

Gamification in deaf students social behavior learning to implement SDGs: A literature review

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Abstract: The aim of this study is to investigate the application of gamification in learning as an innovation to support digital learning programs in order to motivate social behavior skills among deaf students that can affect social interaction, empathy, and cooperation. This study's purpose is to review the literature systematically to examine the challenges faced in social behavior learning applied to deaf students and the practice of gamification in supporting social behavior learning for deaf students to promote SDG implementation. The search results were obtained using the keywords “gamification,” “deaf,” “social behavior,” and “SDGs” from literature published between 2016 and 2025. A total of 647 relevant publications from Scopus and Google Scholar were collected and processed using the PRISMA method. The analysis focused on gamification trends that have been proven to positively impact learning and the extent to which gamification supports social behavior learning for deaf students. The research underscores the importance of the ongoing contribution of gamification in the social behavior learning of deaf students, providing insights into the challenges faced in this area and the ways gamification is applied in supporting social behavior development among deaf students. These implications offer practical guidance for schools, educational technology developers, and policymakers to improve the learning system. This research contributes by providing a current synthesis of studies on how educators can effectively adapt gamification strategies to encourage social behavior among deaf students, aligning with SDG 4 objectives to support inclusive quality education.

Keywords: Deaf, Gamification, SDGs, Social behavior.

1. Introduction

The role of Sustainable Development Goals (SDGs) in becoming a reference for global development is crucial, particularly in the field of education. SDG number four, which focuses on quality education, guarantees inclusive and accessible learning opportunities along with lifelong learning for all. This aligns with the provision of social behavior learning for students with disabilities, especially deaf students who face challenges in initiating social relationships with their conversation partners. This learning includes studying behaviors such as cooperation, empathy, and self-control, which contribute to the adaptive development of individuals within their social environment. These skills foster positive interpersonal relationships and enhance the ability to solve personal problems.

Learning with deaf students often faces challenges in introducing good social behavior due to their special sensory needs, namely, in their hearing [1]. This affects the way children learn, requiring structured strategies to understand the ups and downs of voice expressions and solve children's problems independently. Such as difficulty understanding facial expressions, voice intonation, and delays in acquiring sign language or spoken language. In the context of inclusive education, an adaptive, visual, and interactive approach is needed to bridge communication needs and strengthen social interaction. Structured social behavior learning combined with gamification principles, namely the application of

game elements such as scores, levels, challenges, and rewards in the form of reciprocal social relationships, can encourage students' intrinsic motivation to learn and interact [2].

According to previous research, gamification increases the motivation and learning achievement of non-disabled students. If applied to deaf students, the impact is even greater because gamification also functions as a social tool with visualization features, which help them understand the social context more concretely. Interactive gamification makes the learning atmosphere more interesting for deaf students [3]. The application of this learning innovation to deaf students will facilitate understanding and motivate them to engage socially, which has always been a challenge for deaf students [4].

Therefore, this article aims to acknowledge the challenges and developments in the application of gamification in the social behavior learning of deaf students to implement the Sustainable Development Goals in quality education. By mapping the latest literature, this study is expected to contribute to the development of inclusive educational innovations. Unlike previous studies, which generally focused more on literature reviews related to other learning materials, this study focuses on innovations in social behavior learning, which are crucial for the early development of deaf students. This study has the following research questions:

1. What are the challenges faced in social behavior learning applied to deaf students?
2. How is gamification applied in deaf students' social behavior learning to support SDG implementation?

2. Method

This study uses the Literature Review research method, which involves collecting sources or data related to the topic of discussion from various sources such as books, newspapers, journals, the internet, and other libraries. This process includes identifying, assessing, and interpreting summaries derived from research evidence with the aim of providing answers to research questions [5]. In the initial process, 647 sources of literature on “gamification,” “deaf,” “social behavior,” and “SDGs” were found to be related to the main keywords, which were then reselected to obtain filtered results focusing on specific discussions on the application of gamification in Deaf students' social behavior learning to implement SDGs. The PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) approach was used with the following steps:

2.1. Identification

Selected literature sources were identified by matching keywords through Google Scholar and Scopus sources. The keywords used, entered sequentially with the words gamification, deaf, social behavior, and SDGs, were also filtered with literature focusing on learning innovations related to the implementation of learning with innovations in the form of gamification in the delivery of material. The main focus was on its application in inclusive learning that emphasizes social behavior learning for deaf students in order to implement Sustainable Development Goal 4 on Quality Education, which covers not only formal education but also life skills that are important for a person's future.

2.2. Screening

Literature selection was used to obtain meaningful review results. Several methods were chosen, including keyword searches, the use of English in the literature, and the year of publication, namely 2016-2025. A total of 112 out of 647 pieces of literature from the final identification stage were found to meet the content requirements related to the keywords searched, before finally being filtered again into 48 pieces of literature that were more focused on the application of gamification. The selection in this screening stage was useful for reviewing the identification results provided.

2.3. Eligibility

The focus of this eligibility phase was to determine the requirements that met the criteria, namely having clear and measurable outcomes in each piece of literature. The requirement sought in this

literature review was related to how social behavior learning gamification was provided to deaf students to support the achievement of Sustainable Development Goals (SDGs). In selecting the literature, we found 48 pieces of literature that could represent this. After we reselected them based on the content of the literature in depth and based on their relevance to the main research question related to the application of learning for deaf students, a total of 12 articles were used in the inclusion stage.

2.4. Inclusion

The result of the approach using digital literature search to answer the first research question is to identify the types of challenges faced in social behavior learning applied to deaf students in supporting the development of Sustainable Development Goals (SDGs). Through the second research question, the literature review is used to identify the impact of gamification on the social behavior learning of deaf students in the implementation of SDGs in the field of quality education. From these two research questions, conclusions will be drawn from the relevant literature as follows:

1. Chan et al. [6], Gamification as Technology Enabler in SEN and DHH Education
2. Coelho and Abreu [7], Systemic Gamification Theory (SGT): A Holistic Model for Inclusive Gamified Digital Learning
3. Costa et al. [8], Games for Education of Deaf Students: A Systematic Literature Review
4. Cruz [9], Developing a Gamified Learning Application to Enhance Engagement for Deaf and Mute Learners
5. Escudeiro et al. [10], Play with Purpose: Serious Games for Inclusion and Sustainability
6. Farid et al. [11], Developing the KATAKU Mobile Application to Enhance Vocabulary Acquisition for Deaf Students
7. Hussein et al. [12], Exploring the Impact of Gamification on Skill Development in Special Education: A Systematic Review
8. Moreira et al. [13], Gamification and Inclusion: A Systematic Review on the Use of Gamified Technologies in Deaf Education
9. Nurhasanah et al. [14], Gamification on EFL Learners with Deaf Disabilities: A Systematic Literature Review
10. Shelton and Parlin [15], Teaching Math to Deaf/Hard-of-Hearing (DHH) Children Using Mobile Games: Outcomes from Student and Teacher Perspectives
11. Shohieb [16], A gamified e-learning framework for teaching mathematics to Arab Deaf students: supporting an acting Arabic Sign Language avatar.
12. Yasin et al. [17], Go Fish English Game: Enhancing Vocabulary for Pupils with Hearing Disabilities in Special Needs Education.

3. Results

Through the results of the literature review, it was found that literature published between 2016 and 2025 showed an increasing trend in discussions related to the proof of learning innovation. In the graph provided, there was an increase in literature discussing gamification-based innovation applied to the social behavior learning of deaf students in the implementation of Sustainable Development Goals in the Quality Education section. Therefore, Figure 1 shows a total of 12 major literature sources that were collected that met the focus of the literature review research, which discussed the types of learning materials and the use of gamification to be applied in the social behavior learning of deaf students in supporting the implementation of SDGs.

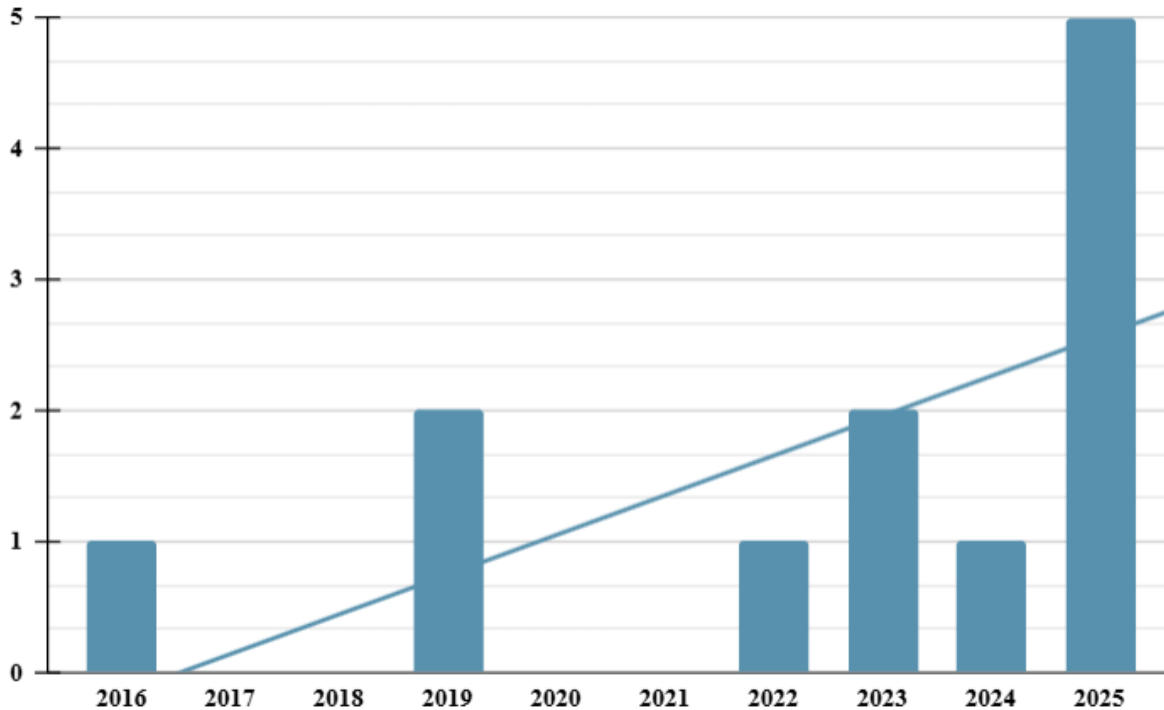


Figure 1.

Graph of literature discussing gamification-based innovation applied to the social behavior learning of deaf students in the implementation of Sustainable Development Goals.

3.1. Types of Challenges Faced in Social Behavior Learning Applied to Deaf Students

The challenge faced by deaf students in social behavior learning is how to provide understanding and improve good social behavior. Deaf students are often faced with special needs in digesting language and applying it [6]. These challenges make it difficult for children to socialize and motivate them to participate in learning because they cannot easily understand messages as well as their non-deaf school friends. This challenge is also related to relationships between friends and between deaf students and their teachers, as stated by Cruz [9] in his literature, which discusses, among other things, development, where learning success is influenced by the initiative of stakeholders, teachers, and the school environment, with strategies to maintain relationships with students.

Social learning, applied with other gamification, also targets challenges related to implementing new learning systems for deaf students. Deaf students with special communication needs require appropriate procedures to introduce them to how to play, with the hope that children will learn how to play and how to perform the roles required in a game. According to Escudeiro et al. [10], playing with purpose is taught and practiced for deaf students with the hope of helping them to further understand their specific needs and teaching them according to the needs that are found, with the aim of helping children understand the game system and increasing their interest in socializing. In addition, the challenge of attracting the interest of deaf students is often faced because many children lose their motivation to learn social behavior, as learning feels uninteresting [10].

Learning that is uninteresting for deaf students will also present other challenges related to material absorption and understanding. One of these challenges is related to vocabulary acquisition, which is also related to the success of social interaction. According to Yasin et al. [17], this is quite challenging for deaf and hard-of-hearing students to learn because the language and words they acquire are the result of senses other than hearing, which can absorb information heard earlier. Another

challenge identified in Farid et al. [11] research indicates that after deaf students have learned an easier way to learn, it is related to problem-solving. Therefore, social learning using problems so that children can find their own solutions through simulations or role-playing via gamification will make it easier for deaf students to excel in their social behavior.

3.2. The Use of Gamification to be Applied in the Social Behavior Learning of Deaf Students in Supporting the Implementation of SDGs

In the second part of the research question, the discussion relates to identifying the benefits of using gamification in supporting the learning of deaf students' behavior in the implementation of SDGs in the field of equalizing and expanding the quality of education. From the results of literature screening focused on the behavioral learning of deaf students, 13 sources were found that explain the benefits of this technology in supporting the process of achieving quality education. Shohieb [16] mentions that gamification supports interaction and learning related to social behavior applied in an inclusive Special Education environment and focuses on children who are deaf and hard of hearing. The use of gamified learning settings has been proven to help deaf and hard-of-hearing students reduce their cognitive overload, which improves their peripheral response control and interactions. This is also supported by the fact that the game system implemented in the classroom can improve abilities in behaviorism and cognitivism, particularly in social contact [3].

Another study by Coelho and Abreu [7] explains that gamification, as a form of support for the implementation of SDGs, with the achievement of access to education related to social behavior that gives deaf students rights, has been proven to increase social interaction with hearing students by 80%. This is supported by the fulfillment of the learning design needed by deaf students [9] and increased learning motivation so that the quality of children's education is fulfilled with social behavior learning in the form of gamification [13]. One example is proven by gamified learning through research by Yasin et al. [17], the KATAKU Mobile Application, which helps increase vocabulary in socializing for deaf students and has been implemented in several different countries. There are also two studies on the application of game-based applications for learning by Shelton and Parlin [15] Teaching math to Deaf/hard-of-hearing (DHH) children using mobile games: Outcomes with student and teacher perspectives and Farid et al. [11] a gamified e-learning framework for teaching mathematics to Arab deaf students, supporting an acting Arabic sign language avatar, which proves that even in other subjects such as mathematics, social behavior learning can still be better understood. Additionally, with gamification, it was found that games in online education settings proved effective in improving the social behavior and even academic performance of deaf students, thus greatly supporting the fulfillment of the Sustainable Development Goals in quality education, which ensures that all learners acquire the knowledge and skills needed to promote sustainable development [12, 14, 18-20].

4. Discussion

In the resulting literature review, challenges were identified in implementing social learning for deaf students and the process of applying gamification in this learning for the implementation of the Sustainable Development Goals. These results were obtained from previous studies showing that the integration of technology with gamification elements can significantly improve children's social behavior skills, especially for deaf students who, through the challenges they have previously faced, can overcome them with learning innovations in the form of gamification. This combination creates a dynamic and contextual learning experience, where students not only observe visual information but also actively engage through problem-solving-based digital interactions and other social behaviors that simulate social situations as learning materials.

The challenges encountered range from understanding the importance of social behavior learning, digesting language and applying it, a lack of motivation to participate in learning, and new learning systems for deaf students without media that are attractive and tailored to the specific needs of deaf students. As factors for success in social behavior, vocabulary acquisition, and problem-solving skills

remain challenges faced by deaf students, a way to provide inclusive and appropriate access for deaf students needs to be found.

The use of gamification as a support for the implementation of SDGs with the achievement of educational access supports interaction and has been proven to help deaf and hard-of-hearing students reduce their overload, which can improve their abilities in behaviorism and cognitivism. Gamification increases learning motivation so that the quality of social behavior learning is optimal. Another benefit is that it increases vocabulary in socializing, which has been proven to be applicable in settings with different ethnicities and cultures. In addition, it has been proven that even in other subjects such as mathematics, social behavior learning that is inserted can still be understood better, thus proving to be effective in improving the social behavior and even academic performance of deaf students. Given the challenges that accompany the benefits of gamification learning innovation, it will be very beneficial for learning and will greatly support the implementation of the Sustainable Development Goals in quality education.

Based on the literature found in this study, there is a need for further research on gamified learning with more specific social behavior learning materials. This includes a focus on interpersonal communication and socializing using sign language in the form of gamification. More specific research in this area could produce more focused outcomes on specific topics, thereby opening up opportunities for the development of gamified learning for social behavior materials for other deaf students.

5. Conclusions

The conclusion of this Systematic Literature Review is that gamification significantly improves the quality of learning and social engagement of students, especially deaf students. The research and literature collected support the use of technology that maximizes visual display, which has a positive impact in creating a more inclusive learning environment through experience-based learning so that the material can be conveyed in an interesting and enjoyable way without reducing the depth of the content, thereby increasing the motivation and emotional engagement of deaf students.

This supports the strengthening of the foundation of quality education in the Sustainable Development Goals, for equitable, accessible, and inclusive education. With the rapid development of educational technology and increasing awareness of the importance of inclusive education, gamification designed and developed in various educational contexts, especially behavioral education for disabilities, can be a very effective alternative for implementation.

Therefore, the results of this study can serve as an important reference in curriculum development and teacher training to realize a fair, innovative, and learner-centered educational transformation. To support this, it is necessary to strengthen teachers' capacity through training in technology-based gamification design and implementation, as well as to encourage collaboration between educational institutions, technology developers, and the disability community so that the resulting products are more contextual and have a real impact.

Transparency:

The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

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