

# Leveling Up Learning: The Impact of Gamification on Motivation and Achievement in Special Education

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**Abstract:** This study aimed to explore the integration of gamification in special education to enhance learning outcomes for exceptional learners. Employing a descriptive-development methodology, the research focused on understanding current educational practices and relationships, while also developing a gamified learning system tailored to the needs of exceptional learners. Utilizing the ADDIE Model, the system was systematically analyzed, designed, developed, implemented, and evaluated. Various data collection methods, including document analysis, observations, and interviews, provided comprehensive insights into the educational landscape and requirements for effective gamified learning solutions. The findings revealed a predominantly traditional approach to teaching exceptional learners, highlighting the need for innovative strategies. The developed system, featuring personalized learning activities and gamified elements, received high satisfaction ratings from stakeholders. Positive feedback on usability, design, and user-friendliness underscored the system's effectiveness in meeting user needs. While certain gamified elements showed variability in acceptance, overall, the study suggests that integrating gamification in special education holds promise for enhancing motivation and achievement among exceptional learners.

**Keywords:** special education, gamification, exceptional learners, Addie model, educational technology, learning outcomes, student engagement

## 1. Introduction

Special education is a crucial aspect of the educational landscape, providing tailored support to students with disabilities and learning disorders. It aims to enhance their behavior and academic performance through a variety of teaching methods and strategies [1]. Exceptional learners encompass a diverse range of individuals, including those with learning and behavior issues, physical disabilities, and intellectual talents [2].

In recent years, there has been a growing interest in integrating technology, particularly gamification, into educational settings. Gamification involves incorporating elements of games, such as leaderboards, badges, and points, into non-game contexts to enhance motivation and engagement [3]. Gamification involves applying game elements, such as rewards and challenges, to non-game contexts, aiming to enhance motivation and learning outcomes [4]. Computer games have become increasingly prevalent in the daily lives of learners across all age groups [5]. Gamification desires to combine intrinsic motivation with extrinsic one to boost motivation and engagement [6]. These game elements incorporate items like points, badges, leaderboards [7], avatars, three-dimensional environments, ranks, feedback, levels, communication systems, competition, and time pressures [8].

Exceptional learners, including those with learning and behavior issues, physical disabilities, and intellectual talents, may have unique needs and challenges that require tailored educational approaches. Thus, there is a need for research that examines the effectiveness of gamification specifically within the context of special education.

Addressing these gaps in the literature is of paramount importance for several reasons. Firstly, it has the potential to inform the development of evidence-based practices that can better support the educational needs of exceptional learners. By understanding how gamification can impact motivation and achievement in this population, educators and policymakers can make more informed decisions regarding the integration of technology in special education classrooms. Additionally, exploring the effectiveness of gamification in special education can contribute to a more inclusive and equitable educational environment, where all students have access to engaging and effective learning experiences.

In light of these considerations, this study seeks to investigate the impact of gamification on motivation and achievement in special education settings. By examining the experiences of exceptional learners within a gamified learning environment, this research aims to provide valuable insights into the potential benefits and challenges of incorporating gamification into special education practice. Ultimately, the findings of this study have the potential to enhance educational outcomes and promote the holistic development of exceptional learners.

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## 2. Literature Review

Research has shown that gamification has the potential to positively impact student motivation and achievement. The impact of gamification on student motivation and performance is a vital topic, as there has been increased interest in gamification [9] at the college level. Lambton College in Sarnia, Ontario, has recently announced intentions to include gamification into its curriculum to better reach mobile-savvy students and increase student engagement. The college is now able to design curricula that include avatars and scoreboards [10]. Fanshawe College in London, Ontario, is using gamification elements (e.g., goals, rules, and feedback systems) to engage children and adults in improving their literacy skills [11]. Ensuring students are engaged in their learning in post-secondary environments is vital as student engagement is positively related to academic outcomes as represented by first-year student grades and by persistence between the first and second year of college [12].

Studies have found that gamified learning environments can lead to increased class participation and attendance [4]. Furthermore, gamification has been correlated with improved academic performance among students [13].

Furthermore, [14] conducted a study that explored the effects of gamification in special education classrooms, revealing that gamified interventions led to increased motivation and achievement among students. Similarly, [15] examined gamification strategies and found that they positively impacted motivation and achievement among students with disabilities. The [16] further supported these findings, demonstrating that gamification enhanced motivation and achievement specifically for students with learning disabilities.

Moreover, [17] investigated the influence of gamified learning environments, highlighting significant improvements in both motivation and achievement among students in special education settings. Additionally, [18] conducted a meta-analysis, consolidating findings across multiple studies and confirming the positive impact of gamification on motivation and achievement among exceptional learners. These findings collectively underscore the potential of gamification as an effective approach to enhance motivation and academic outcomes in special education contexts, emphasizing its value as a tool for promoting engagement and success among diverse student populations.

## 3. Materials and Methods

This study used the descriptive-development method. The descriptive part focused on understanding and explaining current conditions, practices, and relationships in special education regarding gamification. It aimed to describe how gamification affects students and their interactions. The

developmental part involved creating and developing a system based on the clients' needs, ensuring it met specific acceptance criteria.

To build the educational activities, the ADDIE Model was used. This model includes five phases: Analysis, Design, Development, Implementation, and Evaluation. It helps create effective learning tools by allowing for early feedback and catching problems early, saving time and money [19]. This approach ensured that each phase of the project was carefully planned and executed, with continuous improvements.

Different tools, such as document analysis, observations, and interviews, were used to gather necessary information. Document analysis reviewed existing records and materials, observations were made in classrooms, and interviews with teachers and students provided deeper insights into their experiences with the system.

Using the ADDIE Model and various data collection methods, this study aimed to create a gamified learning system that effectively enhances motivation and achievement among students in special education.

## 4. Result and Discussion

The researcher observed that Special Education (SPED) schools in Dagupan City primarily employ traditional educational methods. Recognizing the need for improvement, the researcher endeavored to develop a system aimed at enhancing learning instruction for exceptional learners through a game-based learning approach.

### 4.1. Existing process in teaching Exceptional Learners

Teaching exceptional learners presents unique challenges, with individualized instruction being paramount. Although exceptional learners may share similarities with their peers, their learning pace is often slower due to various factors, including learning disabilities. Presently, teachers utilize limited resources, conducting lectures and activities with extra care due to varying student capabilities. Methods such as traditional paper and pen, games, activities, and book readings are employed to engage students, with scores and points recorded in class records. Teachers provide additional guidance through advising and counseling sessions with students, while parents are kept informed of their child's performance.

### 4.2. Hardware and Software Requirements

Hardware requirements for system development include an Intel Core 2 Duo CPU with a minimum speed of 2.40 GHz, 4 to 8 GB of RAM, a 150GB or higher HDD for backup, and speakers for audio output. Software deployment necessitates an operating system of Windows 10 or higher, or Mac OS, along with a compatible browser for full system functionality.

### 4.3. Features of the System

The researcher devised the system to enrich the educational experience and methodology for exceptional learners. This system offers functionalities geared towards enhancing their understanding of subjects, aiding in clear pronunciation, and facilitating comprehension of text while enabling them to effectively respond to posed questions. The student module provides mechanisms for students to become familiar with class lessons and activities. Utilizing multimedia as a navigational tool enhances information dissemination, improving both learning and performance by fostering efficiency and motivation. Furthermore, the integration of multimedia promotes active and experiential learning, aligning with student-centered approaches and ultimately leading to enhanced educational outcomes. By incorporating game-based elements, the system addresses the challenges exceptional learners face in traditional lecture-based learning environments.

The developed system features various game activities designed to support exceptional learners, whether they are learning through videos, demonstrations, or printable worksheets. The teacher module caters to educators, offering tools for managing accounts, classes, and resources for all types of exceptional learners. This includes the ability to enroll students, specify student types, and generate reports. A key feature of the system is its comprehensive repository of teaching resources, categorized for different exceptional learner types, enabling teachers to access lectures tailored to individual student needs. Additionally, the system provides printable worksheets for use in the classroom.

Distinguishing itself from existing open-source versions, the developed system is tailored to stakeholder requirements and follows the modular approach endorsed by the Department of Education. This approach involves breaking down the curriculum into specific objectives and creating associated learning materials in module form. Moreover, the system utilizes game-based activities to promote engagement and learning among exceptional learners.

Included below are screenshots showcasing various aspects of the system's interface.



**Fig 1.** System Log-in

The system login page serves as a security measure for teachers accessing the system.



**Fig 2.** Homepage

The homepage features a "New Student" button, allowing exceptional learners to input and save their personal information in the database. Once saved, students can engage in various activities offered by the system.



**Fig 3.** Activity Form

Prior to starting an activity, exceptional learners are required to complete this form, providing teachers with insight into their progress while using the system.



**Fig 4.** Categories

This displays different categories from which exceptional learners can choose based on their individual needs or conditions.



**Fig 5.** Different Categories

Various activities are available on this page, covering subjects such as the alphabet, mathematics, music, shapes and colors, and animals and body parts. The "story mode" option allows users to select topics as a bus moves along.

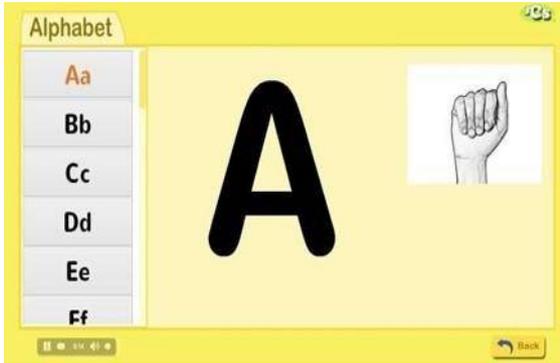


Fig 6. Sign Language

Designed for children with hearing disabilities, this page features sign language, which serves as a means of communication for deaf individuals.

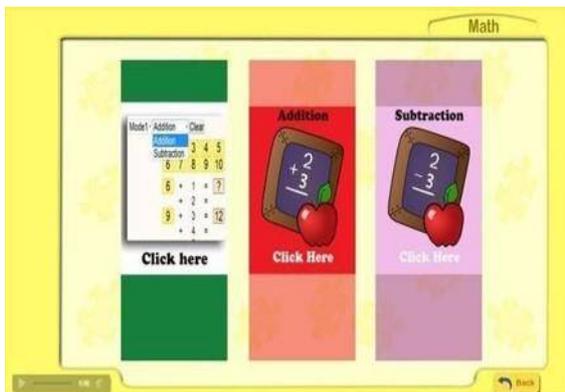


Fig 7. Math Category

Exceptional learners can tackle math questions on this page, with the system automatically generating scores upon completing each activity.



Fig 8. Worksheets

The system includes printable worksheets to supplement learning, providing additional support through videos, demonstrations, and other activities.



Fig 9. Scores

Upon completing gamified activities, exceptional learners can view their scores, which are stored in the system's database.

VIEW SCORES								
ENGLISH			MATH			SCIENCE		
TOPIC 1			TOPIC 2			TOPIC 3		
#1	JEPOY	10/10	#1	JEPOY	10/10	#1	JEPOY	10/10
#2	JEPOY	9/10	#2	JEPOY	8/10	#2	JEPOY	9/10
#3	JEPOY	8/10	#3	JEPOY	8/10	#3	JEPOY	8/10
#4	JEPOY	7/10	#4	JEPOY	6/10	#4	JEPOY	7/10
#5	JEPOY	7/10				#5	JEPOY	5/10
#6	JEPOY	5/10						
#8	JEPOY	4/10						
#9	JEPOY	2/10						

Fig 10. Summary of Scores

Teachers can access this section to view exceptional learners' scores and track the frequency of activity participation.

#### 4.4. Acceptability of the System

Following the system's completion, the researcher conducted a satisfaction test to assess its effectiveness. The researcher introduced the developed system to stakeholders, specifically one hundred (100) exceptional learners from various Special Education (SPED) schools in Dagupan City. An acceptability test was carried out to gauge the extent to which the developed system would be embraced and appreciated by the educational community.

Table 1 shows the overall system acceptability as to usability, design, user-friendliness, and navigation.

Table 1. Overall Acceptability of the System

Criteria	Response	Description
System as to Usability	4.6	SA
System as to Design	4.7	SA
System as to User Friendliness	4.5	SA
System as to Navigation	4.4	A
Pooled Mean	4.5	SA

Legend: SA-Strongly Agree; A-Agree; N-Neutral; DA-Disagree; SD-Strongly Disagree

The table presents the overall acceptability of the gamified learning system based on four criteria: usability, design, user-friendliness, and navigation. The system's usability

received a high score of 4.6, indicating that users strongly agree that it meets their needs effectively and efficiently. The design of the system scored even higher, at 4.7, showing strong user satisfaction with its aesthetic and functional aspects. User-friendliness was rated at 4.5, also falling into the "strongly agree" category, suggesting that users find the system easy to use and interact with, which is crucial for maintaining engagement and minimizing frustration. Navigation received a score of 4.4, interpreted as "agree," which, while positive, suggests there might be minor areas for improvement in how users move through the system. The pooled mean score for the system's acceptability is 4.5, with a corresponding description of "strongly agree." This indicates a high level of user satisfaction, showing that the system is generally well-received and meets user expectations across various aspects.

Meanwhile, ten (10) teachers were asked on the gamified elements used that resulted in positive effects on student achievement and motivation. Table 2 shows their overall feedback.

**Table 2.** Gamified Elements of the System

Criteria	Response	Percentage
Points	10	100%
Badges	9	90%
Leveling	9	90%
Leaderboards	9	90%
Achievements	10	100%
Certificates	3	30%
Collectibles	4	40%
Bonuses	2	20%

The table presents the responses and percentages related to the gamified elements of the system. All users (100%) responded positively to the inclusion of points and achievements, indicating that these elements are universally appreciated and deemed effective in the gamified learning environment. Badges, leveling, and leaderboards also received high approval, with 90% of users responding positively to each of these elements. This shows a strong preference for these features, which likely contribute significantly to user engagement and motivation. Certificates and collectibles had lower approval rates, with only 30% and 40% of users responding positively, respectively. This suggests that while these elements are appreciated by a segment of users, they may not be as universally effective or necessary as the other elements. Bonuses received the lowest approval, with only 20% of users responding positively, indicating that this feature might not be as valued or might need further refinement to

increase its effectiveness and appeal. The data suggests that while most gamified elements are well-received, there is variability in their effectiveness and acceptance among users.

## 5. Conclusion

This study employed a descriptive-development approach to address the challenges and opportunities in special education through the integration of gamification. By utilizing the ADDIE Model, the research team systematically analyzed, designed, developed, implemented, and evaluated a gamified learning system tailored to the needs of exceptional learners. Through a combination of document analysis, observations, and interviews, the study provided a comprehensive understanding of the current educational landscape and the requirements for effective gamified learning solutions.

The findings revealed that traditional teaching methods dominate special education practices in Dagupan City, highlighting the necessity for innovative approaches to enhance learning outcomes for exceptional learners. Recognizing this need, the researcher devised a system equipped with features aimed at enriching the educational experience and methodology for exceptional learners. The system's design prioritized accessibility, engagement, and personalization, catering to the diverse needs and learning styles of exceptional learners.

Notably, the acceptability test conducted among stakeholders demonstrated a high level of satisfaction with the developed system. Users strongly agreed on its usability, design, and user-friendliness, indicating that the system effectively met their needs and expectations. Positive feedback on gamified elements such as points, badges, leveling, leaderboards and achievements underscored their role in enhancing student motivation and achievement.

However, the study also identified areas for potential improvement, particularly in the implementation of certain gamified elements such as certificates, collectibles, and bonuses. While some elements received universal approval, others showed variability in their effectiveness and acceptance among users. This highlights the importance of ongoing refinement and customization to ensure that gamified learning experiences are engaging and impactful for all exceptional learners.

This study contributes valuable insights into the integration of gamification in special education, offering a promising approach to address the unique challenges faced by exceptional learners. Moving forward, further research and development efforts should focus on optimizing the gamified learning experience to maximize its benefits for students, teachers, and educational stakeholders alike.

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## Author contributions

CSDC conceptualized the study, designed the research methodology, conducted data collection and analysis, developed the gamified learning system, interpreted the findings, and wrote the manuscript.

## Conflicts of interest

The author declares no conflicts of interest.

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