The Development of an Educational Game in Supporting Motivation among Special Needs Learners

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ABSTRACT - The integration of educational games in special education has gained increasing attention due to their potential to enhance learner motivation, engagement, and inclusivity. However, existing research remains limited in its focus on the development of educational games explicitly designed for special needs learners. This study aims to develop an educational game that supports the motivation of slow learners by integrating motivational theory. Based on the ADDIE instructional design model (Analysis, Design, Development, Implementation, and Evaluation), the educational game entitled Pico Party Adventure was developed and implemented with slow learner students in a primary School. Data were collected through teacher discussion sessions, informal interviews, and gameplay testing to examine learners' motivational responses. The findings indicate that the developed game effectively supports learners' motivation and engagement, while also contributing to improvements in basic learning outcomes, including reading, understanding, recognizing, and classifying everyday objects. This study highlights the potential of motivation-oriented educational games as an inclusive learning approach for slow learners and provides design insights for the development of educational games in special education contexts. Future research is recommended to explore the long-term impact of such games and to establish best practices for their integration across diverse educational settings

INTRODUCTION

Educational games have been increasingly adopted as an alternative instructional approach to support learning across various educational levels. Previous studies have shown that educational games can facilitate learner engagement and support cognitive processes such as problem-solving and knowledge retention by incorporating interactive elements including feedback, challenges, and learner participation (Xiong et al., 2022; Tamosevicius, 2022). Compared to conventional instructional approaches, educational games offer more flexible learning experiences and can be adapted to suit diverse learner needs. The integration of digital technologies further enables differentiated learning, allowing learners to progress according to their own pace and capabilities (Major et al., 2021).

In special education contexts, educational games have been increasingly recognised as supportive learning tools that align with inclusive education practices. Learners with special needs, particularly slow learners, often experience difficulties related to attention, motivation, and information processing when engaged in traditional classroom instruction. Educational games offer structured yet flexible learning environments through the use of visual supports, interactive mechanics, and repeated practice opportunities. These features may contribute to improved learner focus, motivation, and participation, while providing a more accessible learning environment compared to conventional methods. In addition, educational games can facilitate peer interaction and collaborative learning, which are important aspects of inclusive educational settings.

Motivation is a key factor influencing learners' engagement and persistence in learning activities. Motivational theory provides a conceptual framework for understanding the factors that encourage learners to initiate and sustain learning behaviours. Intrinsic motivation refers to engagement driven by interest and enjoyment, whereas extrinsic motivation is influenced by external reinforcement such as rewards or recognition. Several motivational theories, including Self-Determination Theory, Expectancy-Value Theory, and Goal Theory, have been widely applied in educational research to explain learner engagement and learning outcomes. These theories highlight the importance of autonomy, competence, and goal clarity, which are relevant considerations in the design of educational games. Game-based learning environments naturally incorporate such motivational elements through structured challenges, feedback mechanisms, and progression systems.

Empirical studies have reported positive associations between the use of educational games and learner engagement. Cheung and Ng (2021) found that educational games can support learner engagement and understanding by introducing interactive and enjoyable learning experiences. Their study emphasised the importance of aligning game mechanics with instructional objectives and providing timely feedback to support learning. Similarly, Urhahne and Wijnia (2023) reviewed motivational theories in educational settings and concluded that learner motivation plays an important role in influencing learning engagement and outcomes. Their findings suggest that the application of motivational principles can enhance the effectiveness of instructional strategies, including educational games.

Research related to inclusive education has further indicated the potential of educational games in supporting learners with special needs. Yuan (2023) reported that educational games provide flexible learning opportunities that can accommodate individual learning differences, thereby supporting the inclusion of special needs learners in mainstream educational environments. The study also highlighted that educational games may encourage social interaction and participation, which are important for the socio-emotional development of learners with special needs. However, the effective implementation of educational games requires careful consideration of learner characteristics, instructional goals, and design features.

Although existing studies have demonstrated the potential of educational games in supporting learner engagement and motivation, there remains a limited body of research focusing on the systematic development of educational games that are specifically designed to address the motivational needs of special needs learners, particularly slow learners. Most prior research has concentrated on evaluating outcomes rather than examining development processes informed by motivational theory and inclusive design principles. Therefore, this study is conducted to address this gap by developing an educational game entitled 'Pico Party Adventure' that integrates motivational theory to support the learning needs of slow learners. The findings of this study are expected to contribute to the field of game-based learning

by providing design-oriented insights for educational game development. Furthermore, the study has implications for inclusive education by demonstrating how game-based learning can be utilised as a supportive instructional approach to promote equitable access, learner participation, and meaningful learning experiences for special needs learners.

METHODOLOGY

Pico Party Adventure is a recognition-oriented game and its purpose is for learning. This is through applying the three most prominent game genres, namely puzzle, 2D platformed, and educational games. The target audience is children who are slow learners, as it aims to create an endearing yet nurturing learning environment. This study adopts the ADDIE model as shown in Figure 1 to guide the development of Pico Party Adventure, ensuring that the educational game undergoes structured analysis, design, development, implementation, and evaluation processes to address the learning needs of special needs learners and to support their motivation during learning activity.
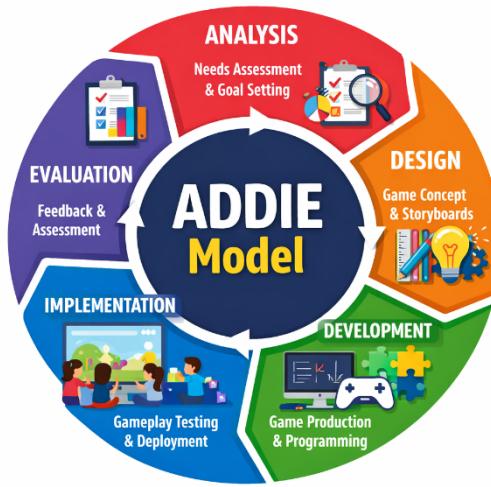

Figure 1. Development process adopt by ADDIE model

Analysis Phase

At this phase, data and information related to the game were collected through brainstorming sessions and informal interviews with special needs school teachers. These activities were conducted to inform the selection of a suitable game-based learning topic for special needs students. Additional insights were obtained through the review of YouTube videos, articles, and relevant research studies, which indicated that traditional teaching methods tended to reduce engagement among some students, while game-based approaches generated greater interest. Based on these findings, the target audience was identified as slow learner students aged seven years old. The primary objective of the game was defined as supporting learners in reading, understanding, recognising, and classifying common daily objects. Accordingly, the game ideation for Pico Party Adventure was designed as shown in Figure 2. A narrative for the main character, Pico, was outlined following group discussions, and appropriate development tools were selected. The game was designed to be challenging, engaging, and interactive, incorporating explicit rules, penalties, and rewards. To enhance enjoyment, enemies were included, and the gameplay was designed to be simple and user-friendly.

Figure 2. Pico Party Adventure's ideation concept using game design canvas

Design Phase

Based on the ideation visualized using game design canvas, a flowchart stated in Figure 3 has been designed to represent how the game would play out with scenes and the story of Pico Party Adventure. Draw.io was used to plot out this flowchart, and then detailed storyboards were drawn for every part and every level of the game. These visual aids were paramount in serving as the key to understanding the characteristics and features of the game. The background of the game and interface were developed using Adobe Photoshop to create an environment that suits the game theme and for special needs children.
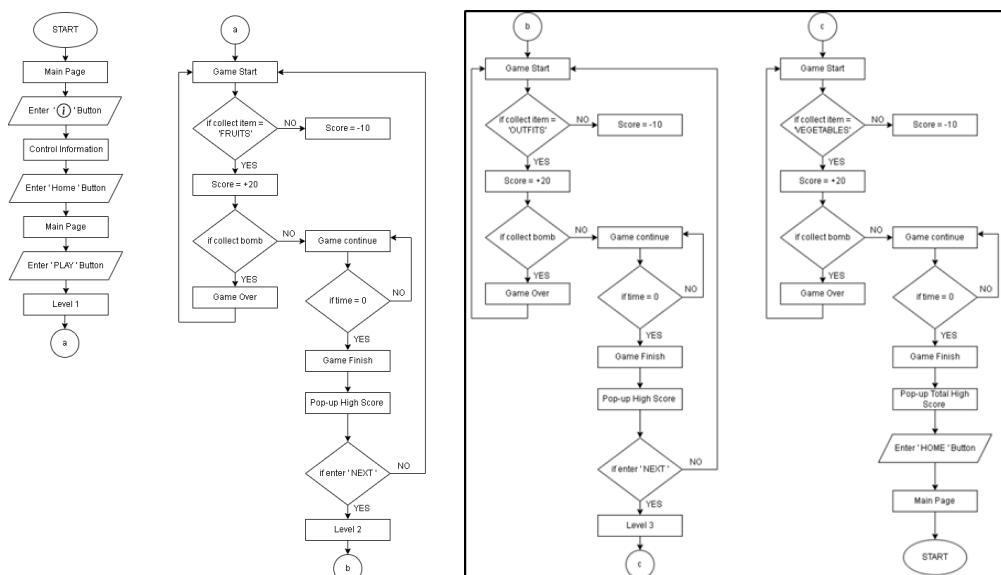

Figure 3. Pico Party Adventure's flowchart

Development Phase

Pico Party Adventure was developed using the Scratch application as shown in Figure 4. The development process began with the implementation of functional interface buttons, followed by the use of Scratch's default Pico character and various everyday objects as in-game assets. A range of built-in audio effects, including collection and explosion sounds, were incorporated to enhance the overall gameplay experience. Development activities primarily focused on block-based coding and the construction of game scenes and characters to support the achievement of the game's instructional objectives. Engaging and visually appealing environments were designed to facilitate learning, with the character Pico serving as a guide throughout the gameplay to maintain an educational yet enjoyable experience. All game elements were carefully considered to align with the instructional objectives and to promote player immersion. The game was designed to be accessed via a laptop due to its file size and interface requirements, and access does not require a user account. For students who were unfamiliar with laptop usage, a tutorial video was provided to support gameplay navigation and interaction.
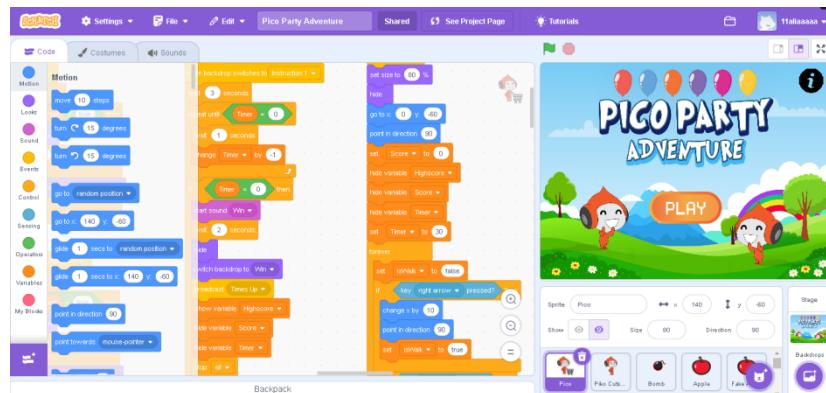
Figure 4. The development of the Pico Party Adventure using Scratch application

Implementation Phase

Pico Party Adventure game was implemented as part of a classroom-based learning session involving primary school students with special needs. The game was accessed either through installation on personal computers or via an online link, as facilitated by the teachers. Before the gameplay session, teachers conducted brief introductory and brainstorming activities to familiarise students with the learning objectives and gameplay context. Students then engaged with the game for approximately 15 to 30 minutes as a structured learning activity as shown in Figure 5. Following the session, students' learning experiences were gathered through guided reflection facilitated by the teachers.

Figure 5. Gameplay session in a classroom setting

Evaluation Phase

Upon completion of the gameplay session, feedback was collected from 10 slow learner students to examine the extent to which the game achieved its educational objectives. Learner engagement and responses were examined through survey, and students were invited to share their perceptions regarding aspects of the game they found engaging, challenging, or beneficial to their learning. The evaluation aimed to determine whether the game supported enjoyable, meaningful, and engaging learning experiences, particularly in helping students to recognise and categorise everyday objects. To further examine learners' motivational experiences, the Player Experience of Need Satisfaction (PENS) model was employed as an evaluative framework. A questionnaire consisting of 21 items was administered to the students at the end of the gameplay session (Hulaj et al., 2020). While some students were able to complete the questionnaire independently, assistance from teachers was provided to students who required additional support.

RESULTS AND DISCUSSION

The results of the Pico Party Adventure testing were analysed based on five motivational constructs derived from the Player Experience of Need Satisfaction (PENS) model, namely competency, autonomy, relatedness, immersiveness, and intuitive control. Students' responses were categorised into three levels ("No", "Maybe", and "Yes") to reflect their perceived experiences during gameplay.

Competency

The competency results demonstrate that most students perceived themselves as capable and motivated while engaging with the game, as shown in Figure 6. High "Yes" responses were recorded across all competency items, particularly for feeling motivated when completing tasks and overcoming challenges in the game. A small number of students fell within the "Maybe" and "No" categories, indicating some variation in perceived skill mastery. These findings suggest that while the game effectively supports feelings of competence for most learners, differentiated scaffolding may be required for students who experience uncertainty or difficulty during gameplay.


Item	Statement
C1	I feel motivated to learn when I feel skilled in the game.
C2	My confidence in learning increases when I succeed in the game.
C3	Challenges in the game motivate me to improve my learning.
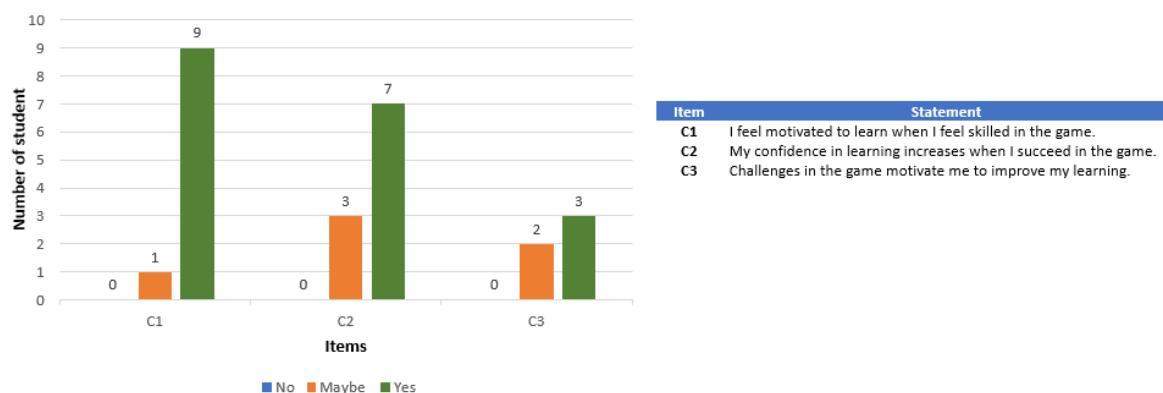
Figure 6. Students' competency while playing the Pico Party Adventure game

Autonomy

Results for autonomy as shown in Figure 7revealed consistently positive responses, with no students indicating a complete lack of autonomy. Most students agreed that their motivation increased when they were able to make choices and explore different learning approaches within the game. A small proportion of "Maybe" responses suggests that some learners may require clearer guidance or additional opportunities for decision-making. Overall, the findings indicate that the game design successfully supported learner autonomy, which is a key factor in sustaining motivation.

Figure 7. Students' autonomy while playing the Pico Party Adventure game

Relatedness

The relatedness construct also received favourable responses, with most students reporting a sense of connection while playing the game, as shown in Figure 8. Students generally agreed that building relationships and interacting with others during gameplay contributed positively to their motivation. Although a small number of students reported uncertainty or lower levels of relatedness, the overall distribution suggests that the game environment supported social engagement and a sense of belonging, which are particularly important in inclusive learning contexts.
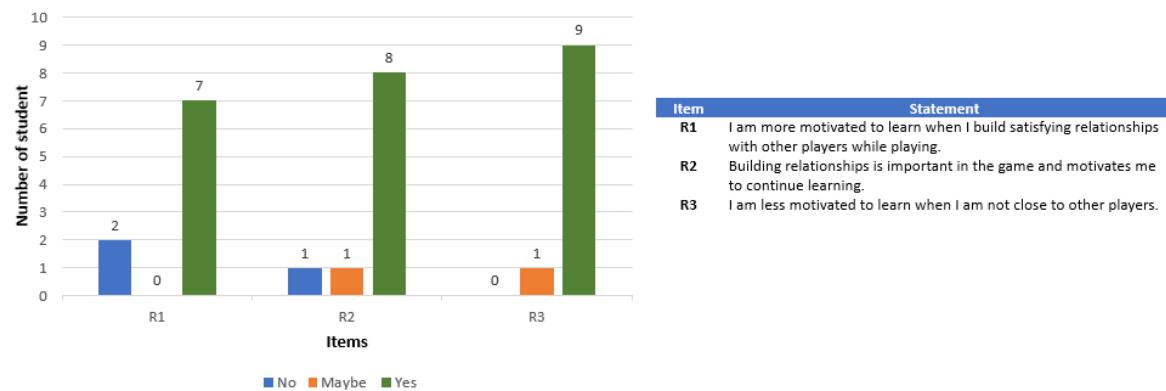
Figure 8. Students feel related while playing the Pico Party Adventure game

Immersiveness

The immersiveness results showed in Figure 9 strong affirmative responses across all items. Most students reported feeling emotionally engaged and connected to the game world, with the majority indicating that immersive elements motivated them to continue learning. Only a small proportion of students expressed uncertainty or negative responses. The consistency of positive responses across all immersiveness items suggests that the narrative, visual design, and interactive elements of Pico Party Adventure contributed to a meaningful and engaging learning experience.
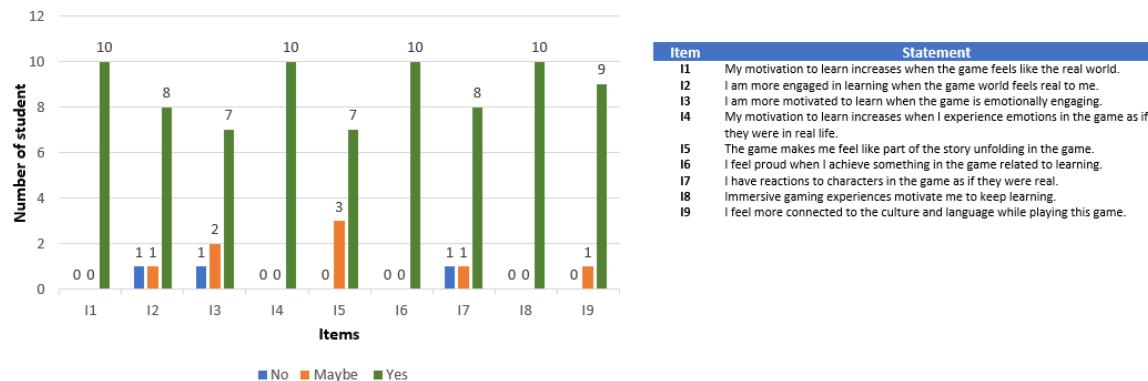
Figure 9. Students feel immersive while playing the Pico Party Adventure game

Intuitive Control

The findings related to intuitive control were the most positive among all constructs as shown in Figure 10. Almost all students agreed that the game controls were easy to learn, intuitive, and easy to remember. The absence of "No" responses and the minimal presence of "Maybe" responses indicate that the control design was accessible and appropriate for the target group. This suggests that the simplicity of the control scheme supported learner engagement by reducing cognitive and technical barriers during gameplay**.**
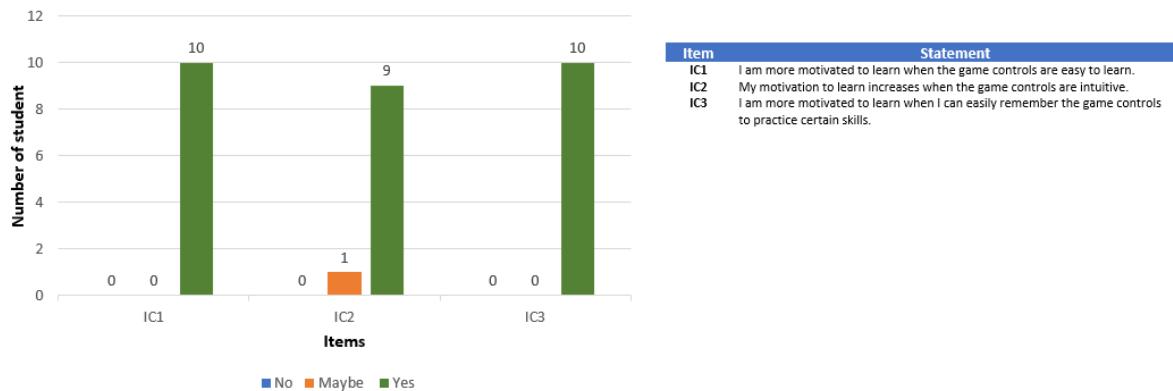
Figure 10. Students intuitive control while playing the Pico Party Adventure game

The findings on Pico Party Adventure game demonstrate that educational games can significantly enhance learning outcomes and motivation, particularly among special needs students. The implementation and evaluation phases revealed that the game effectively engages students by incorporating adaptive features and interactive elements, catering to various learning needs. Feedback collected using the Player Experiences of Needs Satisfaction (PENS) model indicated high levels of competency, autonomy, relatedness, and immersion among the students (Ijaz et al., 2020). The results, shown through bar charts, highlighted that most students felt motivated and confident when they mastered the game, enjoyed making their own choices, and appreciated the immersive and emotionally engaging game environment. The study underscores the importance of continuous monitoring and targeted support to address areas of uncertainty and improve overall learning experiences (Li et al., 2024).

CONCLUSIONS

This study aimed to develop an educational game designed to support learner motivation among special needs students through the integration of motivational theory and inclusive game design principles. Guided by the ADDIE instructional design model, Pico Party Adventure was systematically developed and implemented in a classroom setting involving primary school students with special needs. The findings indicate that the educational game supported multiple dimensions of learner motivation, including competence, autonomy, and relatedness, as conceptualised in Self-Determination Theory.

The results demonstrate that learners generally experienced positive motivational outcomes while engaging with the game. In particular, high levels of perceived immersiveness and intuitive control suggest that accessible interface design and engaging game environments play an important role in sustaining learner engagement. The positive responses related to competence, autonomy, and relatedness further indicate that the game design successfully addressed key psychological needs that underpin intrinsic motivation, especially within inclusive learning contexts.

This study contributes to the field of game-based learning by providing empirical insights into the development of motivation-oriented educational games for special needs learners. The findings highlight the importance of grounding educational game development in established motivational theories and inclusive design frameworks to support meaningful and equitable learning experiences. From a practical perspective, the study demonstrates that educational games can be effectively integrated into classroom-based learning to support learner motivation and participation without imposing excessive cognitive or technical demands. Overall, this study underscores the potential of educational games as supportive instructional tools that contribute to inclusive education by promoting learner motivation, engagement, and access to meaningful learning experiences.

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CONFLICT OF INTEREST

The authors declare no conflicts of interest.

AUTHORS CONTRIBUTION

Author 1.: Led the development of the educational game, conducted data collection and analysis, and prepared the initial draft of the manuscript. **Author 2.**: Reviewed the manuscript and performed copy editing to improve clarity, coherence, and academic writing quality.

AVAILABILITY OF DATA AND MATERIALS

Data available within the article or its supplementary materials.

DECLARATION OF GENERATIVE AI

2. During the preparation of this work, the author(s) used ChatGPT to enhance the clarity of the writing and generate the figure. After using ChatGPT, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the content of the publication.

ETHIC STATEMENTS

Ethical approval and permission were obtained from the relevant educational authorities and participating schools before the study. Informed consent was obtained from teachers, and student participation was voluntary with confidentiality and anonymity assured. All data were used solely for research purposes.

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