Fostering Inclusive Education through Gamification in Secondary Schools in Malta: Enhancing Student Assessment

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Abstract

This study explores the integration of gamification and Technological Advanced Machines (TAMs) to foster inclusive education and enhance student assessment in secondary schools. Utilising a mixed-methods approach, the study combines quantitative data from online questionnaires with qualitative insights from semi-structured interviews. The research investigates how TAMs can address the diverse needs of students. Findings reveal that while educators recognise the potential of gamification and TAMs to boost student engagement and motivation, challenges such as technical difficulties and the need for professional development persist. The study highlights the importance of personalised learning approaches, culturally responsive teaching practices, and continuous professional development to implement these technologies effectively. By integrating the Universal Design for Learning (UDL) theoretical framework with empirical evidence on gamification effectiveness, student engagement, and technology adoption, this research provides valuable insights. It offers actionable recommendations for educators and policymakers to enhance inclusive education through gamified learning environments and TAMs. The study highlights the idea that a holistic approach, combining technological solutions with inclusive pedagogies, is essential for creating equitable and engaging learning environments that cater to the diverse needs of all students.

Keywords

Inclusion, gamification, assessment, teaching methodologies, diversity

Introduction

This study was conducted in a secondary school in the Southern region of Malta and explored the use of gamification in education to make learning more enjoyable and engaging for students. It also examined the methods of assessment in gamified learning environments. The research explored the importance of addressing students' diverse needs and abilities in the classroom. It analysed the efficacy of various TAMs in addressing the unique challenges faced by students with diverse needs and abilities. The research was conducted with the aim to contribute to the continuous initiatives to raise educational standards and guarantee all students' access to stimulating and compelling learning experiences. The following is a brief literature review which influenced this research.

Students with Diverse Needs

In today's educational landscape, addressing the diverse needs of students is paramount to fostering an inclusive and effective learning environment (Müller et al., 2022). Understanding and addressing the varied needs of students, including those with high-functioning autism, dyslexia, visual impairments, mobility limitations such as wheelchair use, and Attention Deficit Hyperactivity Disorder (ADHD), is crucial for teachers in the classroom. Research on co-created personas emphasises engaging users with diverse needs within lesson design (Neate et al., 2019). In their research, fictional personas were developed collaboratively with educators to represent diverse learner profiles, enabling tailored learning experiences that address the specific needs, preferences, and challenges of different student groups effectively.

According to Vasquez et al. (2023), integrating technological machines and artificial intelligence can serve as a model for addressing learning difficulties through TAMs and tailored teaching strategies. This approach can enhance learning outcomes across various subjects in secondary schools, such as mathematics, science, language, arts, and social studies, where personalised support and adaptive technologies can address individual learning gaps and promote deeper understanding.

Assistive technology implementation varies based on individual student requirements; for instance, students with Autism Spectrum Disorder (ASD) may benefit from group work facilitated by collaborative projects like Microsoft Class Notebook (Gandal et al., 2018), while those with ADHD are motivated by the technologies themselves during their learning processes (Danielson et al., 2018). For dyslexic students, resources such as software tools, audiobooks, text-to-speech applications and visual aids are invaluable (Taran et al., 2022). Students with visual impairments can utilise screen readers or magnification software to access content (Pennell et al., 2021). Providing hands-on opportunities and alternative interaction methods–such as touch or sound–can further enhance these students' learning experiences (Yang et al., 2023).

Recent studies underscore the importance of listening to students' perspectives to create inclusive environments. Messiou (2012) emphasises recognising various forms of marginalisation experienced by students, some not overtly visible, and actively involving them in decision-making processes as a means to mitigate marginalisation. Listening to students is not merely a strategy for understanding but exemplifies inclusivity itself. While technology offers promising solutions for educational marginalisation, it cannot address these issues alone; a holistic approach combining technology with inclusive pedagogies is essential for creating genuinely inclusive experiences (Venkatesh et al., 2012).

Teaching Methodologies

In a didactic classroom, where the teacher dictates the lesson and students listen, it may be more difficult for students from diverse backgrounds, particularly those from underprivileged backgrounds or those at risk of marginalisation, to reach their goals (Yu et al., 2022). Creating comfortable, acceptable and environmentally friendly learning environments in vocational topics can be facilitated by modifying equipment and instructional strategies (Marshall, 2019). Flexible education systems enable learners to transition from school to training to employment.

In 1958, Skinner (as cited in Teasley, 2015) outlined instructional techniques that allow each student to progress at their own speed. He likened passive learning with instructional aids (audio-visual) to a teaching machine dispensing a drug, resulting in material presentation without active learner involvement. Instead, he advocated for an approach where instructors pose questions to students, provide positive reinforcement for correct responses, and offer simpler questions for incorrect answers, allowing students to master material at their individual pace. Skinner's insights remain relevant today; inquiry-based learning (IBL), a student-centred approach emphasising independent learning and active engagement, is crucial for fostering lifelong learning skills (Spronken-Smith, 2012). Educators must seize every opportunity to ensure that every student achieves their learning goals while recognising that success confers significant psychological and physical advantages for individuals of diverse abilities and cultural backgrounds.

Universal Design for Learning

Universal Design for Learning (UDL) is a framework designed to provide equal learning opportunities regardless of abilities or backgrounds. UDL principles guide curriculum objectives, activities, instructional materials, and assessments towards flexibility and accessibility (Luke, 2021). The three core principles include multiple means of representation, multiple means of action and expression, and multiple means of engagement (Oyarzun et al., 2021). These guidelines facilitate educational programmes that offer learners flexible access concerning space-time configurations and modality. Given that varied learners will access the curriculum with different abilities and competencies, UDL encourages educators

to adopt innovative approaches to curriculum design compared to traditional methods. By utilising UDL concepts effectively, educators can create accessible evaluations for all students regardless of varying needs or skill levels (Boothe & Lohmann, 2020).

UDL differs from differentiation in that it proactively designs curricula accessible from the outset rather than adapting them post-creation for individual students (Rao & Meo, 2016). Differentiation often involves tailoring instruction reactively based on specific student needs; conversely, UDL anticipates learner variability by integrating multiple means into curriculum design itself, making it inherently flexible and inclusive. Despite its benefits in promoting equity and inclusivity being significant, UDL implementation faces challenges such as resource availability and educator training requirements necessary for effective application of its principles (Priyadharsini & Mary, 2024). Integrating various means often necessitates access to information-communication technologies (ICTs) or assistive technologies that may not be universally available or affordable across educational institutions.

The Use of Technology in Education

The use of technology within classrooms has transformed both assessment methods and student engagement levels significantly. Shabiralyani et al. (2015) note that visual aids serve as instructional tools that stimulate interest while simplifying complex ideas through photos or videos, enhancing comprehension among learners. Online quizzes like Kahoot or Wordwall games have gained popularity due to their gamified nature offering real-time feedback.

Technology effectively supports students facing challenges such as learning difficulties. Augmentative and alternative communication (AAC) technologies have emerged as vital tools for supporting students with complex communication needs; Valencia et al. (2023) emphasise AI-generated phrases' potential to save time while ensuring alignment with users' preferences. Speech-to-text software is valuable for transcribing ideas into written form, allowing verbal expression tailored according to abilities (Haug, 2016). Audio-recorded answers can assess understanding without limiting physical capabilities during evaluations (Karmen-Tuohy et al., 2022). Bluetooth Low Energy technology has shown effectiveness in facilitating daily communication among nonverbal schoolchildren with moderate intellectual disabilities, further supporting technology's role in educational settings (Grynyuk et al., 2022).

Digital tools like Class Notebook have emerged as powerful instruments fostering collaboration among peers while enhancing information exchange capabilities. The shift away from traditional pen-and-paper methods and toward various software applications enhances public speaking skills while inspiring creativity among learners, fostering effective communication applicable beyond classroom settings (Schultheiss & Backes-Gellner, 2023). Online games generating reports serve as valuable resources enabling efficient

evaluation processes; Nicol and Macfarlane-Dick (2006) emphasise the role of immediate feedback within formative assessments, promoting self-regulated learning through prompt error identification leading toward improvement opportunities.

As a result of the gamification efforts, educators have observed significant shifts in student engagement and motivation (Costley, 2014). The integration of technology not only enhances traditional teaching methods but also creates dynamic learning environments where students are actively involved in their education. The use of digital tools allows for personalised learning experiences tailored to individual student needs, which is particularly beneficial for those with diverse learning requirements. Research has shown that technology facilitates collaborative learning, enabling students to work together on projects and share ideas seamlessly (Dillenbourg, 1999; Johnson & Johnson, 2017).

Gamification in Education has been a topic of interest for researchers, and various studies have been conducted. Kapp (2012, p. 10) defined gamification as "using game-based mechanics, aesthetics and game thinking to engage people, motivate action, promote learning, and solve problems". According to Vrcelj et al. (2022), gamification in education is used less frequently in elementary and secondary schools and more frequently in university settings. However, experience demonstrates that gamification, the use of games and various digital tools in the classroom, is successful, even though the relevant research presented in the papers often contradicts this.

Assessments and Technology

Assessments are essential for gauging student progress, guiding future steps, and involving parents and students in the learning process (Castles et al., 2018). They play a pivotal role in secondary education, helping to measure students' knowledge, understanding, and skills. Reinke et al. (2011) emphasise the value of assessments in supporting mental health in schools, noting that teachers' perceptions can influence this aspect significantly.

Formative and Summative Assessment in Education. Formative assessments provide ongoing insights that allow teachers to modify instruction continuously, encouraging student reflection and self-monitoring (Zhai & Nehm, 2023). Summative assessments, in contrast, evaluate overall achievement at the end of a unit, benchmarking student performance against set standards (Buléon et al., 2022). Formative assessments, typically more informal and frequent, support immediate adjustments, while summative assessments serve as formal evaluations of final progress (Hao & Lu, 2024).

Gamified Assessments and Automated Feedback. Zainuddin et al. (2019) investigated the effects of gamified e-quizzes on student engagement in formative assessments within secondary education settings. Their study demonstrated that incorporating game elements such as points, badges, and leaderboards through platforms like Socrative and

Quizizz significantly increased student motivation and interaction during learning activities. Automated feedback within these systems positively impacts student revision behaviours, aiding in learning improvements (Zhu et al., 2019). Such feedback mechanisms in gamified assessments encourage self-regulation, allowing students to actively engage in revising and mastering content.

Engaging Diversity in the Teaching Profession

Kalogiannakis et al. (2021) conducted a systematic review of the literature in which they explored the impact of gamification on science education. The findings suggested that gamification positively influences student motivation, engagement, and learning outcomes in science education. This insight can be applied to the teaching profession, particularly in engaging students from diverse backgrounds. Educators can promote inclusivity and cater for diverse learning needs by incorporating gamified assessments.

A study by Lynch et al. (2020) emphasised the importance of educational management in fostering diversity and equality in the classroom. The research highlighted the need for a shift from a 'one size fits all' educational model to a socially just education that responds to the diverse needs of all learners.

Furthermore, in a study by Gheyssens et al. (2020), the researchers discussed differentiated instruction and the diversity of teachers' philosophy and praxis to adapt teaching to students' interests, readiness, and learning profiles. This research emphasised the need for teachers to tailor their instructional approaches to accommodate students' diverse interests and learning profiles. By integrating differentiated instruction and adapting assessments to students' individual needs, educators can effectively engage diversity in the teaching profession.

The literature reviewed underscores the significance of integrating technology to support diverse student needs. By incorporating assistive technologies, adopting inclusive teaching practices, and using UDL principles, educators can create more equitable and engaging learning environments. Visual aids, online quizzes, speech-to-text software, and digital collaboration tools have all been shown to improve learning outcomes, particularly for students with learning difficulties and disabilities. Gamification, specifically, offers engaging and interactive approaches to motivate students; however, positionality and consideration of diverse perspectives are crucial to ensure equitable benefits. Listening to students not only provides valuable insights into their experiences and needs but also actively involves them in shaping their educational environment, thereby fostering a sense of belonging and empowerment that is fundamental to true inclusivity.

Methodology

The problem addressed in this research is the need to foster inclusive education and enhance student assessment in secondary schools through gamification. This is significant due to the importance of addressing students' diverse needs and abilities, including those with learning and physical difficulties. A mixed-methods approach was used to explore the issue. The research was conducted in Malta. The main research questions for this exploration were:

1. How can educators utilise TAMs to overcome specific challenges encountered by students with special needs in gamified learning settings?

2. How can educators leverage gamification and TAMs to provide an engaging and equitable learning environment for all students, particularly those from disadvantaged backgrounds and minority populations in Malta?

3. To what extent does the implementation of gamification and TAMs contribute to creating inclusive and culturally responsive learning spaces that accommodate the needs and perspectives of diverse communities?

Participants

The study involved educators from a secondary school with a substantial staff of over 150 members, including teachers, Learning Support Educators (LSEs), and Senior Management and Leadership Team (SMLT), and aimed to gather diverse perspectives on using technology in student assessments. Eighty-five educators completed the quantitative data from an online questionnaire. The qualitative insights were gathered from semi-structured interviews conducted with seven educators.

Approach

By investigating how gamification and TAMs can enhance the overall learning experience while promoting inclusivity and sensitivity towards diverse communities in a school in Malta, this research explored practical strategies for incorporating these technologies into educational systems to benefit students with varying needs and abilities. Using a mixed-methods approach, combining a quantitative questionnaire with qualitative interviews allowed for a comprehensive exploration of the impact of gamification and TAMs on creating inclusive and culturally responsive learning spaces. While this methodology offers the advantage of triangulating data to gain a holistic understanding of the research questions, it also presents challenges such as time constraints, resource allocation, and potential criticisms related to philosophical underpinnings and research typologies (Creswell & Creswell, 2018). A two-phase mixed-methods approach was used to gather and analyse the data.

Phase 1. A quantitative online questionnaire was administered to all educators at a secondary school with a staff of over 150 members, to gather information about their knowledge and use of gamification and TAMs in the classroom, as well as their current usage of tablets, virtual reality (VR), and other gamification resources.

Phase 2. Interviews were then conducted with those educators from the school who expressed an interest in being interviewed to gather their in-depth views about their experiences with gamification and TAMs, as well as their recommendations for improving the use of these tools in education.

The questionnaire encompassed five key sections: Demographic Information, Gamification in Education, Assessment Methods, Assistive Technology and Inclusive Education, and an optional interview participation section. A pilot study was conducted before the actual data collection, to ensure the questionnaire's clarity; this helped to make the necessary amendments to improve the questionnaire. The interview questions covered the experiences with gamification in education and its effectiveness; gamification in assessments; how gamification and TAM can foster inclusion; instances of integrating TAM in the class; use of speech-to-text software for assessments; and examples of using digital collaboration tools.

The questionnaire was first organised in Microsoft Excel, and then data was imported to IBM SPSS version 28.0 to be further analysed. Quantitative analysis included descriptive statistics, chi-square tests, and correlation analyses. Data from the interviews were transcribed, and then thematic analysis was used. Responses were coded, and themes were generated as suggested by Braun and Clarke (2020). The themes were then compared and contrasted with the quantitative findings.

Ethical Implications

According to Schutt (2022), informed consent, which also implies informed refusal, is a foundational principle in research; this was done by ensuring that the participants entered the research voluntarily and with complete information about their involvement. To safeguard participant identities when presenting the findings, stringent measures were implemented, such as changing names and omitting workplace affiliations. The wellbeing of the participants is also paramount in research (Creswell & Creswell, 2018). Therefore, a safe, comfortable environment was created for the interviews, considering factors like interview duration, location safety, and participant comfort. Also, to prevent moral harm, a comprehensive approach included using sensitive language, respecting cultural differences, and ensuring questions were phrased to avoid causing offence, as emphasised by Bryman (2016).

Findings and Discussion

This section focuses on the results and analysis of the data collected through the questionnaire and interviews, aimed at gathering experiences and perspectives regarding the use of gamification in a secondary school in Malta.

Questionnaire Overview

Demographic Information. The respondents were predominantly between the ages of 35–44 (n=31, 36.5%) and 45–54 (n=23, 27.1%). The majority of teachers had 16 years or more of teaching experience (n=33, 38.8%). This was followed by those with 11–15 years of experience (n=18, 21.2%) and 6–10 years of experience (n=16, 18.8%). Only a small percentage of teachers had less than a year of experience (n=2, 2.4%). The participants included teachers from various educational levels within the school; however, this study focuses exclusively on the secondary school teachers (n = 32, 37.6%) to maintain relevance to the secondary education context. While some teachers also taught at middle and primary school levels, their insights and practices related to secondary schooling were the main focus of the analysis.

Gamification in Education. Participants were asked about their experiences in gamification in education. The majority of respondents (n=42, 49.4%) found gamification to be highly effective in boosting student engagement, while 27.1% considered it moderately beneficial, and 16.5% were neutral. Only one respondent preferred not to use gamification, and eight were not familiar with it. A significant proportion (n=26, 30.6%) had used gamification in assessments, with 69.4% not having done so. This suggests that educators have had positive experiences with gamification in their classrooms. It also indicates that most educators see gamification as a valuable tool for engaging students in learning.

The relationship between age and experience with gamification variables was tested using Crosstab, as shown in Table 1.

Table 1
Crosstabulation of Age and Experience

Statistic	Value	df	p-value
Pearson Chi-Square	17.214	16	0.372
Likelihood Ratio	18.544	16	0.293
Valid Cases (N)	85	-	-

Notes: 72% of cells had an expected count < 5, violating the Chi-Square assumption.
No correlation statistics were provided as variables are non-numeric.

The Pearson chi-square value was 17.214 with 16 degrees of freedom and a p-value of 0.372, indicating no significant association between Age and Experience in Gamification. However, it is important to note that 72% of the cells had an expected count of less than 5, violating the Chi-Square test's assumption. The analysis suggests no significant relationship between Age and Experience in Gamification in the given sample.

Table 2 presents a crosstabulation analysis between the variables "EduLvl" (Education Level) and "Experience" (Years of Experience in Gamification). The table shows the number of observations for each combination of education level and experience level.

The following chi-square tests assess the independence between the above-mentioned variables. The Pearson's chi-square value in Table 3 is 12.265 with 16 degrees of freedom and a p-value of 0.726, indicating no significant association between education level and experience level.

Table 2
Crosstabulation of Education Level and Years of Experience

Years of Experience	1	2	3	4	5	Total
Educational Level 4	0	1	0	0	0	1
Educational Level 5	0	4	7	3	1	15
Educational Level 6	10	13	9	3	1	36
Educational Level 7	6	10	10	5	1	32
Educational Level 8	0	0	1	0	0	1
Total	16	28	27	11	3	85

Note: This table shows the number of observations for each combination of education level (EduLvl) and experience level

Table 3
Chi-Square Tests – Education Level and Experience in Gamification

Test	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	12.265	16	0.726
Likelihood Ratio	15.048	16	0.521
Linear-by-Linear Association	0.509	1	0.476
N of Valid Cases	85		

Note: 19 cells (76.0%) have expected counts less than 5. The minimum expected count is 0.04

The symmetric measures in Table 4 provide correlation coefficients to quantify the strength and direction of the relationship. The Spearman correlation coefficient is -0.063, with a p-value of 0.566, indicating a very weak negative correlation between education level and experience, which is not statistically significant. The analysis shows no significant association or correlation between education level and experience level in the given data.

Tables 5 and 6 present a crosstabulation analysis between the Years of Teaching Experience versus the Experience in Gamification, along with the corresponding chi-square test results.

Table 4

Symmetric Measures – Relationship between Education Level and Experience Level in Gamification

Measure	Value	Asymptotic Standard Error	Approximate T	Approximate Significance
Interval by Interval Pearson's R	-0.078	0.100	-0.711	0.479
Ordinal by Ordinal Spearman Correlation	-0.063	0.106	-0.576	0.566
N of Valid Cases	85			

Note: The values indicate the strength and direction of the relationship between education level and experience level.

Table 5

Crosstabulation of Years Teaching and Experience

Years Teaching	Experience Level					Total
	1	2	3	4	5	
less than 1 year	0	0	2	0	0	2
1-5 years	2	3	7	4	0	16
6-10 years	2	3	3	3	0	11
11-15 years	7	5	8	2	1	23
16 years and above	5	7	13	6	1	32
Total	16	18	33	15	2	84

Note: Values represent counts of teachers in each category.

The crosstabulation table (Table 5) shows the count of observations for each combination of "Years_Teaching" and "Experience" levels. The highest count (13) was observed for teachers with 16 years and above of teaching experience and an experience level of 3. The lowest count (0) was observed for teachers with less than 1 year of teaching experience and experience levels of 4 and 5, as well as for teachers with 1–5 years of teaching experience and an experience level of 5.

The Pearson's chi-square test statistic value (Table 6) was 9.228 with 16 degrees of freedom. The corresponding p-value (Asymptotic Significance) was 0.904, which is greater than the commonly used significance level of 0.05. This result indicates that there was no statistically significant association between the "Years_Teaching" and "Experience" variables based on the chi-square test.

Assessment Methods. The survey also explored the methods used to assess student learning, with 52.33% of respondents using traditional exams and quizzes, 35.22% employing project-based assessments, and 67.42% utilising continuous formative assessments. The use of automated assessments was reported by 28.2% of respondents, with 10.6% having a highly positive experience, 15.3% finding them positive, and 5 having a neutral experience. The majority (71.8%) had not used automated assessments. This suggests that while many educators are open to using gamification in assessments, there is still room for growth in this area.

Table 6
Chi-Square Test – Years of Teaching Experience and Experience Level in Gamification

Statistic	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	9.228	16	0.904
Likelihood Ratio	11.488	16	0.778
N of Valid Cases	85		

Note: 16 cells (64.0%) have expected count less than 5. The minimum expected count is 0.07.

Table 7
Chi-Square Test – Age and Assessment Methods

| Test	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	73.314	72	0.435
Likelihood Ratio	66.006	72	0.677
N of Valid Cases	85		

Notes: 93 cells (97.9%) have an expected count less than 5. The minimum expected count is 0.01. Correlation statistics are available for numeric data only.

The assessment methods considered in the analysis were continuous formative assessments, project-based assessments, traditional exams and quizzes, online quizzes in class (for example, Plickers), practicals, and coursework & homework (CW & HW). The participants reported various combinations of these assessment methods.

A chi-square test was performed to examine the association between age and the assessment methods used as shown in Table 7. The results showed a Pearson Chi-Square value of 73.314 with 72 degrees of freedom and a p-value of 0.435. Therefore, it was not considered statistically significant. The non-significant p-values suggested no significant association between age and the assessment methods used in general.

Assistive Technology and Universal Design for Learning. The incorporation of UDL principles was reported by 24.28% of respondents, with 36.42% not using them and 25.3% being unsure, Figure 1 below summarises these results. The methods used to address diverse student needs included multiple means of representation, engagement, and expression, as well as flexible assessment options and the incorporation of technology. This suggests that while UDL principles are becoming more widely known, their adoption still needs room for growth. Respondents who had used UDL principles in their lessons shared their specific strategies, such as offering multiple means of representation, engagement, and expression, providing flexible assessment options, incorporating technology, and encouraging collaborative learning.

Figure 1
The Incorporation of Universal Design for Learning
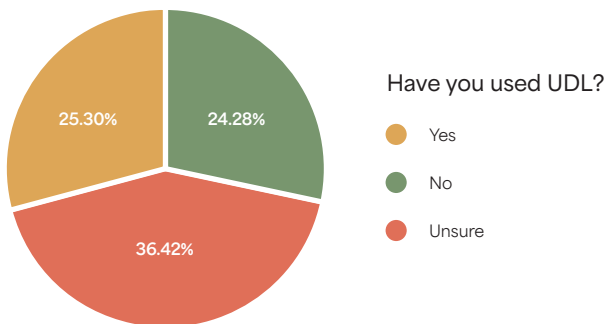
General Conclusion for the Questionnaire. In conclusion, the questionnaire results provide a comprehensive understanding of educators' experiences and perceptions regarding the use of gamification in secondary school assessments. The findings suggest a generally positive perception of gamification, with many respondents finding it effective in boosting student engagement and useful for practice. The questionnaire also highlights the importance of incorporating UDL principles and the use of visual aids, including gamification elements, in the classroom for assessment purposes.

Qualitative Data – Discussion

Seven of the eighty-five respondents who answered the questionnaire were willing to participate in the interviews. This section provides additional insights gathered from the seven respondents according to the generated themes. Participants from the interviews were given pseudonyms E1 to E7, while respondents from the questionnaire were referred to as R1, R2, etc.

Gamification: Enhancing Student Engagement and Motivation. E1 and E4 highlighted the motivational aspect of gamification, emphasising its role in engaging students through activities like video quizzes. This aligns with the findings of Zainuddin et al. (2019), who demonstrated that gamified e-quizzes significantly increased student engagement and motivation compared to traditional methods. E4 stated, "I think it's an excellent idea, especially for kids who are not motivated. They are more motivated if they see it as a game, not as a lesson". Similarly, R4 stated, "I find online games that are related to the topic or make personalised games on learning apps or crosswords, etc. Still very basic because I'm not that computer savvy, but I would be interested in learning more." On the contrary, E2 and E5 discussed the challenges of managing noisy classrooms during gamified activities, underscoring the need for more training and understanding to implement gamification techniques effectively. This echoes the concerns raised by Al-Azawei et al. (2016) regarding the need for adequate resources and training for educators to effectively apply new educational approaches.

Technology Integration: Fostering Inclusive Education. and engaging students with attention difficulties, showcasing the potential of technology to cater to diverse needs effectively. This aligns with the findings of Danielson et al. (2018), who noted that assistive technologies could help students with ADHD and ADD due to increased motivation and engagement during the learning process. E5 mentioned the potential use of speech-to-text software for students with dyslexia, stating, "Speech-to-text, they say. Speech-to-text could help". This is supported by Taran et al. (2022), who identified audiobooks, text-to-speech software, and visual aids as valuable tools for students with dyslexia. However, R7 also asserted that:

"I used to find ready-made games and quizzes with bonus points and game-like scoreboards; however, this impacts mostly young groups such as Year 7s and 8s (12–13 years).

The challenging part was that I couldn't rely solely on these types of quizzes as part of their assessments, as some students may not excel in digital skills as others. (R7)"

In addition, E7 expressed concerns about technology integration and the need for more explicit guidance from school administrations.

Tailored Assessments and Personalised Approaches. Participants E4 and E6 supported adapting assessments to effectively cater to diverse abilities, highlighting the significance of personalisation in enhancing student engagement and learning outcomes. This approach aligns with the UDL principles discussed by Luke (2021), emphasising the importance of providing flexibility and allowing learners to customise their learning experiences to meet their needs. Likewise, E3 emphasised the importance of personalisation in gamification, stating, "But it's important to personalise it, to make it personalised for each student because not everyone learns the same way." This was supported by R6, who stated, "I created card or board games for my students to make classwork more interesting. It was much more engaging than the pen-to-paper exercise."

Contrasting Perspectives and Challenges. While some participants found gamification motivating and effective, others had diverse responses. For example, E3 and E6 emphasised the importance of training and understanding to implement gamification effectively. Different levels of awareness also emerged. Likewise, R3 stated, "I'm not sure if it's the right way to teach, but I'm open to it. I need more training and understanding of how to use gamification effectively in my teaching practice." E3 and E6 highlighted the benefits of technology for personalised learning experiences, contrasting with E7's concerns about technology integration and the need for more explicit guidance from school administrations. Similarly, E2 and E5 showcased differing perspectives on using technology to enhance student assessments. E5 advocated for more training on available tools for technology integration. This variability in technology adoption aligns with the findings of Venkatesh et al. (2012), who emphasised that while technology offers promising solutions, it is not a panacea for addressing educational marginalisation.

The interviews and the questionnaire provided a comprehensive overview of the educators' perspectives on gamification, technology integration, and assessment strategies in education. The findings suggest that while some educators have successfully integrated gamification and technology into their teaching practices, others face challenges in effectively implementing these strategies due to limited training, resources, and guidance from school administrations. This underscores the need for comprehensive professional development programmes and transparent policies to support educators in leveraging innovative teaching methods and technology to create inclusive and engaging learning environments.

Furthermore, the emphasis on personalised approaches and tailored assessments highlights the importance of addressing students' diverse needs. As R9 mentioned, "I

used game-like quizzes because the students enjoy it, and they believe they're playing and challenging each other rather than getting tested." By adapting teaching methods and assessments to cater for individual learning styles and preferences, educators can foster a more inclusive and equitable educational system that empowers all students to reach their full potential.

Conclusions

The main objectives of this research were to integrate gamification and TAMs to foster inclusive education and enhance student assessment. The findings from both the quantitative and qualitative data confirm that integrating gamification and Technological Assistive Methods (TAMs) can effectively enhance inclusive education and improve student assessment outcomes in secondary schools. The implementation of gamified e-quizzes and tailored TAM interventions significantly increased student engagement, motivation, and formative assessment performance. Teachers highlighted how these strategies supported diverse learner needs and fostered a more collaborative and inclusive classroom environment. These results provide a solid foundation for understanding the benefits and challenges of using gamification and TAMs in educational settings. The following sections will offer recommendations and address the study's limitations for practice and future research to build upon these promising outcomes.

Implications and Recommendations

The need for more training on technology integration and gamification to enhance student engagement and learning outcomes is very important. As E5 stated, "They [the students] need hands-on in assessment." Also, educators need more precise guidance from school administrations on utilising tablets, computers, and digital tools to foster inclusive education and enhance student assessments effectively. This aligns with the recommendations of Al-Azawei et al. (2016), who highlighted the need for adequate resources and training for educators to apply new educational approaches effectively.

The researchers recommend personalised approaches and tailored assessments to meet diverse student needs. Educators need to be allowed to adapt assessments to cater to individual student abilities, recognising the potential of technology to facilitate personalised learning experiences. As E6 mentioned, "Thanks to continuous formative assessments, I create class discussions, interactive activities, and an adaptable approach based on feedback." This echoes the principles of UDL discussed by Rao and Meo (2016), who emphasise the importance of proactively designing curricula to be accessible to all learners from the outset.

Policymakers should develop and implement policies that promote inclusive education and address the diverse needs of students.

Limitations of the Study

One significant limitation of this study is the reliance on self-reported data from the online questionnaires and interviews. Self-reported data can introduce biases such as social desirability bias, where respondents may provide answers they perceive as more socially acceptable rather than their genuine opinions or behaviours. The study's sample consisted of 85 educators who completed the online questionnaire out of over 150 educators to whom it was sent, and seven who participated in the interviews. While this sample size provides valuable insights, it may not fully represent the broader population of educators. The optional nature of interview participation could lead to self-selection bias, where only those with strong opinions or experiences chose to participate, potentially skewing the results. Additionally, disseminating the questionnaire via email and MS Teams may have excluded less tech-savvy educators or those who have limited digital access, further impacting the sample's representativeness.

The findings of this study are based on data collected from a secondary school. While the insights gained are valuable, they may not directly apply to other educational settings in the Maltese islands with different cultural, socio-economic, and technological contexts. Future research should consider exploring similar studies in a broader range of academic environments to enhance the generalisability of the findings. Ensuring the confidentiality and anonymity of participants is crucial in educational research. While measures were taken to protect participant identities, online surveys and digital communication tools can pose challenges in maintaining data security and privacy.

Final Reflections

This research makes significant contributions to the field of inclusive education and assessment by providing empirical evidence and insights into the integration of gamification and TAMs in educational settings locally.

This research contributes to the ongoing discourse on the role of technology in education by exploring the potential of TAMs in addressing accessibility challenges and supporting diverse learners. The findings underscore the need for a holistic approach that combines technological solutions with inclusive pedagogies and a deep understanding of students' unique needs and backgrounds.

Additionally, this research adds to the growing literature on gamification in education by examining its impact on student engagement, motivation, and assessment practices in the Maltese environment. By exploring the perspectives and experiences of educators, this study provides valuable insights into the effective implementation of gamified learning experiences and the potential challenges that need to be addressed.

This research contributes to advancing inclusive education and assessment practices by bridging the gap between theory and practice. It offers a comprehensive understanding of the integration of gamification and TAMs while providing actionable recommendations for educators, policymakers, and researchers to foster inclusive and engaging learning environments that celebrate diversity and promote academic success for all students.

Notes on Contributors

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Robert Vella is from Gozo, Malta. In 1992 he graduated with a B.Sc. (Melit) in Computer Science and Mathematics. In the same year he joined the teaching profession in a secondary school in Gozo, Malta. In 1992, Robert followed the Pedagogy Course in Education and graduated in 1994. In the meantime, he followed various courses leading to IT certifications. In 2004, Robert was promoted to a Head of Department (Computing). In 2015, Robert graduated with a PGDEL (Melit) – Postgraduate Diploma in Educational Leadership, and in 2016 he graduated with a MA (Melit) in Educational Leadership and Management. In 2016 he joined The University of Sheffield where he read a PhD (School of Education), focusing on the perceptions and experiences of senior female educational leaders in Malta – he was awarded his PhD in February 2021. In July 2021 Robert joined MCAST (The Malta College of Arts, Science and Technology) as a Deputy Director (Gozo). Robert is also a lecturer, supervisor/examiner at MCAST for Master's programmes.

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