherent element of play. The competitive or cooperative nature of games, combined with the desire to achieve victory or solve challenging puzzles, fuels motivation (Crabb & Heron, 2023). This intrinsic motivation can result in increased perseverance and a willingness to overcome obstacles, thereby enhancing the learning process (Ab Rahman et al., 2017).

The adaptability of EBGs is another compelling aspect. These adaptations involve modifying game mechanics, objectives, and content to align with specific learning goals (Chen & Chi, 2022). This flexibility allows educators

to leverage existing, well-designed games to create customized educational experiences that cater to diverse subjects and age groups (Anggraeni, Affandi, Wahyudin, Paramitha, & Ramadhan, 2022).

Board games also offer a multifaceted experience that goes beyond mere entertainment (Vasconcelos, Sousa, Ferreira, & Pinheiro, 2022). They provide opportunities for social interaction, intellectual stimulation, emotional engagement, and a sense of achievement. These factors collectively contribute to heightened player satisfaction. According to Jansuk and Choochumpang (2022), the use of the inquiry-based learning approach known as the 5E method, along with the incorporation of board games, resulted in a very high level of student satisfaction.

**The MEEGA+ Assessment Model: An Innovative Approach to EBG:** The MEEGA+ Assessment Model represents an innovative approach to evaluating educational games. This comprehensive framework, designed for both digital and non-digital games like card and board games, has significantly advanced educational assessment. It allows for swift evaluation with minimal disruption to instruction, offering valuable feedback without necessitating in-depth knowledge of educational theory, measurement, or statistics from educators (Petri, Von Wangenheim, & Borgatto, 2016; Petri, Von Wangenheim, & Borgatto, 2017; Petri, Gresse von Wangenheim, Ferreti Borgatto, 2017). Developed in response to the evolving landscape of education and the need for more engaging and effective assessment methods, this model seamlessly combines assessment and EBG principles to create a comprehensive approach to evaluating the effectiveness and user satisfaction (Petri et al., 2016; Petri et al., 2017).

In recent years, game-based learning (GBL) has seen extensive use in educational contexts. Compared to traditional methods, GBL enhances learning effectiveness and boosts motivation by creating a positive and informative learning environment (Eltahir, Alsalhi, Al-Qatawneh, AlQudah, & Jaradat, 2021). MEEGA+ offers a compelling exploration of the synergy between GBL and the dynamic world of EBG (Petri et al., 2016; Petri et al., 2017). This study delves into the MEEGA+ assessment model, a contemporary framework designed to evaluate the effectiveness and user satisfaction of EBGs. It unveils fresh perspectives on how board games can harness game-based learning to enrich the educational experience (Haoran, Bazakidi, Zary, 2019). This research is expected to offer significant insights into the dynamic educational landscape, where educational board games are emerging as crucial tools for engaging and educating learners across diverse subjects and disciplines (Calderón & Ruiz, 2015; Petri et al., 2017). Presently, MEEGA+ stands out as one of the most widely utilized evaluation models (Borges, Juy, De Andrade Matos, Angelo Silveira, & Darin, 2020; Wang, Zhang, & Hong, 2023; Xinogalos & Satratzemi, 2022).

At present, the MEEGA+ model is among the most extensively utilized evaluation frameworks in practice (Borges, Juy, De Andrade Matos, Angelo Silveira, & Darin, 2020; Wang, Zhang, & Hong, 2023; Xinogalos & Satratzemi, 2022). It has been recognized for its potential to enhance engagement and motivation in educational settings. By infusing elements like challenges, rewards, competition, and interactivity inspired by games into educational activities, game-based learning captivates students and encourages active participation in the learning process (Sari, Fadillah, Al Hariri, Habibi, Mega, 2022). The MEEGA+ model offers a valuable tool for game developers, educators, and researchers to assess the quality of educational games, facilitating their enhancement and promoting effective and efficient practical application (Petri et al., 2016; Petri et al., 2017; Wang et al., 2023; Xinogalos & Satratzemi, 2022). Measurement within the MEEGA+ model involves the collection of quantitative and qualitative data on student performance, participation, and outcomes (Borges et al., 2020; Petri et al., 2016; Petri et al., 2017). This data provides valuable insights into the effectiveness of instructional methods and the level of student involvement, shedding light on areas that may need improvement.

The MEEGA+ assessment model, recognized for its effectiveness, is utilized to evaluate game quality, focusing on learner usability and experience post-gameplay of educational games (Petri et al., 2016; Petri et al., 2017). Evaluation goes hand in hand with measurement, allowing educators to assess the impact of EBG elements on learning outcomes (Borges et al., 2020). This includes examining whether EBG strategies enhance content retention, problem-solving skills, and overall student satisfaction (Borges et al., 2020; Eltahir et al., 2021; Wang et al., 2023; Xinogalos & Satratzemi, 2022). This approach can effectively assess and improve the educational experience, leading to enhanced learning outcomes (Sari et al., 2022). The model's ability to combine game-

based learning with measurement and evaluation techniques has been shown to increase student engagement, motivation, and overall satisfaction with the learning process (Sari et al., 2022; Wang et al., 2023).

**Usability in EBG: Enhancing the User Satisfaction:** Usability in EBG refers to the design and functionality of the game interface and components, aiming to ensure that players can interact with the game effectively and intuitively. It encompasses several key dimensions, such as aesthetics, learnability, and operability. According to Yang and Kopcha (2022), aesthetics play a crucial role in capturing and retaining players' attention. It is also evident that the added aesthetics and story attract players' attention and increase their motivation to play the game (Yang & Kopcha, 2022). A visually appealing game design with engaging graphics, well-chosen colors, and immersive artwork can draw players into the learning experience (Rahimi & Kim, 2021). Visual elements should align with the educational content and create a cohesive and immersive environment. Consistency in design contributes to a polished and professional appearance, enhancing the overall user experience.

Learnability focuses on how easily players can understand and navigate the game. Tutorials, tooltips, and clear instructions can aid in the learnability of the game (Chen & Chi, 2022). Ensuring that players can easily access guidance and assistance when needed can reduce frustration and support effective learning. Ramadhan et al. (2022) highlighted that learnability forms the user's initial impression and significantly enhances their satisfaction. Operability concerns the functionality and ease of interaction within the game (Martins & Mota, 2022). Player actions and decisions should result in logical outcomes, promoting a sense of agency and control. Minimizing lag or technical issues contributes to a seamless gaming experience.

Player satisfaction in EBGs is a critical outcome that reflects the overall quality of the gaming experience (Bangalee, Oosthuizen, Perumal-Pillay, Suleman, & Walters, 2021). EBGs should align with specific learning objectives. Satisfaction increases when players perceive that they have gained knowledge, skills, or problem-solving abilities through gameplay (Chang, Hu, Kuo, Nguyen & Chuang, 2022). The game's educational impact is a crucial determinant of overall satisfaction. Player satisfaction is often tied to achievement and progress within the game. Tracking progress, earning rewards, and experiencing a sense of accomplishment enhance satisfaction levels, motivating players to continue their educational journey (Bangalee et al., 2021; Tan & Mogali, 2022).

**Hypotheses Development:** The MEEGA+ framework identifies critical factors influencing usability and player experience, including aesthetics, learnability, and operability (Ben Itzhak et al., 2023; Petri et al., 2016; Petri et al., 2017). Player usability plays a crucial role in determining user satisfaction during learning activities involving EBGs (Barbara, 2019; Begy, 2017; Ben Itzhak et al., 2023; Byusa et al., 2022).

The relationship between aesthetics and user satisfaction in EBGs is multifaceted (Hsieh, 2020). Aesthetics, including game board design, artwork, and components, play a pivotal role in drawing players in, sparking initial interest, and setting the stage for engagement (Rogerson, Sparrow, & Freeman, 2022). When aesthetics align with educational content, they foster immersion, making the learning experience more enjoyable and emotionally satisfying (Razami & Ibrahim, 2022). Aesthetics can also impact motivation and long-term engagement, encouraging players to explore and learn more (Vecchio & Greco, 2023). Aesthetics, as a key factor affecting player usability, is vital in defining a game's overall attractiveness (Ben Itzhak et al., 2023; Petri et al., 2016; Petri et al., 2017). Additionally, aesthetics creates positive first impressions, influencing users to approach the educational content with enthusiasm (Katsaounidou, Vrysis, Kotsakis, Dimoulas, & Veglis, 2019). This initial positivity sets the tone for the entire learning experience, enhancing overall satisfaction. Aesthetically pleasing games foster higher player engagement, motivating active exploration and investment in acquiring knowledge and skills. Therefore, we hypothesize that:
**H1**: Aesthetics and user satisfaction are significantly related when playing EBGs

Learnability is another critical element influencing user satisfaction (Ben Itzhak et al., 2023; Petri et al., 2016; Petri et al., 2017). Learnability is pivotal for user satisfaction in EBGs because it directly affects the player's ability to engage with the educational content (Srivastava & Monga, 2023). The relationship between learnability and user satisfaction in EBGs is fundamental to creating an effective learning experience (Kontiza, Liapis, & Jones, 2020). High learnability ensures accessibility by providing clear instructions and an intuitive learning curve, removing barriers, and fostering immediate engagement. High learnability reduces frustration,

promoting a positive gaming experience and increased satisfaction (Kurisu, Okabe, Nakatani, & Moriguchi, 2021). Ultimately, easy learning motivates users to invest effort, leading to a sense of accomplishment and satisfaction (Juan & Chao, 2015). In summary, learnability enhances accessibility, reduces frustration, promotes a positive learning experience, and boosts motivation, all vital for user satisfaction in EBGs. Thus, our next hypothesis is:

**H2**: Learnability and user satisfaction are significantly related when playing EBGs

Operability and user satisfaction are vital when crafting EBGs (Daud, Osman, Abu Yazid, Md Taib, & Mohd Nor, 2021). Operability refers to how easily players engage with the game's rules and components, including the clarity of rules, accessibility, quality of materials, adaptability, and feedback mechanisms (Wehrle, Wiens & Schultmann, 2022). User satisfaction, on the other hand, hinges on engagement, learning value, replicability, positive social interaction, and achievement (Machado, Lima, Florido, & Silva, 2021). The review of the literature emphasizes the important link between operability and user satisfaction in EBGs. Operability, which denotes the ease of interaction with the game interface, is essential for fostering a positive gaming experience (Wehrle et al., 2022). Research findings emphasize that operability impacts the educational effectiveness of these games, with intuitive controls and clear instructions enhancing learning and satisfaction (Wang & Lee, 2022). In conclusion, optimizing operability is essential for EBGs to effectively serve as tools for both learning and enjoyment, ensuring a valuable experience for users. Therefore, the following hypothesis is developed:

**H3**: Operability and user satisfaction are significantly related when playing EBGs

**Figure 1: Proposed Research Framework**
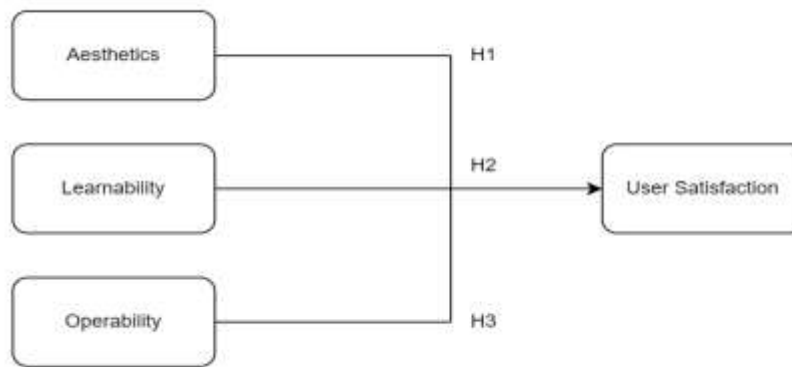


## 3. Method

**Sample and Procedure:** The present study's sample comprised bachelor's degree students taking the Personal Financial Planning (PFP) course at the Faculty of Business and Management, Universiti Teknologi MARA (UiTM) Cawangan Melaka, Kampus Bandaraya Melaka. Using quantitative methods and empirical data, the study aimed to establish cause-and-effect relationships and make predictions based on tested hypotheses (Brant, Haas-Haseman, Wei, Wickham & Ponto, 2015). Purposive sampling was employed to gather data from 200 full-time students enrolled in various programs, including Finance, Human Resource Management, International Business, Marketing, and Office Management, from a total of 581 students. An online survey method was used, featuring multiple-item questionnaires. Participants received links to the questionnaire via Google surveys, which utilized a five-point Likert scale from one (strongly disagree) to five (strongly agree).

**Measures:** The survey items measured respondents' satisfaction with usability components (aesthetics, learnability, and operability) and overall user satisfaction, based on the framework developed by Petri et al. (2016). Derived from the MEEGA+ model, aesthetics components included two items assessing the visual appeal and attractiveness of the game. Learnability was gauged using a three-item scale, focusing on the ease of understanding the game, clarity of instructions, and how quickly students could master the gameplay mechanics and concepts. Operability was assessed through a two-item scale evaluating the game's functionality, including the responsiveness of controls. User satisfaction, the dependent variable, was measured using a four-item scale from Petri et al. (2016).

**Data Analysis:** The study's findings were presented in two segments. Initially, descriptive statistics, correlations, and reliability analyses were discussed. Subsequently, hierarchical multiple regression models were tested, and hypothesis testing results were presented. The analyses were performed using SPSS 29.0, covering descriptive statistics, correlations, reliability, and hierarchical multiple regression.

**4. Findings**

Self-reported questionnaires were administered online to 200 respondents. Table 1 reveals that of the 200 respondents, 69% were male and 31% were female. The ethnicity of the respondents revealed that 100% were Malays. The program distribution of respondents showed that 60% were from Finance, 18.5% from Marketing, 17.5% from Human Resource Management, and the remaining 2% from International Business and Office Management.

**Table 1: Profile of Respondents (n=200)**

| Criteria | Category | Total | Percentage |
|---|---|---|---|
| Gender | Male | 62 | 31% |
| | Female | 138 | 69% |
| Ethnicity | Malay | 200 | 100% |
| | Bumiputera Sabah | 0 | 0% |
| | Bumiputera Sarawak | 0 | 0% |
| Programme | Finance | 120 | 60% |
| | Human Resource Management | 35 | 17.5% |
| | International Business | 4 | 2% |
| | Marketing | 37 | 18.5% |
| | Office Management | 4 | 2% |

**Descriptive statistics, correlations and reliabilities:** The reliability and validity of all items were thoroughly tested. Ensuring the stability and consistency of the study's instrument is vital (Sekaran & Bougie, 2013). The constructs extracted from this analysis showed excellent reliability, with Cronbach's Alpha ($\alpha$) values exceeding 0.70, as recommended by Nunnally and Bernstein (1994). As indicated in Table 2, variables with a Cronbach's Alpha of 0.70 or higher were retained. The reliability of all variables ranged from 0.756 to 0.838, surpassing the acceptable threshold of 0.70, indicating sufficient reliability.

**Table 2: Results of Reliability Analysis**

| Variables | Statements | $\alpha$ Cronbach's Alpha |
|---|---|---|
| Aesthetics | The game design is attractive (interface, graphics, cards, boards, etc.) (AESI) | |
| | The text font and colors are well-blended and consistent (AES) | 0.832 |
| Learnability (LEA) | I needed to learn a few things before I could play the game (LEA1) | |
| | Learning to play this game was easy for me (LEA2) | 0.756 |
| | I think that most people would learn to play this game very quickly (LEA3) | |
| Operability (OPE) | I think that the game is easy to understand (OPE2) | 0.838 |
| User Satisfaction | Completing the game tasks gave me a satisfying feeling of accomplishment (SAT1) | |
| | It is due to my effort that I managed to advance in the game (SAT2) | 0.776 |
| | I would recommend this game to my colleagues (SAT4) | |

Table 3 presents the mean, standard deviation (SD), and correlations among the four constructs. Among all the variables, aesthetics received the highest mean value of 4.608 (SD=0.451), while learnability recorded the lowest mean value of 4.452 (SD=0.401). Additionally, Pearson's correlation values indicated a positive correlation between usability components (aesthetics, learnability, and operability) and user satisfaction when playing EBGs. The significant correlation value of 0.000 highlighted the importance of this relationship, indicating a moderate effect, as the value fell between 0.4 and 0.7.

**Table 3: Mean, SD and Correlation Results**

| Constructs | Mean | SD | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|---|
| Aesthetics | 4.608 | 0.451 | 1.00 | | | |
| Learnability | 4.452 | 0.401 | 0.490** | 1.00 | | |
| Operability | 4.523 | 0.463 | 0.458** | 0.708** | 1.00 | |
| User Satisfaction | 4.511 | 0.386 | 0.455** | 0.562** | 0.596** | 1.00 |
| *Notes: **Correlation is significant at the 0.01 level (2-tailed)* | | | | | | |

**Regression Analysis:** Table 4 illustrates that aesthetics, learnability, and operability positively impacted user satisfaction in EBGs. Specifically, the study's objective revealed that the direct influence of usability components (aesthetics, learnability, and operability) accounted for approximately 42% of the variance in user satisfaction. Numerous factors influence human behavior in social science fields like psychology, sociology, and education, leading to lower R-squared values (Frost, 2017). R-squared values in the range of 42% can still be considered meaningful and acceptable, as indicated by previous studies in the field of education (Martínez-Jiménez et al., 2021; Wai & Tran, 2022). The beta coefficients for the three independent variables ranged from 0.184 to 0.356, thus supporting H1, H2, and H3. The results in Table 4 show that operability was the most important variable influencing user satisfaction, followed by learnability and aesthetics. In summary, this study has supported all three tested hypotheses.

**Table 4: Regression Analysis Results**

| Predictors | User Satisfaction | | | |
|---|---|---|---|---|
| | Beta | Std. Error | t | Sig. Level |
| Constant | 1.498 | 0.264 | 5.685 | 0.000 |
| Aesthetics | 0.184 | 0.054 | 2.901 | 0.004 |
| Learnability | 0.220 | 0.077 | 2.757 | 0.006 |
| Operability | 0.356 | 0.065 | 4.545 | 0.000 |
| *Note: R Square = 0.420; F=47.254; p < 0.05* | | | | |

## 5. Discussion and Conclusion

The survey results in this study emphasize the impact of usability on user satisfaction in EBGs. The data indicate that aesthetics, learnability, and operability are vital for enhancing user satisfaction. The study produced compelling results, highlighting the significant influence of these usability components on user satisfaction in EBGs. The MEEGA+ assessment model, adopted in this study, provided an objective and comprehensive framework for quantifying these elements. It was found that aesthetics, encompassing visually pleasing design elements, exhibited a strong and positive correlation with player satisfaction. EBGs with appealing aesthetics not only capture players' attention but also contribute to heightened emotional engagement and immersion (Fjællingsdal & Klöckner, 2020). A visually attractive game enhances the player's experience, making it more enjoyable and immersive (Srivastava & Monga, 2023). By assessing these factors objectively, the study established a concrete link between aesthetics and player satisfaction.

The findings of the study validate the hypothesis of a positive correlation between learnability and user satisfaction. Learnability pertains to the ease with which players understand the game's rules, mechanics, and objectives (Martindale & Weiss, 2020). EBGs that are intuitive and offer clear tutorials or instructions tend to provide a smoother learning curve for players (Yannakakis & Togelius, 2018). This reduces frustration and allows players to enjoy the game from the beginning, leading to higher satisfaction levels (Marques Netto,

2022). The MEEGA+ assessment model's ability to evaluate the learning process objectively, such as tracking the time it takes for a user to understand the game mechanics, contributed to confirming this relationship.

The study also found a strong relationship between operability and user satisfaction. Operability denotes the ease with which players can manage and interact with the game, encompassing the responsiveness of controls, the intuitiveness of menus, and the overall user interface (Lin & Lai, 2016). Games that offer responsive controls and a user-friendly interface enhance the player's sense of agency and control, leading to increased satisfaction (Swab, Cogan, Pret, & Marshall, 2021). Players are more likely to enjoy a game when they feel in command of the gameplay. The MEEGA+ assessment model's ability to objectively measure the efficiency and effectiveness of player interactions and control mechanisms was instrumental in confirming the link between operability and user satisfaction.

The study on EBGs and the use of the MEEGA+ framework offers both theoretical and practical implications. Theoretically, it advances gamification and learning theories by emphasizing the impact of gamification elements and analytics on motivation, engagement, and education. Practically, this research informs the development of game design guidelines, curriculum integration, teacher training, and inclusive design, enhancing the effectiveness of educational board games. This emphasizes the importance of data-driven design for the ongoing enhancement of educational tools, ultimately resulting in a more engaging and effective learning experience.

However, the study observed certain limitations. Firstly, the research focused narrowly on usability components such as aesthetics, learnability, and operability, overlooking other variables that can influence user satisfaction in EBGs, such as individual learning styles and interface design. Secondly, the sample was restricted to bachelor's degree students enrolled in Personal Financial Planning (PFP) courses, which may limit the generalizability of the findings. Future research should broaden the sample to include individuals from diverse backgrounds, institutions, and varying levels of financial literacy to enhance the study's applicability. Lastly, the exclusive use of a quantitative approach may have missed qualitative insights into the user experience. Future research should adopt mixed-methods approaches to comprehensively explore user experiences in educational board games and how the MEEGA+ framework can cater to a broader array of user profiles.

In conclusion, this study, utilizing the MEEGA+ assessment model, has unequivocally established a strong and positive relationship between usability components and user satisfaction in the context of EBGs. The findings confirm the critical role these elements play in shaping the overall gaming experience and user satisfaction. Aesthetically pleasing designs not only capture players' attention but also foster emotional engagement and immersion, resulting in heightened satisfaction levels. Learnability, assessed through intuitive mechanics and clear instructions, significantly influences satisfaction by smoothing the learning curve and reducing player frustration. Additionally, operability, encompassing responsive controls and user-friendly interfaces, enhances player agency and control, leading to increased satisfaction. These conclusive results underscore the paramount importance of prioritizing aesthetics, learnability, and operability in the design and development of EBGs, offering actionable insights for game developers and educators seeking to create more engaging and effective learning tools. As a result, this study contributes substantially to the enhancement of educational gaming experiences and their potential to facilitate effective learning outcomes.

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