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Navigating the World of Video Games for Self-Directed Learning: A Digital Pedagogy Approach

Jewell Ken V. Bañes, Sachiko R. Gubat, Kristine T. Soberano, and Jeffric S. Pisueňa

Graduate School Department, Northern Negros State College of Science and Technology, Old Sagay, Sagay City, Negros Occidental, Philippines

ABSTRACT: The popularity of video games has led to increased interest in exploring their potential for promoting self-directed learning, as they provide an immersive and engaging platform for learners to develop their skills and knowledge. To investigate the role of motivation and identify effective instructional strategies for promoting self-directed learning in the context of digital pedagogy, a survey was conducted with 70 video gamers, using four-item questions for self-directed learning, the Situational Motivation Scale, and open-ended questions. The Situational Motivation Scale was used to measure both intrinsic and extrinsic motivation, including four dimensions: intrinsic motivation, identified regulation, external regulation, and amotivation. Data analysis included descriptive statistics, ordinal logistic regression analysis, and thematic analysis to determine the effective instructional strategies. The survey results suggest that intrinsic and extrinsic motivation significantly impact self-directed learning in video games, with intrinsic motivation and identified regulation having a stronger positive impact than external regulation and amotivation. The effective instructional strategies identified were clear and concise instructions, feedback on performance, challenge to think creatively, incorporation of problem-solving and critical thinking elements, and fostering a sense of community. Furthermore, practical recommendations for educators were drawn from these strategies. The findings highlight the importance of considering different types of motivation when designing instructional strategies in digital learning environments and promoting intrinsic motivation in these settings.

KEYWORDS: Intrinsic motivation, extrinsic motivation, instructional strategies, video gaming, digital education.

1 INTRODUCTION

Video games have gained attention in education and have been studied for their potential to improve teaching and learning outcomes, such as engagement and motivation. Technological advancements and automation in the twenty-first century have significantly altered the way people learn and work, making self-directed learning more important [1] . This study intends to contribute to the field by investigating the effectiveness of video games as a pedagogical tool, with an emphasis on digital pedagogy and the use of video games to improve teaching and learning.

With the increasing pace of change in today's world, traditional teacher-directed learning models may not be sufficient to prepare students for the challenges they will face. Therefore, students need to become more self-directed in their learning so that they can adapt to changing circumstances and continue to learn throughout their lives [2] . Furthermore, studies found that students who enjoyed themselves while learning made considerable advances in their learning capacity, and memory retention was determined to be more successful than the traditional technique of learning [3] .

The field of education has been exploring the potential of video games as a tool for enhancing learning outcomes, but there is still a gap in identifying effective instructional strategies that can promote self-directed learning. Toh and Kirschner [1] in their study, identified a set of self-directed learning strategies in video games that are a useful basis for adoption in the pedagogical domain. This solely concentrates on the aspect of acquiring learning and fails to address the instructional aspect. Moreover, there has been limited investigation into how intrinsic and extrinsic motivation affect learning through video games. By exploring the intersection of video games, self-directed learning, and motivation, this research can provide valuable insights

for educators and instructional designers. Ultimately, this research can contribute to the advancement of digital pedagogy approaches that can help prepare students for the challenges of the 21st century. This paper is structured around three research questions:

RQ1: What is the relative impact of intrinsic and extrinsic motivation on self-directed learning in video games?

RQ2: What instructional strategies are most effective for promoting self-directed learning in video games?

RQ3: How can these instructional strategies be implemented in digital pedagogy?

1.1 VIDEO GAMES IN DIGITAL PEDAGOGY

The practice of using technology to improve teaching and learning is known as digital pedagogy [4]. As technological advancements and automation continue to reshape the learning and working landscape, self-directed learning has become increasingly important. However, the identification of effective instructional strategies and understanding the role of intrinsic and extrinsic motivation in video game-based learning remain significant gaps in the existing literature. This research aims to investigate the impacts of video games in promoting self-directed learning and its implications for digital pedagogy. The study seeks to provide insights to contribute to the ongoing discourse on the use of video games in education.

Video games have been used in digital pedagogy to enhance student learning in various subject areas, including mathematics, further indicating that mathematics video games contributed to higher learning gains as compared with traditional instructional methods [4] . Studies have shown that game-based learning in education significantly improves students' engagement, interest, and motivation, as well as the quality of learning. However, the long-term impacts and reliability of digital gamification in education require further investigation [5] .

Recent studies indicated that employing game-based learning in digital pedagogy has been shown to enhance student engagement and motivation. Furthermore, game-based learning environments allow students the freedom to navigate a space to interact with game elements that foster learning [6] . Moreover, the integration of games into online learning has been found to have a significantly positive effect on student learning outcomes, as demonstrated by pre-test and post-test results indicating a significant increase in learning outcome scores [7] .

1.2 STUDENT ENGAGEMENT, MOTIVATION AND SELF-DIRECTED GAME-BASED LEARNING

Motivation is a crucial factor that drives individuals to engage in activities [4] . In the field of education, motivation is classified into two types: intrinsic motivation, which stems from personal interests and enjoyment, and extrinsic motivation, which comes from external factors such as rewards and punishments [5] . Several research studies have investigated diverse approaches to encourage student engagement in educational settings, but deploying active learning techniques does not necessarily guarantee motivation for learning among students [4] . Video games have been increasingly used in digital pedagogy as a means of enhancing student engagement and motivation. Eseryel et al. [6] conducted a study that demonstrated that complex problem-solving challenges within video games led to a boost in student motivation and engagement. Their research evaluated grade nine students' complex problem-solving abilities and level of engagement during the game McLarin's Adventure to arrive at this conclusion. Furthermore, Sung et al. [7] discovered that utilizing the experiential gaming mode led to increased levels of intrinsic motivation, deeper comprehension of learning strategies, and greater acceptance of learning technology when compared to the conventional technology-enhanced learning approach.

There is a growing body of research that suggests video games can be a powerful tool for promoting self-directed learning, as they are designed to integrate both intrinsic and extrinsic motivational components, which can help to cultivate an environment where players feel more motivated to engage in the target activities [8] . Hawlitschek and Joeckel [9] emphasized the importance of self-efficacy, autonomy, and social environment in fostering intrinsic motivation. These factors are relevant to the current study's focus on self-directed learning. Intrinsic motivation is one of the key factors that drive players to engage with video games. Autonomy and relatedness are some of the basic components of intrinsic motivation, and they are also features that are commonly found in video games [10] . For example, many games allow players to choose their path through the game world, giving them a sense of autonomy and control over their experience. Additionally, games often feature social elements such as multiplayer modes, which can foster a sense of relatedness and connection among players.

By integrating these intrinsic motivational components into the gameplay experience, games can tap into players' natural desires to learn and explore. This can make games a highly effective tool for promoting self-directed learning, as players are motivated to engage with the content on their terms, rather than being forced to learn through rote memorization or other more traditional teaching methods [1] . Research has shown that video games can be particularly effective at promoting self-

directed learning in several different domains. For example, games have been used to teach everything from math and science to language and history [11] . By presenting information in a fun and engaging way, games can help to capture players' attention and hold their interest for longer periods. This, in turn, can help to facilitate the process of learning and make it more enjoyable and rewarding for players.

Overall, the integration of intrinsic and extrinsic motivational components in video games, along with the emphasis on autonomy and relatedness, make games an effective tool for promoting self-directed learning. As such, there is a growing interest in using games as a means of enhancing educational outcomes and fostering a love of learning among students of all ages [12], [13] .

2 METHODOLOGY

2.1 RESEARCH DESIGN

This study utilized a mixed-methods research approach. Mixed methods research involved utilizing both qualitative and quantitative methodologies within the same study, with an emphasis on combining and integrating these methods [14] . The mixed-methods approach would allow for a more comprehensive understanding of the research question, by combining quantitative data on motivation and learning outcomes with qualitative data on participants' experiences and perspectives.

2.2 PARTICIPANTS

In this study, participants were acquired through purposive sampling with an age range of 18 to 34 years old. These demographic characteristics were taken into account since 70% of individuals who engage in video game activities are 18 years or older, and the mean age of individuals who participate in gaming is 34 years old [15] .

2.3 QUESTIONNAIRE

The survey for this research was divided into four parts. The first part asked for demographic information about the participants, while the second part included a four-item survey questionnaire using a 7-point Likert Scale to evaluate self-directed learning in video games. The third part of the survey used the Situational Motivation Scale (SIMS) to measure the influence of intrinsic and extrinsic motivation on self-directed learning in video games. Finally, the last part of the survey included open-ended questions to identify instructional strategies that effectively promote self-directed learning in video games. The researchers employed the Situational Motivation Scale (SIMS) because it is an established and validated way to assess the level of motivation in a given situation [16], [17] . The SIMS is an assessment instrument comprising 16 questions that aims to evaluate a person's level of self-motivation when deciding to engage in an activity. It generates scores for different types of motivation, such as intrinsic motivation (Items 1, 5, 9, 13), identified regulation (Items 2, 6, 10, 14), external regulation (Items 3, 7, 11, 15), and amotivation (Items 4, 8, 12, 16) [16] .

2.4 DATA COLLECTION AND ANALYSIS

To answer RQ1, the researchers collected data from a sample of video game players and used descriptive statistics and ordinal regression analysis to examine the relationship between motivation and self-directed learning. In addition, the researchers also explored the instructional strategies that are most effective for promoting self-directed learning in video games. To answer RQ2, the researchers conducted a thematic analysis of data collected from interviews with video game players, with a focus on identifying the strategies and features of video games that promote self-directed learning. Lastly, to provide practical recommendations for educators and game designers, the study derived on the findings from the first two research questions to create a comprehensive answer to RQ3, offering specific examples of how the identified effective strategies and features of video games can be incorporated into digital learning environments.

3 RESULTS

Table 1 shows the descriptive statistics for the study variables. The sample size was n=70, with a mean age of 22.79 years (SD=2.89). These participants were acquired through a purposive sampling technique who are playing video games. Approximately 48.6% of the participants were male and 51.4% were females. The majority of the participants reported high levels of intrinsic motivation (M=5.95, SD=0.95) followed by identified regulation (M=5.56, SD=1.04), amotivation (M=2.93, SD=1.36), and external regulation (M=2.74, SD=1.27). In terms of self-directed learning, the mean score was 5.62 (SD=1.04).

Table 1. Descriptive Statistics for Study Variables

	Mean	Std. Error	Std. Deviation	Minimum	Maximum	Skewness	Kurtosis
SDL	5.6179	.12427	1.03972	2.00	7.00	-.976	1.279
IM	5.9536	.11401	.95391	3.00	7.00	-1.071	.692
IR	5.5571	.12411	1.03837	2.50	7.00	-.791	.376
ER	2.7429	.15151	1.26761	1.00	7.00	1.592	1.046
AM	2.9250	.16226	1.35758	1.00	7.00	1.058	1.046

To investigate the relative impact of intrinsic and extrinsic motivation on self-directed learning in video games, the researchers conducted an ordinal logistic regression analysis using the SPSS software (version 25). The researchers further used self-directed learning as the dependent variable and intrinsic motivation, identified regulation, external regulation, and amotivation as the independent variables. The results of the ordinal logistic regression analysis are presented in Table 2.

Table 2. Results of Ordinal Logistic Regression Analysis

	B	Std. Error	Wald Chi-Square	df	Sig.	Exp (B)	95% Wald CI for Exp (B)
IM	.489	.2452	3.971	1	.046	1.630	(1.008, 2.636)
IR	.853	.2378	12.862	1	<.001	2.347	(1.472, 3.740)
ER	-.260	.2077	1.567	1	.211	.771	(.513, 1.158)
AM	-.048	.1800	.072	1	.788	.953	(.670, 1.356)

The results of the ordinal logistic regression analysis indicate that intrinsic motivation (IM) and identified regulation (IR) are significant predictors of self-directed learning in video games (Wald Chi-Square = 3.97, df = 1, p = 0.046 for intrinsic motivation; Wald Chi-Square = 12.86, df = 1, p < 0.001 for identified regulation), for external regulation and amotivation, (Wald Chi-Square = 1.567, df = 1, p = 0.211; Wald Chi-Square = 0.72, df = 1, p = 0.788). While the coefficients for external regulation (ER) and amotivation (AM) were both negative (-0.260 and -0.48, respectively), their non-significant p-values of 0.211 and 0.788 suggest that there may be other unmeasured factors that could be influencing it, which should be considered a limitation of this study. For the odds ratio indicated as Exp (B) or the exponential value of the coefficient, the results were 1.63 for intrinsic motivation (IM); 2.35 for identified regulation (IR); 0.77 for external regulation (ER), and 0.953 for amotivation (AM), holding the other variables constant.

Table 3. Determined Effective Instructional Strategies Promoting Self-Directed Learning in Video Games

No.	Effective Instructional Strategies
1	Clear and concise instructions
2	Feedback on performance
3	Challenge to think creatively
4	Incorporation of problem-solving and critical thinking elements
5	Fostering a sense of community

Table 3 presents the effective instructional strategies for promoting self-directed learning in video games that were identified through thematic analysis. The identified themes are clear and concise instructions, feedback on performance, challenge to think creatively, incorporation of problem-solving and critical thinking elements, and fostering a sense of community. These strategies can help learners develop the skills and knowledge necessary to become self-directed learners in the context of video games. Each theme will be discussed in further detail in the following sections.

4 DISCUSSION

4.1 RELATIVE IMPACTS OF INTRINSIC AND EXTRINSIC MOTIVATION ON SELF-DIRECTED LEARNING IN VIDEO GAMES

Based from the results and findings presented earlier, the odds ratio of intrinsic motivation and identified regulation indicates that for every one-unit increase in intrinsic motivation and identified regulation is associated with 1.63 times and 2.35 higher odds of a higher level of self-directed learning respectively. Specifically, intrinsic motivation and identified

regulation was found to have a significantly stronger positive impact on self-directed learning than external regulation and amotivation. These findings are consistent with previous research on motivation and learning in video games, which has suggested that intrinsic motivation is a key factor in promoting self-directed learning and engagement in video games [10] .

On the other hand, the odds ratios for external regulation and amotivation were 0.771 and 0.953, respectively, based on the ordinal logistic regression analysis. These results suggest that for every one-unit increase in external regulation or amotivation, the odds of self-directed learning in video games decreased by approximately 23% and 5%, respectively. These findings provide evidence for the negative impact of external regulation and amotivation on self-directed learning in video games, and may be useful in designing instructional strategies that promote intrinsic motivation and reduce external regulation and amotivation in digital pedagogy. However, it is important to consider the limitations of this study, including potential unmeasured confounding variables, and further research is needed to fully understand the relationship between motivation and self-directed learning in video games.

4.2 Effective Instructional Strategies For Promoting Self-Directed Learning In Video Games And Practical Recommendations For Implementation

4.2.1 Clear And Concise Instructions

Clear and concise instructions are essential in video games to encourage self-directed learning. According to research [18] , players must understand their objectives and how to achieve them. Without clear guidance, players may become confused and uncertain, leading to frustration and disinterest. Games that offer tutorials, pop-up windows, or tooltips with precise instructions can help players understand game mechanics and how to progress, which promotes self-directed learning.

To create effective activities or educational materials, researchers suggest that teachers provide easy-to-follow, step-by-step instructions using clear language that avoids technical jargon that may be unfamiliar to learners. Teachers should also consider including visual aids like screenshots or videos to help learners better understand the instructions.

4.2.2 Feedback On Performance

Providing feedback on performance is an effective instructional strategy for promoting self-directed learning in video games [19] . Players require feedback to understand how well they are doing and what they need to improve. In-game statistics, progress bars, or visual and auditory cues [20] can provide players with valuable information to identify their strengths and weaknesses and adjust their gameplay accordingly. Games that provide frequent and informative feedback can keep players engaged and motivated as they track their progress and improvement over time.

To promote self-directed learning, the researchers suggest that teachers should offer regular and timely feedback on learners' performance. This can be done through automated feedback systems, such as in-game feedback or online quizzes, or through manual feedback given by instructors or peers. Feedback should be specific and actionable, highlighting areas for improvement and providing suggestions on how learners can improve their performance.

4.2.3 Challenge To Think Creatively

Video games that challenge players to think creatively can foster self-directed learning by encouraging players to explore and experiment with different strategies and approaches [18] . This autonomy and initiative can help players develop problem-solving skills and critical thinking abilities. Games that provide multiple pathways or solutions to problems can also promote self-directed learning, as players are encouraged to find their own unique solutions.

To encourage self-directed learning, teachers should establish a means to foster creative thinking and problem-solving skills in learners. This can be achieved by presenting learners with open-ended problems or scenarios that require creative solutions. Encouraging learners to experiment with different approaches and share their ideas with others can also be beneficial.

4.2.4 Incorporation Of Problem-Solving And Critical Thinking Elements

Incorporating problem-solving and critical thinking elements into games can promote self-directed learning by encouraging players to think strategically and analytically [9] , [18] . Games that require players to solve puzzles or navigate complex environments can help them develop these skills. Additionally, games that allow players to experiment with different strategies or tactics can help foster a sense of agency and autonomy.

Teachers can design learning activities that encourage learners to think critically and solve problems. This can be accomplished by incorporating elements such as puzzles, quizzes, and decision-making scenarios. Teachers can also provide learners with opportunities to reflect on their problem-solving process and evaluate the effectiveness of their solutions.

4.2.5 FOSTERING A SENSE OF COMMUNITY

Finally, fostering a sense of community can be an effective instructional strategy for promoting self-directed learning in video games [21] . Games that create opportunities for players to interact and collaborate can promote a sense of social support and shared learning [22] . This can help players feel more engaged and motivated, as they are part of a larger community that shares their interests and goals. Games that incorporate multiplayer modes or online forums can help foster this sense of community and encourage players to learn from each other.

To promote self-directed learning, teachers can create opportunities for learners to connect and collaborate with others. This can be achieved by incorporating discussion forums, group projects, and team-based activities. Teachers can encourage learners to share their ideas and experiences with others, and provide opportunities for peer feedback and support. Creating a social learning environment where learners can build relationships with each other and feel a sense of belonging can also be beneficial.

5 CONCLUSION

In conclusion, this study investigated the relative impact of intrinsic and extrinsic motivation on self-directed learning in video games, identified the effective instructional strategies for promoting self-directed learning in video games as well as practical recommendations for educators regarding the implementation of those strategies in digital learning environments. This study surveyed 70 video gamers using the Situational Motivation Scale designed based on Self-determination theory as well as open-ended questions, and the following inferences was drawn:

- It was found that intrinsic motivation and identified regulation were strong positive predictors of self-directed learning in video games (Exp (B) = 1.63 for intrinsic motivation (IM); Exp (B) = 2.35 for identified regulation). On the other hand, external regulation and amotivation were found to be negative predictors of self-directed learning (Exp (B) = 0.771 for external regulation (ER); Exp (B) = 0.953 for amotivation). These findings suggest that instructional strategies that promote intrinsic motivation and identified regulation may be effective in enhancing self-directed learning in video games. However, the negative impact of external regulation and amotivation on self-directed learning also highlights the need to reduce or eliminate external control factors in digital pedagogy. Nonetheless, it is important to note that further studies are needed to explore the underlying factors that may be influencing these relationships
- The identified effective instructional strategies for promoting self-directed learning in video games were determined through thematic analysis of the data. The themes that emerged were clear and concise instructions, feedback on performance, challenge to think creatively, incorporation of problem-solving and critical thinking elements, and fostering a sense of community. These strategies can be implemented by game designers and educators to create an environment that promotes self-directed learning and enhances players' motivation and engagement in video games. By providing clear instructions, meaningful feedback, and opportunities for creativity and problem-solving, players can develop their skills and knowledge in a self-directed manner. Moreover, fostering a sense of community and promoting collaboration and teamwork can enhance social learning and contribute to a more engaging and enjoyable experience
- In digital pedagogy contexts, it is essential to use effective instructional strategies. The identified strategies include providing clear and concise instructions, offering feedback on performance, challenging learners to think creatively, incorporating problem-solving and critical thinking elements, and fostering a sense of community. Clear instructions should be provided in an easily understandable manner, and feedback should be prompt and specific to encourage learners to improve their performance. Creative thinking can be encouraged by presenting open-ended problems and scenarios that require out-of-the-box solutions. Incorporating problem-solving and critical thinking elements can be achieved by including puzzles, quizzes, and decision-making scenarios. Finally, fostering a sense of community can be achieved by creating opportunities for learners to connect and collaborate with each other through discussion forums, group projects, and team-based activities. By implementing these instructional strategies, self-directed learning can be effectively promoted in digital pedagogy. It is also worth considering incorporating game mechanics that promote motivation and self-directed learning can enhance learners' engagement and promote self-directed learning. Rewards and incentives can motivate learners by providing tangible benefits for completing learning activities or achieving certain milestones. Competition and ranking can create a sense of achievement and motivation to improve. Collaboration and teamwork can create a sense of community

and promote social learning, fostering important skills such as communication and leadership which are valuable in both digital and real-world contexts

6 LIMITATIONS AND FUTURE RESEARCH

One limitation of this study is the small sample size of only 70 video gamers, which may limit the generalizability of the findings. Another limitation is that the study only focused on intrinsic and extrinsic motivation using the Situational Motivation Scale and did not explore other potential factors that could impact self-directed learning in video games.

Future research could expand on this study by using a larger and more diverse sample size to increase the generalizability of the findings. Additionally, future studies should explore other factors that could influence self-directed learning in video games, such as cognitive and affective factors. It is also important to investigate potential unmeasured confounding variables to fully understand the relationship between motivation and self-directed learning in video games.

Furthermore, this study highlights the need to reduce or eliminate external control factors in digital pedagogy to enhance self-directed learning in video games. Future research should investigate the most effective strategies for reducing external control factors and promoting intrinsic motivation and identified regulation in digital pedagogy.

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