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COMBINING ACCOUNTING AND SERIOUS GAME: EXPLORING ALTERNATIVES IN MOBILE LEARNING AND ANALYZING STUDENT EXPERIENCE

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Abstract

Changes in social dynamics require efforts to search for alternatives to improve teaching and learning processes in technological education. In this context, the objective of this research was to evaluate students' experience in using Serious Games in teaching practical accounting content, with a particular focus on mobile devices, using Flow Theory as a theoretical lens. The study was conducted at the Federal Institute of Education, Science, and Technology in Rio Grande do Sul. The Design Science Research research method was adopted. The data collection procedure used the Model for the Evaluation of Educational GAmes (MEEGA+) questionnaire. The analysis used the Likert scale to determine medians for participants' responses. The failure to reach the "Flow State", which is the core of the theory used, stands out among the findings. That can be explained, in part, by the limited availability of Serious Games and reported operational glitches. However, it is important to mention that the students evaluated the experience positively, highlighting the relevance of the content and the perception of learning provided by the Serious Game. This research suggests that, despite the criticisms described, Serious Games are a viable alternative for teaching accounting, highlighting the importance of adapting pedagogical practices to the demands of hyperconnected students. This research contributes threefold. First, it provides new evidence about technology education students' acceptance of new learning technologies. Second, it fills a gap at the national level since no similar research was found in the country. Third, it differs from international studies by adopting Flow Theory as a theoretical lens, going beyond the description of cases and results, as analyzed in previous studies.

Keywords: Accounting; Educational Game; Teaching and Learning.

Resumo

As mudanças nas dinâmicas sociais demandam esforços na busca de alternativas para aprimorar os processos de ensino e aprendizagem no ensino tecnológico. Nesse contexto, o objetivo desta pesquisa foi avaliar a experiência dos estudantes no uso de *Serious Games* no ensino de conteúdos práticos de contabilidade, com foco particular em dispositivos móveis, empregando a Teoria do *Flow* como lente teórica. O estudo foi realizado em um Instituto Federal de Educação, Ciência e Tecnologia, localizado no Estado do Rio Grande do Sul. Foi adotado o método de pesquisa *Design Science Research.* O procedimento de coleta dos dados ocorreu por meio do questionário Model for the Evaluation of Educational GAmes (MEEGA+). A análise envolveu a determinação de medianas para as respostas dos participantes, utilizando a escala Likert. Entre os achados, destaca-se o não atingimento do "Estado de Flow", que é o cerne da teoria utilizada. Isso pode ser explicado, em parte, pela limitada disponibilidade de Serious Games e pelas falhas operacionais relatadas. No entanto, é importante mencionar que os alunos avaliaram positivamente a experiência, destacando a relevância do conteúdo e a percepção de aprendizado proporcionada pelo Serious Game. Esta pesquisa sugere que, apesar das críticas descritas, os Serious Games são uma alternativa viável para o ensino de contabilidade, destacando a importância da adaptação das práticas pedagógicas às demandas dos alunos hiperconectados. Esta pesquisa contribui de maneira tripla. Primeiro, fornece novas evidências sobre a aceitação de novas tecnologias de aprendizagem pelos estudantes do ensino tecnológico. Segundo, preenche uma lacuna em âmbito nacional, uma vez que não foram encontradas pesquisas similares no país. Terceiro, se diferencia de estudos internacionais ao adotar a Teoria do *Flow* como lente teórica, indo além da descrição de casos e resultados, como analisado em estudos anteriores.

Palavras-chave: Contabilidade; Ensino e Aprendizagem; Jogo Educativo.

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INTRODUCTION

In the contemporary educational landscape, the influx of highly connected students poses significant challenges to educational institutions, especially in conventional accounting classes, resulting in less engaging learning experiences and low academic performance. Although the transition to digital teaching was made possible by the COVID-19 pandemic, pedagogical approaches have not yet adjusted adequately, remaining, to a large extent, analogous to face-to-face classes.

In this context, research demonstrating the implementation of new pedagogical practices could advance this area. However, it is worth highlighting that research in accounting education and research at the national level is notably limited. The scarcity of studies on the use of serious games in practical accounting teaching, especially considering the interaction between the student and the game content, represents a gap in the existing literature, thus providing a research opportunity.

This research aims to analyze student evaluation regarding the use of serious games in learning accounting content, with special emphasis on the role played by mobile devices in the student's interaction with the game content. The study aims to provide empirical evidence on the use and potential of serious games, thus filling a gap in this area.

The research is based on Flow Theory, which highlights immersion in activities as a fundamental element for student motivation and learning. The choice of the mobile learning format is justified by the familiarity, accessibility, and natural integration of mobile devices in students' lives. It is important to highlight that, by incorporating Flow Theory as a theoretical basis, this research represents an advance concerning previous investigations that did not adopt structured theoretical support and limited the case description.

From a methodological point of view, the research is classified as qualitative and descriptive, using the Design Science Research method. The process of this method covers, in detail, awareness of the problem, suggestion of solutions, development, evaluation, and, finally, conclusion.

In addition to this introduction, the research addresses the following topics: theoretical-conceptual framework, methodology, results, and discussion, culminating, finally, in final considerations.

LITERATURE REVIEW

In the contemporary educational scenario, educational institutions face significant challenges arising from the arrival of hyperconnected students. This reality manifests forcefully in traditional

accounting classes, resulting in reduced student engagement and low academic performance (MALAQUIAS *et al*., 2018). Given this panorama, the need for institutional adaptation becomes evident, as King *et al*. (2014) and Yu *et al*. (2022) highlight students' preference for active methodologies incorporating mobile technologies.

The traditional educational paradigm, centered predominantly on the teacher, is questioned due to the realization that the effectiveness of the teaching process does not always translate into learning since several factors can interfere. It is also recognized that learning is not completely under the teacher's control (KING *et al*., 2014). In this context, gamification emerges as an alternative to involve students in a participatory way, stimulating intrinsic interest in learning (LIMA *et al*., 2023).

The urgency of adjusting pedagogical practices to digital technologies is accentuated by the context of the COVID-19 pandemic, which precipitated a rapid transition to digital teaching. However, there is resistance to adapting teaching approaches, remaining essentially unchanged concerning face-to-face classes (SCHLEMMER; OLIVEIRA; MENEZES, 2021). This phenomenon highlights the need to reevaluate traditional methodologies, as Viana, Costa and Marques (2023) noted.

In the context of the COVID-19 pandemic, the imposition of social isolation resulted in a significant expansion in the use of technologies in everyday life, especially in the educational area, where technologies played a crucial role in the teaching-learning process (SANTOS; BAIMA; BOTTENTUIT JÚNIOR, 2023).

Research addressing active methodologies in accounting teaching minimizes this asymmetry in the context described. However, research on Accounting Education and Research in the national context presents a significant gap, representing only 8% of theses, with a minimum portion focused on “Accounting Education” (MIRANDA *et al*., 2013). This scarcity, reinforced by Vendramin *et al*., (2020), points to the need for studies, especially those related to using Serious Games in practical accounting teaching, as Malaquias *et al*., (2018) suggested.

Following what was recommended by Malaquias *et al*., (2018), studies by Seow and Wong (2016), Kao, Yuan and Wang (2023), and also Voshaar *et al*., (2023), however, these merely describe the cases without mixing accounting teaching and theory. This study justifies the choice of the mobile learning format due to the familiarity, accessibility, and natural integration of mobile devices in students' lives (LIMA *et al*., 2023).

In addition to the studies above, which did not use any theory in their analysis, this research adopts the Flow Theory, which emerges as an alternative approach that aims to improve teaching and learning processes, providing an intense concentration on stimuli relevant to the person, in a state of experience in the activity (WESTERA, 2018).

Flow Theory, developed by Mihaly Csikszentmihalyi in the 1970s, is a concept derived from positive psychology that seeks to explain the phenomenon of the state of flow, also known as flow feeling. This optimal psychological state of consciousness is characterized by intrinsic involvement, in which there is a balance between the difficulty presented by an activity and the individual's ability to carry it out. During this state, the person is deeply engaged in the activity, focusing exclusively on it and removing any thoughts that could interfere with the process. This total immersion excludes the possibility of experiencing apprehension and worry, optimizing the individual's performance to the maximum (SILVA; RODRIGUES; LEAL, 2021).

According to the observations of Csikszentmihalyi (1999), the time available to individuals can be essentially categorized into three axes or functions: production (work), maintenance, and leisure. These axes operate in different environments and contexts, influencing the individual's disposition of psychic energy. Within these contexts, the nature and quality of the lived experience are intrinsically linked to the allocation and use of time and the feeling experienced by the individual during the execution of a certain task. The activities themselves incorporate information that, once absorbed by the person, results in the generation of feelings. For an activity to be considered fruitful and satisfying, it must provide positive feelings.

Flow Theory is characterized by intense concentration on a set of stimuli relevant to the person, provoked in a state of experience in the activity. In the so-called “State of Flow”, there is a balance between the person's capacity and the challenge presented by the activity, and the notion of time is altered. A person feels they have control over their actions and environment, and activities such as arts, sports, games, and hobbies are examples of environments that provide the curiosity and challenge necessary to motivate and facilitate concentration and engagement. Flow Theory is widely applied in several areas to describe the state of concentration and pleasure in an activity or situation (SILVA; RODRIGUES; LEAL, 2021).

The State of Flow, according to Silva, Rodrigues and Leal (2021), results from an experience with clear and objective goals and sub-goals, immediate feedback, focus on the present, change in the perception of time, deep concentration, sense of control, balance between capacity and opportunity, and exclusion of the ego in favor of achieving objectives. It is a state in which the person knows what needs to be done exactly, is aware of their good performance, concentrates fully on the activity, feels in control of the situation, trusts themselves, and values achieving the goal more highly than external recognition. SGs can be an important tool for skill development. That is because, during SG, students can focus intensely on the activities, allowing them to experience the task fully. These moments of immersion in

the activity are known as the Flow state and are considered one of the main motivational factors for learning (WESTERA, 2018).

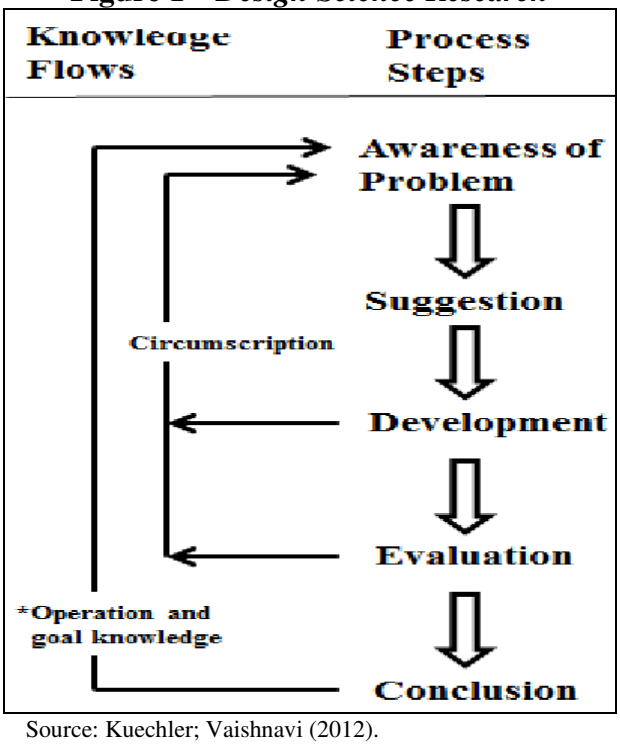
This research is based on Flow Theory and uses a validated questionnaire that incorporates it, developed by Petri, Von Wangenheim and Borgatto (2017); the details are described in the methodology section.

METHODOLOGY

Methodologically, this research is classified as qualitative and descriptive. According to Kemparaj and Chavan (2013), a methodological approach aims to understand complex phenomena, exploring the depth of social, cultural, or behavioral phenomena using flexible and interpretative methods. This approach allows researchers to capture participants' subjectivity, experiences, and meanings, providing a richer, more contextualized understanding.

As for this research being considered descriptive, Siedlecki (2020) clarifies that it is an approach that aims to describe specific characteristics of a population or context. Focuses on identifying and reporting behaviors, opinions, or patterns, providing a detailed representation of the object of study. Descriptive research contributes to a clear and complete understanding of specific phenomena for the same authors. It was developed through the Design Science Research method.

Figure 1 – *Design Science Research*



Source: Kuechler; Vaishnavi (2012).

Figure 1 elucidates the steps of the Design Science Research process. The research by Mülbert and Pereira (2017) and Hevner and Vom Brocke (2023) seeks to transpose the structure of Design Science Research with a view to education, each step being outlined as:

> *Problem awareness* consists of clearly identifying and defining the challenges faced in education. This step often involves an in-depth analysis of educational literature or student needs.
>
> *Suggestion*: in the second step, the researchers propose a teaching approach to address the identified problem. This suggestion is based on theories and a review of relevant literature.
>
> *Development*: involves the creation of the pedagogical practice proposed in the previous stage. This development may include developing teaching materials, implementing innovative teaching strategies, or creating a personalized learning environment, depending on the situation's needs.
>
> *Evaluation*: Researchers test and evaluate teaching practice to determine its effectiveness in solving the original educational problem. This practice may involve collecting data on student performance, providing feedback from educators, and analyzing test results, among other research approaches.
>
> *Conclusion*: researchers analyze the evaluation results and determine whether the pedagogical practice is suitable for solving the educational problem. They also evaluate their work's practical and theoretical implications and document their findings in articles or research reports.

The study was conducted during the second semester of 2022 and the first semester of 2023 at a Federal Institute of Education, Science and Technology in Rio Grande do Sul. A face-to-face collaborative pedagogical practice was implemented, in which 67 students participated. The practice was carried out each semester, comprising four meetings lasting two periods. Two professors from the institution were responsible for conducting this pedagogical practice. Four technological education classes, specifically accounting for non-accountants, participated in the study. It is worth mentioning that, although four classes were considered, the number of students in each class was reduced due to the high post-pandemic dropout rate (Ordinance of the Ministry of Health nº 913 of April 22, 2022 - closure of the Emergency in Public Health of National Importance – SPIN – as a result of COVID-19).

The selection of the educational institution and students who participated in the study is a methodological limitation convenience of researchers. The data collection procedure was carried out using Google Forms after the students had tested the selected Serious Game, following the model proposed by Petri, Von Wangenheim and Borgatto (2017), called “Model for Evaluation of Educational Games” (MEEGA+). It should be mentioned that this model has a specific focus on perceiving the quality of the player's experience and the student's learning process.

The data analysis procedure comes from the MEEGA+ model, a questionnaire composed of 31 questions on a Likert scale, with scores ranging from -2 (unfavorable evaluation) to +2 (favorable evaluation) per question. It is divided into two blocks: the first, “Usability,” with nine questions,

addresses aspects such as aesthetics, ease of learning, operability, and accessibility. The second block, "Player Experience," includes 22 questions that assess confidence, challenge, satisfaction, social interaction, fun, focus, relevance, learning, and educational goals.

Before respondents respond to the questionnaire, information is collected from them, including age group, frequency of involvement in digital games, and participation in non-digital games, ensuring the anonymity of responses. Data analysis reveals that most participants are women (55%). The largest age group of respondents is 18 to 28 years old (72%). Regarding the frequency of digital games, 12% play daily, 39% weekly, 28% monthly, 15% rarely, and 6% never. About non-digital games, no participant plays daily, 10% play weekly, 31% play monthly, 40% play rarely, and 18% never play. Additionally, at the end of the questionnaire, an open question allows additional participant comments.

As for the theoretical-methodological triangulation design, this study uses data collection techniques, the MEEGA+ questionnaire, and student statements allocated during this study. The bibliographic data profile describes results and description.

In the subsequent topic, there is a description of the research application, which strictly follows the steps outlined in Design Science Research.

RESULTS AND DISCUSSION

Following the outlined methodological approach, the present study followed the steps described in the Design Science Research structure.

Step 1: Awareness of the problem

In its initial stage, a concern was identified for teachers related to exploring alternatives to the traditional teaching approach, predominantly based on lectures, to improve student performance and motivation.

Step 2: Suggestion

In the second stage of Design Science Research, research was carried out in academic literature to identify alternatives to make teaching and learning processes more engaging, especially for a generation of students who are familiar with digital technologies. During this investigation, the

perspective of incorporating the Serious Game approach in the mobile learning format emerged as a solution that could meet the needs of the accounting discipline for non-accountants.

A search for articles was conducted in the Scopus database without cutting time, with a search on the title, abstract, and keywords. The first string with the terms “m-learning,” “serious game,” and “accounting” returned only one result. The second search string with the terms “m-learning,” “mobile learning,” and “accounting” returned only 13 articles. Respectively, the search expressions were: TITLE-ABS-KEY (“m-learning” OR “mobile learning”) TITLE-ABS-KEY (“serious game”) (accounting) AND (LIMIT-TO (DOCTYPE, “ar”)) and TITLE-ABS-KEY (“m-learning” OR “mobile learning”) TITLE-ABS-KEY (accounting) AND (LIMIT-TO (DOCTYPE, “ar”)).

After reviewing the abstracts, several studies were excluded because they were not aligned with the scope of the research or were not directly related to accounting, including Burke *et al*., (2022), Wang *et al*., (2022), Cheng and Shao (2022), Moreno and Álvarez (2020) and Sánchez-Prieto *et al*., (2019). Others were not excluded due to the lack of approach in Serious Game: Herrador-Alcaide, Hernández-Solís and Hontoria (2020), Moorthy *et al*., (2019), Ajayi, Ayo and Olamide (2019), Lam, Chan and Yan (2015), Lam (2015), and Richardson *et al*., (2013) and others.

However, three studies - Seow and Wong (2016), Kao, Yuan and Wang (2023), and Voshaar *et al*. (2023) - were highlighted as relevant to this research, as they focused on the use of Serious Games for teaching accounting. In comparison, the study by Seow and Wong (2016) is qualitative and introduced the Accounting Challenge (ACE) application. The study above was awarded internationally but does not detail its application in the classroom. The studies by Kao, Yuan and Wang (2023) and Voshaar *et al*., (2023), with a quantitative focus, highlighted the significant benefits of using Serious Games on mobile learning platforms, emphasizing students' voluntary involvement and improvements in the learning experience.

It is mentioned that a search was carried out for Serious Games in application stores. However, some were not available at the time of this research, making the analysis more challenging. Specifically, the Accounting Challenge (ACE) application was not available on the Play Store but only on the Apple Store and has undergone substantial modifications since the original article, even retaining the original question-and-answer mechanics.

In addition to the review presented, this research is based on Flow Theory and uses a validated questionnaire that incorporates it, developed by Petri, Von Wangenheim and Borgatto (2017). Access to the applications is described in the studies by Kao, Yuan and Wang and Voshaar (KAO, YUAN AND WANG 2023; VOSHAAR *et al*., 2023).

Due to the limitation of not finding an application available for IOS and Android and in Portuguese, it was decided to scan the application stores described in the application.

This research adopts the Flow Theory. According to Silva, Rodrigues and Leal (2021) and Csikszentmihalyi (2014), the State of Flow is characterized by clear goals, immediate feedback, concentration on the present, changes in the perception of time, deep concentration, sense of control, and focus on achievement of objectives. For Westera (2018), by promoting immersion in activities, Serious Games establishes an intrinsic connection with Flow Theory, allowing students to focus deeply on tasks, becoming a fundamental motivator for learning, highlighting their potential as a tool for developing skills and engaging students in the educational process.

Step 3: Development

The third step recommended by Design Science Research, as described in the methodology, was carried out during the second half of 2022. The first half of 2023 at a Federal Institute of Education, Science, and Technology, located in the State of Rio Grande do Sul. a face-to-face collaborative pedagogical practice in which 67 participants participated. The flow of activities in all classes was standardized. Initially, searches were carried out in the Apple Store and Play Store application stores for a Serious Game in a mobile learning format that could cover, at least in part, the contents of the subject. It is noteworthy that this search was carried out openly by the students.

The students met face-to-face to search for Serious Games in the app stores. Each student was asked to list at least three and send them through a task on Moodle. A second face-to-face meeting was made available so that students could more carefully evaluate the characteristics of the Serious Games found and their relationship with the subject content.

During the third face-to-face meeting, there was a group discussion to determine the most appropriate Serious Game. A list of student-submitted Serious Games was compiled, and exclusion criteria were applied. The first exclusion criterion considered was language due to the lack of proficiency in foreign languages, such as English and Spanish, among the students. As a result of applying this criteria, only two Serious Games were selected in both semesters. This issue highlights the lack of alternatives at the national level to address accounting education applications (MIRANDA *et al*., 2013; VENDRAMIN *et al*., 2020).

Table 1 presents all Serious Games (in mobile learning format) found and their respective languages.

Table 1 – Serious Game, in mobile learning format, aimed at teaching accounting

Serious Game	Language
Debit and Credit	English
FEFE	English
OdinAnyWhereContabilidad	English
Contabilidad	Spanish
Simple	English
Learn Accounting	English
Addictive Accounting	English
Accounting Missiles	English
AccQuiz	English
RedFlag	English
Accounting Card Challenge	English
Accounting Challenge (ACE)	English
GameCont	Spanish
Quiz Contábil	Spanish

Source: Self elaboration.

The second exclusion criterion used was technical and gameplay quality, seeking to select a Serious Game that included the discipline's content and gamification elements. Quiz Contábil only replicated multiple-choice questions for the digital medium without any gamification element.

Given this, GameCont was selected, as it presented important points, such as rating ranking, rewards, goal setting, progress indication, and levels (SEOW; WONG, 2016).

To encourage students to progress through the levels of the selected Serious Game, a fourth in-person class was provided for the activity and applied in a work format so that all students reached a certain minimum level in the Serious Game. GameCont aims to allow students to practice their knowledge on fundamental accounting topics, more specifically and solely accounting records, through practical case simulations. It is noteworthy that GameCont does not cover all the content covered in the course but was selected from among the possible alternatives after applying the exclusion criteria.

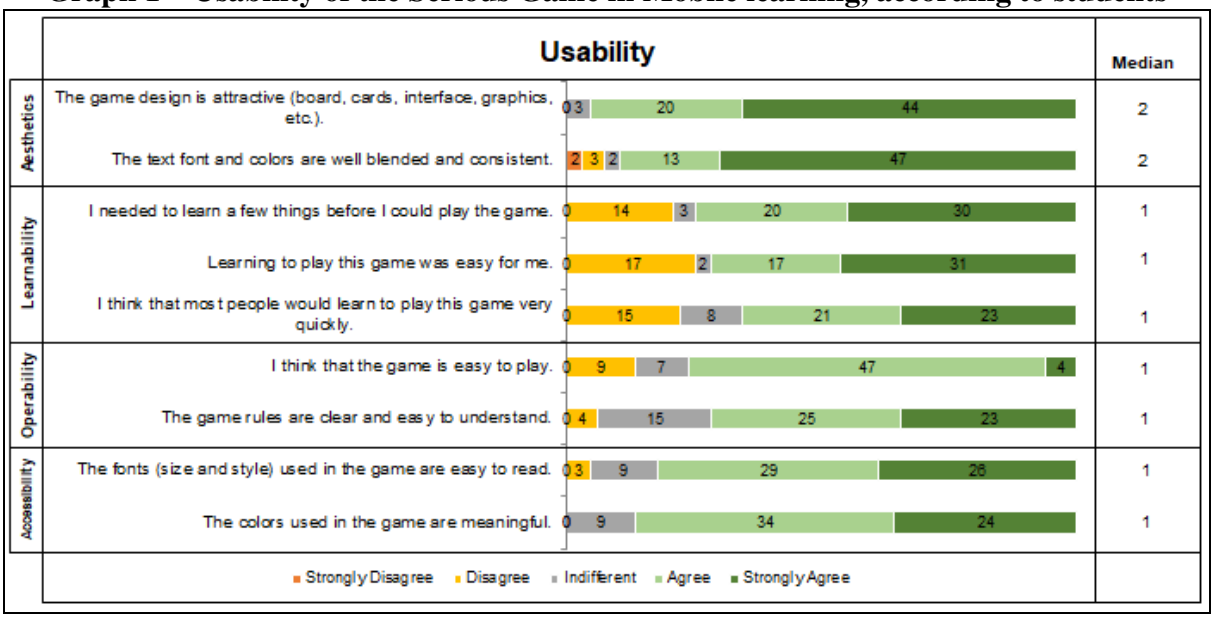
It is mentioned that after the students played GameCont, they carried out the Serious Game evaluation, as recommended by the methodology, through a questionnaire inserted in Google Forms.

Step 4: Evaluation

The evaluation model adopted in this study was the Model for the Evaluation of Educational Games (MEEGA+) developed by Petri, Von Wangenheim and Borgatto (2017). The application of MEEGA+ was carried out after using the Serious Game, allowing the analysis of the student's experience and the impact of the Serious Game on learning the subject.

In mobile learning, the Serious Game's usability is a determining factor (PETRI; VON WANGENHEIM; BORGATTO, 2017). Graph 1 describes the perception of usability of the analyzed Serious Game, according to the students.

Graph 1 – Usability of the Serious Game in Mobile learning, according to students



Source: Self elaboration. Adapted from Petri; Von Wangenheim; Borgatto (2017).

Medians were determined using the five-point Likert Scale, which ranges from -2 (indicating strong disagreement) to +2 (indicating strong agreement). In technical terms, the median represents the midpoint of the response values. In this study, the median regarding the aesthetics of Serious Game was 2, indicating that the respondents strongly agreed with this aspect, as illustrated in Graph 1.

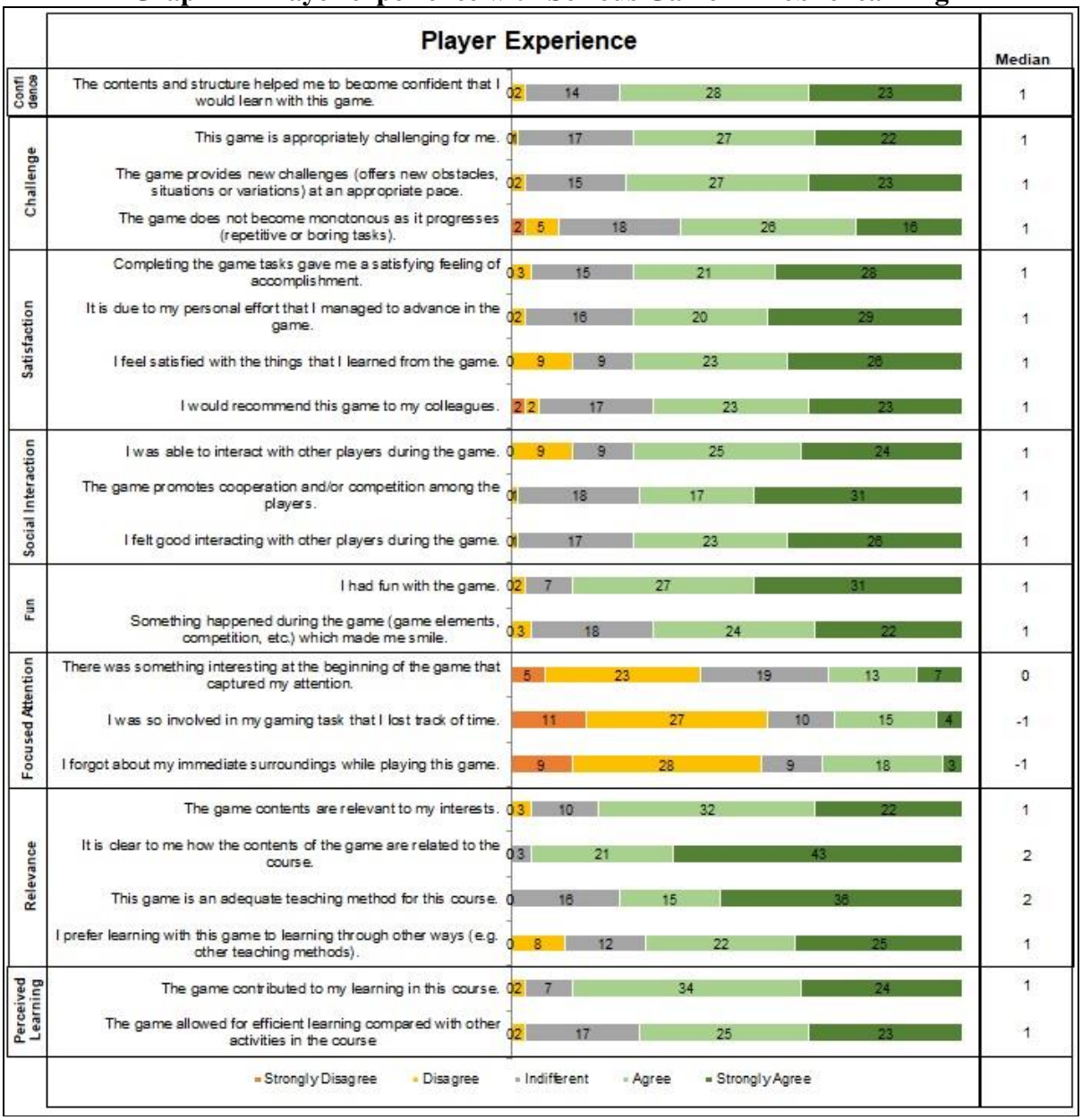
Regarding aesthetics, it is important to note that, in light of previous research, such as the study by Voshaar *et al*. (2023), aesthetics significantly improves student interaction with the game and contributes to their learning process.

The items related to operability and accessibility were evaluated satisfactorily, with a median of 1. However, learnability, that is, the ease of learning to play the Serious Game, even with a median of 1, was the aspect that raised the greatest number of negative evaluations, with responses indicating “disagree”. Specifically, the question “learning to play this game was easy for me” received the most unfavorable reviews, 17 in total.

It is noteworthy that, according to research by Petri, Von Wangenheim and Borgatto (2017), usability directly impacts the quality of the player's experience. Evaluating the quality of the player experience is approached through several dimensions. This study's dimensions encompass focused

attention, fun, challenge, social interaction, trust, relevance, satisfaction, and perceived learning. The results of this assessment in each of the dimensions are presented in Graph 2.

Graph 2 – Player experience with Serious Game in mobile learning



Source: Self elaboration.

In the general context, when considering the dimensions presented in Graph 2, it is possible to perceive the adequacy of the player's experience with the Serious Game under analysis since most questions obtained a median of 1 on a scale that varies from -2 to 2.

The player's confidence assessment demonstrated a positive assessment, with a median of 1, indicating that the rules were well-designed and were readily understood by the participants. However, it is important to highlight that only two participants disagreed, scoring -1.

From the perspective of Flow Theory, which defends the balance between the person's ability and the challenges presented by the activity, the analysis of Graph 2 reveals that the Serious Game provides an adequate balance between the student's technical ability and the challenges facing them. This is evident in the positive responses to the item “This game is adequately challenging for me”.

The Serious Game was considered challenging, obtaining a median of 1. However, criticism related to the possible monotony of the tasks, with eighteen neutral responses and seven negative responses, including two strong disagreements, especially concerning the item “The game does not become monotonous in their tasks”. This criticism can be attributed to the low variability of accounting entries (debits and credits). In the final part of the questionnaire, the following comments were made: “Diversify entries more” and “Accounting entries are repetitive”.

Participants demonstrated approval of the method used to reinforce teaching, with the majority expressing their intention to recommend Serious Game to colleagues. However, a small group of participants indicated that progress in Serious Game did not necessarily correspond to their effort, suggesting the possibility of adjustments to promote greater player engagement.

In the dimensions of social interaction and fun, both aspects received positive evaluations from participants, with a median of 1 for all items evaluated. The favorable response to the item “I had fun with the game” is worth highlighting, indicating that most participants enjoyed the experience. It is essential to highlight that social interaction occurred due to physical presence during the execution of the task and not through the Serious Game evaluated, which did not offer any means of communication between students.

The questions that generated the most significant criticism related to focused attention had a median of minus 1 in two of the three items. This criticism needs to be evaluated together with the item “The game does not become monotonous in its tasks”. According to research by Petri, Von Wangenheim and Borgatto (2017), when there is repetition, there is a tendency for attention to decrease. The question “Was there something at the beginning of the game that piqued my interest?” obtained a median of zero, indicating the indifference expressed by the students.

The relevance dimension deserves special emphasis. The question “Is it clear to me how the content of the game is related to the subject?” received a median of 2, which indicates the most positive evaluation given by students on a scale ranging from -2 (negative) to +2 (positive).

Within the context of relevance, the item “The game is a suitable teaching method for this subject” must be analyzed, which did not receive any negative evaluation. It is important to note that, based on this finding, a significant portion of students would be willing to accept the inclusion of the Serious Game in classes. However, it is essential to consider that other teaching methods also play an

important role and that Serious Game can complement them, not necessarily replace them as the only form of teaching.

The evaluation of potential improvements highlighted criticisms related to operational problems, such as crashes and interaction difficulties. However, the relevance of the Serious Game about the subject's content received a positive evaluation, with a median of 2 in the question about the clarity of the relationship between the game and the subject.

Open questions were included in the last part of the questionnaire, in which students could include additional comments. In addition to the criticisms mentioned throughout the analysis, it is important to highlight other comments from users, such as: “I never imagined an accounting game,” “I thought the teaching method used for learning was very good,” “I liked the way I understood the content throughout the levels” and “I enjoyed the opportunity to test my knowledge, I believe that learning through a game would be much more fun”.

Therefore, the evaluation results suggest accepting the Serious Game as an alternative to teaching and learning. Based on these findings, it is possible to identify some areas that can be improved in the Serious Game, such as focused attention and game mechanics, to make it more challenging and reduce task repetition.

The fifth and final step of Design Science Research is the conclusion covered in the “Final Considerations” topic. We aim to concatenate the results of this research with related studies and the Flow Theory itself.

FINAL REMARKS

In direct response to the problem question of this research, methodologically supported by Design Science Research and the Model for the Evaluation of Educational Games, it appears that participants positively evaluated the use of Serious Game in learning accounting content in mobile format learning.

Despite some criticism, the results indicate that the Serious Game is appropriate and well-received by students. Based on the data collected, positive results were observed about the player's experience in most of the dimensions evaluated. According to the students' perception, the main strengths include relevance, since the content of the Serious Game is aligned with the discipline, and the perception of learning, in which students highlight that the Serious Game contributes to understanding the subject.

This study reveals that students could not achieve the “Flow State,” a fundamental concept of Flow Theory, highlighting especially a negative evaluation concerning the focused attention item (sense of time), with a median of -1 on a scale from -2 to +2. This perception can be attributed to criticisms such as the repetition of tasks and glitches in Serious Game's operating system. This finding aligns with what Csikszentmihalyi (2014) advocates that distractions or excessive challenges can prevent the experience of the “State of Flow”.

This research's findings align with other studies that explore the intersection between Serious Games, mobile learning, accounting, and students' perception of learning. The results of the study by Kao, Yuan and Wang (2023) corroborate the effectiveness of game-based mobile learning in teaching, in addition to indicating that students responded positively to the experience of using mobile games in the accounting area.

In line with what the authors mentioned, the results of the study by Seow and Wong (2016) also demonstrate that most users evaluated the Serious Game “Accounting Challenge” favorably, indicating that the application was engaging and challenging. The study by Voshaar *et al*., (2023) showed that students who used the Serious Game obtained a significantly higher score in the final exam than users who did not use it.

There is a convergence between studies regarding the usefulness of Serious Games as an effective and engaging alternative for teaching accounting, providing a more attractive and motivating experience for students. It is mentioned that related studies were not anchored in a theoretical lens, such as Flow Theory. In this case, it is not possible to make a direct comparison.

This research makes three important contributions to the education literature. Firstly, the study adds new evidence about technological education students' acceptability of digital technologies. Secondly, no related research was identified at the national level, making it necessary to resort to foreign studies to compare results. Third, this study distinguishes itself from others because it is the only one that analyzes it in the light of a theoretical lens, in this case, the Flow Theory, going beyond the description of the case and results, as carried out in the studies already mentioned.

For future work, it is suggested to survey other educational institutions, aiming to continue, expand, and compare results. Another suggestion is the use of other theoretical lenses focused on technological education. There is also a lack of Serious Games, especially nationally. Therefore, there is an opportunity for new studies that cover other accounting disciplines (such as, for example, cost accounting and tax accounting). These considerations highlight opportunities for developing new studies covering Serious Games that can meet this neglected pedagogical demand.

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