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Gamification in the U.S. Mathematics Classrooms: International Teachers' Perceived Impact on Student Engagement and Motivation

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Abstract. This study examines how international teachers working in secondary school mathematics classrooms in the United States (U.S.) perceive the impact of gamification on student engagement and motivation. Despite the increasing utilisation of gamification in mathematics instruction, there is a paucity of knowledge regarding how teachers trained outside the U.S. interpret its instructional value. A qualitative research design was employed, employing semi-structured interviews with four international mathematics teachers teaching across different U.S. states. The interview data were analysed thematically to identify patterns associated with student engagement and motivation. The findings indicate that teachers perceive gamification as fostering student participation, sustained attention, effort, and a willingness to engage with mathematics tasks. Teachers also reported heightened student interest, confidence, and persistence, while emphasising that these outcomes are contingent upon the design and management of gamified activities. Guided by Gamified Learning Theory, the study elucidates how game elements influence engagement and motivation by shaping learning behaviours rather than serving merely as rewards. The study concludes that international teachers regard gamification as a meaningful instructional approach when aligned with learning objectives and classroom needs. The findings highlight the importance of professional development focused on effective gamified task design and suggest that future research should further investigate international teachers' perspectives using larger samples and additional data sources. By foregrounding the voices of international teachers in U.S. mathematics classrooms, this study contributes to an underexplored area of the gamification literature.

Keywords: gamification; student engagement; student motivation; international teachers; mathematics education; U.S. classrooms

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1. Introduction

Gamification is increasingly employed in mathematics classrooms to integrate game elements such as points, live quizzes, competition, and immediate feedback into regular teaching activities without transforming the learning experience into a fully-fledged game (Deterding et al., 2011; Hamari et al., 2014; Sailer & Homner, 2020). Rather than supplanting traditional instruction, gamification enhances existing learning tasks by embedding selected game design features into instructional activities. Deterding et al. (2011, p. 10) define gamification as "the use of game design elements in non-game contexts." Within U.S. mathematics classrooms, educators frequently utilise digital platforms such as Kahoot and Quizizz to facilitate questioning, revision, and formative assessment, particularly during review and practice sessions (Göksün & Gürsoy, 2019; Wang & Tahir, 2020).

Research conducted by Hamari et al. (2014) and Sailer and Homner (2020) elucidates the instructional value of gamified approaches in mathematics education. In a study investigating the utilisation of Quizizz in secondary mathematics classrooms, Muchuweni et al. (2025) reported that "Quizizz consistently promotes active participation and motivation" (p. 106). Comparable findings across gamification research indicate that well-designed game elements can bolster student engagement and sustained effort in mathematics learning (Buckley et al., 2017; Ling et al., 2022; Alt, 2023). Larrosa et al. (2025) found that a gamified instructional tool fostered student motivation and enhanced global competencies among elementary school students, underscoring the broader applicability of gamified approaches across various grade levels.

Student engagement and motivation are intricately linked in mathematics learning, influencing how students participate in lessons, persist with challenging tasks, and respond to classroom activities (Fredricks et al., 2004). Empirical studies have demonstrated that gamification can affect both engagement and motivation by shaping students' learning behaviours during instruction (Alt, 2023; Ling et al., 2022). Consequently, engagement and motivation are employed in this study as key constructs for understanding how students respond to gamified instructional design in mathematics classrooms. These relationships are explored in greater detail in the literature review section.

Teachers' implementation decisions significantly shape the experience of gamification in classrooms. Educators' beliefs, confidence, and instructional choices influence the selection of digital tools, the structuring of activities, and the provision of feedback to students (Acevedo, 2020; Costley, 2022). Acevedo (2020; Khasawneh & Khasawneh, 2024) reported that teachers' perceptions of gamification impact the confidence and consistency with which it is utilised in daily instruction. Similarly, Youngberg (2024) found that teachers associate gamification with alterations in student participation and attention. Nonetheless, most perception studies continue to concentrate on local teacher populations, resulting in limited insights into how international educators operating in U.S. mathematics classrooms interpret the impact of gamification on student engagement and motivation; this is the primary focus of the present study.

1.1 Problem Statement

Low engagement and weak motivation continue to affect participation in U.S. mathematics classrooms. Ashcraft (2002) and Suárez-Pellicioni et al. (2016) demonstrated that mathematics anxiety reduces confidence and classroom involvement. Carey et al. (2016) explained that anxiety and poor performance in mathematics reinforce each other over time. These factors limit students' willingness to attempt challenging tasks (Fredricks et al., 2004). Gamification tools, notably Kahoot and Quizizz, are used to support student engagement in mathematics (Basuki & Hidayati, 2019; Capuno, 2023). Göksün and Gürsoy (2019) reported increased engagement during gamified mathematics activities, while Ling et al. (2022) showed improved motivation through gamified assessment (Alt, 2023; Wang & Tahir, 2020).

However, the success of gamification depends on how teachers design and manage these activities (Wang & Tahir, 2020; Buckley et al., 2017; Landers et al., 2017). Teachers' perceptions and instructional decisions, therefore, shape how gamification is enacted in classrooms (Hanus & Fox, 2015; Sailer & Homner, 2020). Acevedo (2020) demonstrated that teachers' beliefs influence implementation (Rivera & Garden, 2021). Youngberg (2024) examined teachers' views on engagement but focused only on local teacher populations. Similarly, research conducted outside the U.S. has explored teacher perceptions in other national contexts (Shumba, 2024).

As a result, there remains limited evidence on how international teachers working in U.S. mathematics classrooms perceive the impact of gamification on student engagement and motivation (Shumba, 2024; Ikpat, 2025). If this gap is not addressed, gamification may continue to be used without a clear understanding of how diverse teaching backgrounds affect its classroom use and impact (Dichev & Dicheva, 2017).

1.2 Rationale

International teachers working in U.S. mathematics classrooms bring with them professional training, classroom norms, and instructional experiences that have been shaped outside the U.S. education system. These differences in background may influence how teachers perceive student behaviour, classroom engagement, and the implementation of gamification. Despite this, their perspectives are largely absent from the existing literature on gamification in U.S. mathematics education.

Notably, Acevedo (2020) and Youngberg (2024) examined teachers' perceptions of gamification; however, these studies concentrated on local teacher populations. Consequently, there is a limited understanding of how international teachers in U.S. mathematics classrooms interpret the role and impact of gamification on student engagement and motivation. Within the context of teachers' interpretations of classroom practice, student engagement and motivation are central to this inquiry, as they reflect how students respond both behaviourally and affectively to instructional design, particularly in interactive and gamified mathematics learning environments. This study is therefore significant as it documents how international teachers understand the instructional value,

classroom influence, and limitations of gamification within U.S. mathematics classrooms. Their perspectives can contribute to professional development, instructional decision-making, and school leadership practices. Accordingly, this study seeks to answer the following research questions:

- How do international teachers in U.S. mathematics classrooms perceive the impact of gamification on student engagement?
- How do international teachers in U.S. mathematics classrooms perceive the impact of gamification on student motivation?

2. Literature Review

This section reviews the literature on gamification in mathematics education and teachers' perceptions of its impact on student engagement and motivation. The review aligns with the study's research focus and examines how teachers understand the influence of gamification on engagement and motivation in mathematics classrooms.

2.1 Teachers' Perceptions of Gamification and Student Engagement

Student engagement in mathematics is commonly described in terms of participation, attention, and willingness to take part in learning tasks (Fredricks et al., 2004; Kotsopoulos et al., 2020). Fredricks et al. (2004, p. 60) define engagement as "students' involvement in learning activities through behavioural, emotional, and cognitive participation." This definition indicates that engagement is not only about completing tasks but also about how students feel and think during learning.

Gamification is often employed by teachers to increase participation during mathematics lessons (Buckley et al., 2017; Göksün & Gürsoy, 2019; Muchuweni et al., 2025). Göksün and Gürsoy (2019) reported higher classroom involvement when Kahoot and Quizizz were used for questioning and revision in mathematics. Ling et al. (2022) noted that "one hundred percent of students … stated that they enjoyed doing mathematics questions on Quizizz" (p. 152). These findings highlight the role of game-based tools in enhancing visible student involvement during mathematics instruction.

Teachers' implementation decisions shape how gamification affects engagement (Hanus & Fox, 2015; Sailer & Homner, 2020; Carrión Candel et al., 2024). Acevedo (2020) and Costley (2022) found that teachers' confidence with gamification influenced how often they used it and how actively students participated. Youngberg (2024) reported that teachers perceived gamification as increasing students' willingness to answer questions, take risks, and remain engaged during lessons. However, these findings were largely based on local teacher populations.

Studies by Ikpat (2025) and Shumba (2024) conducted outside the U.S. further demonstrate that teacher perceptions vary by context. Ikpat (2025) discovered that teachers in Nigerian primary schools associated gamification with increased student participation and attention during lessons. Shumba (2024) reported that lecturers' readiness to use gamification influenced how students engaged in

learning activities. These findings suggest that teachers' backgrounds and teaching contexts shape their interpretation of the engagement value of gamification.

Despite this growing body of research, there is limited evidence focusing specifically on international teachers working in U.S. mathematics classrooms and how they perceive the engagement impact of gamification (Shumba, 2024; Ikpat, 2025). This gap indicates that little is known about how teachers trained outside the U.S. interpret student participation, attention, and involvement when gamification is implemented in U.S. mathematics lessons. Research Question 1 directly addresses this missing perspective.

2.2 Teachers' Perceptions of Gamification and Student Motivation

Student motivation in learning refers to students' reasons for participating in academic tasks and their willingness to put effort into learning (Ryan & Deci, 2000; Fredricks et al., 2004; Huitt, 2011; Reeve, 2012; Ryan & Patrick, 2009). Motivation is driven by students' need for "autonomy, competence, and relatedness," as described within self-determination theory (Deci et al., 2017). Students tend to be more motivated when they experience control over learning tasks, feel capable of success, and establish positive classroom connections. Teachers often view gamification as a means to support these motivational conditions by creating structured opportunities for choice, feedback, and participation (Sailer & Homner, 2020; Seaborn & Fels, 2015; Alajaji & Alshwiah, 2021).

Buckley et al. (2017) reported that gamification increased students' interest and willingness to complete learning tasks. Alt (2023) found that gamification in mathematics improved students' gaming motivation and their overall learning experience. Similar findings across mathematics and STEM contexts show that gamified activities can support persistence and effort when aligned with learning goals (Hamari et al., 2016; Ling et al., 2022; Sánchez-Arévalo et al., 2025). Building on a review of existing studies, Muchuweni et al. (2025) noted that "...Quizizz does more than just make lessons enjoyable; it can support deeper learning and long-term motivation…" (p. 118). These studies demonstrate a clear link between points, feedback, competition, and increased student effort.

Teacher interpretations and instructional decisions shape how motivational gains are realised in classrooms (Helvich et al., 2025). Acevedo (2020) showed that teachers believed gamification supported student effort and persistence when it was used consistently and purposefully. Youngberg (2024) reported that teachers associated gamification with increased student excitement, task commitment, and willingness to attempt difficult work. Similar conclusions have been reported in qualitative and mixed-methods studies, showing that teachers assess motivation based on changes in effort, persistence, and confidence rather than enjoyment alone (Costley, 2022; Wines, 2024; Hanus & Fox, 2015). These perceptions suggest that teachers do not solely observe surface-level engagement but also deeper motivational shifts in how students approach learning tasks.

Research conducted outside the U.S. supports similar views. Ikpat (2025) reported that teachers in Nigerian schools perceived gamification as strengthening students' motivation to participate and complete learning tasks. Shumba (2024) found that lecturers' readiness to use gamification influenced students' willingness to engage with learning activities. Comparable findings have been reported across international contexts, where teachers' beliefs, training, and instructional confidence shape how motivational benefits are realised in practice (Alabbasi, 2018; Colomo Magaña et al., 2024; Tootian, 2022).

Despite this growing body of international research, there remains limited evidence focusing specifically on how international teachers working in U.S. mathematics classrooms perceive the motivational impact of gamification. As a result, it is still unclear how teachers trained outside the U.S. interpret changes in students' effort, persistence, and willingness to learn when gamification is used. Research Question 2 directly addresses this missing perspective.

3. Theoretical Framework

This study is guided by Gamified Learning Theory (GLT) (Landers, 2014). Gamified Learning Theory explains how game elements such as points, quizzes, competition, time limits, and immediate feedback influence learning when incorporated into regular classroom activities, while emphasising that these elements do not improve learning on their own. Instead, they affect learning by altering how students behave during lessons. According to Gamified Learning Theory, gamification is effective when game elements are carefully aligned with lesson goals and classroom activities (Landers et al., 2017). Teachers play a crucial role because they decide how gamification tools are utilised, how activities are structured, and how feedback is provided. Consequently, student engagement and motivation depend on how teachers design and manage gamified activities rather than on the tools themselves.

In this study, Gamified Learning Theory is employed to understand how international teachers working in U.S. mathematics classrooms interpret the impact of gamification. The theory informed the focus of the interview questions and the thematic analysis by directing attention to observable learning behaviours. Student engagement is understood through behaviours such as participation, sustained attention, and willingness to engage in learning activities. Student motivation is reflected in student effort, persistence, and willingness to attempt challenging questions. These theory-informed behaviours guided how interview responses were examined and organised into themes related to engagement and motivation, in line with the two research questions. Figure 1 illustrates how Gamified Learning Theory is applied in this study.

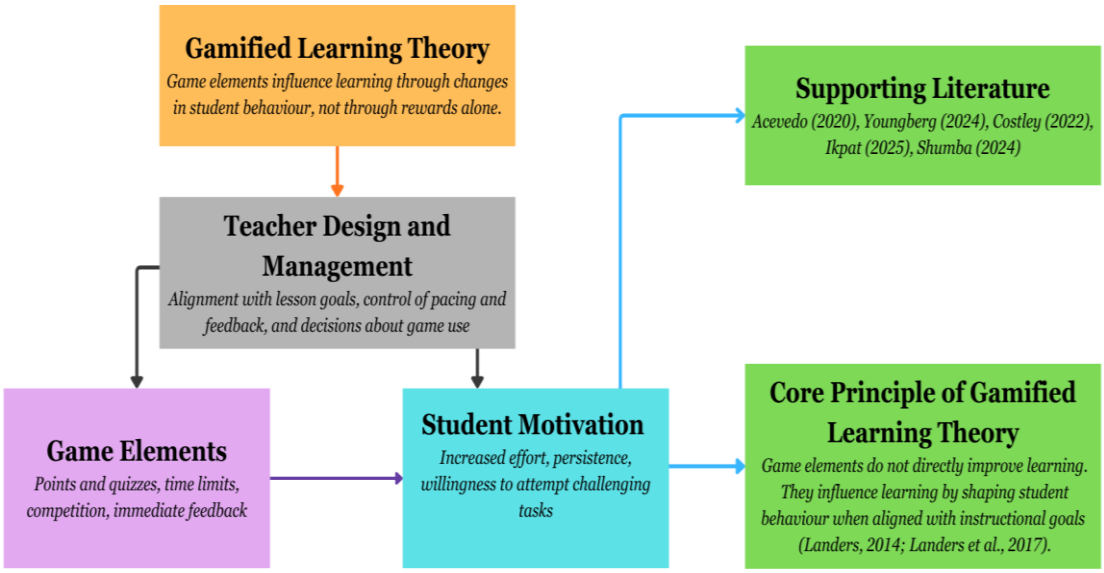

Figure 1: Gamified Learning Theory applied to the study context

4. Methodology

4.1 Research Design and Participants

This study employed a qualitative research design to explore how international teachers working in U.S. mathematics classrooms perceive the impact of gamification on student engagement and motivation. This approach was selected because the aim of the study was to understand teachers' experiences, views, and interpretations, rather than to measure outcomes using numerical data (Ravitch & Riggan, 2011; Ragin, 2014). A qualitative descriptive design allowed teachers to explain their understanding of gamification, how they utilise it in their classrooms, and how they interpret its influence on students.

The participants were international mathematics teachers currently teaching in U.S. schools. Purposeful sampling was used to select teachers who met specific criteria. To be included in the study, teachers had to be teaching mathematics in a U.S. school, have completed their initial teacher training outside the United States, have experience using gamification in their mathematics classrooms, and have at least one year of teaching experience in the U.S. These criteria ensured that all participants had direct experience within the U.S. mathematics classroom context.

The study involved four international mathematics teachers, which was appropriate for an exploratory qualitative design focused on gaining in-depth insight into teachers' perceptions rather than broad generalisation. Interviews were conducted individually online during the 2024 academic year, did not involve colleagues or group discussions, and each interview lasted approximately 15–20 minutes. Table 1 outlines the interview questions used to explore international teachers' perceptions of gamification's impact on classroom practice.

Table 1: Overview of semi-structured interview protocol

Research Question	Interview Focus	Example Prompt
RQ1: Student Engagement	Participation, attention, classroom involvement during gamified lessons	"How do students respond during gamified activities compared to traditional lessons?"
	Willingness to participate and take risks	"Do you notice differences in who participates when gamification is used?"
RQ2: Student Motivation	Effort, persistence, and confidence	"How does gamification affect students' effort or willingness to try?"
	Fear of mistakes and confidence	"Do students seem more or less afraid of being wrong during gamified lessons?"
Both RQs	Teacher decision making and challenges	"What challenges do you experience when using gamification?"

4.2 Data Collection and Analysis

Data were collected exclusively through semi-structured interviews. The interview questions concentrated on teachers' utilisation of gamification in mathematics lessons, their interpretations of student engagement and motivation during gamified activities, and the challenges they encountered. Interviews were conducted online to facilitate participation from teachers across various locations in the United States. Each interview lasted between 15 and 20 minutes. All interviews were audio recorded with participants' consent and subsequently transcribed for analysis. The data were analysed using thematic analysis as delineated by Braun and Clarke (2006). This methodological approach was selected as it enables researchers to identify, analyse, and report patterns of meaning within qualitative data.

The analysis process involved familiarisation with the data through repeated readings of the transcripts, generating initial codes pertaining to engagement and motivation, and consolidating related codes into broader themes. Coding and theme development were undertaken by the researcher, with continual reference to the theoretical framework and research questions to uphold analytic consistency. The themes were subsequently reviewed and refined to ensure they accurately reflected the teachers' perspectives, in alignment with the study's research questions. Engagement and motivation themes were analysed separately to maintain coherence with the two research questions.

As the analysis was conducted by a single researcher, intercoder agreement procedures were not implemented; instead, trustworthiness was ensured through systematic coding, reflexive engagement with the data, and transparent documentation of analytic decisions. All participants received an information sheet detailing the purpose of the study and provided informed consent prior to their involvement. Participant labels (Teacher 1–Teacher 4) were employed to safeguard participants' identities, and all data were stored securely and utilised

solely for research purposes. Table 2 presents sample codes and their organisation into themes.

Table 2: Sample codebook illustrating thematic analysis

Example Code	Meaning	Theme
"Everyone answers"	Whole-class participation during gamified lessons	Increased participation
"They stay focused longer"	Sustained attention during activities	Improved attention
"Not scared to be wrong"	Reduced fear of mistakes	Safe participation
"They keep trying"	Continued effort after mistakes	Persistence
"More confident"	Increased willingness to attempt tasks	Student confidence

5. Results

This section presents the findings from semi-structured interviews conducted with four international mathematics teachers employed in U.S. classrooms. The results are organised according to the two research questions and concentrate on teachers' perceptions of the influence of gamification on student engagement and motivation during mathematics lessons. The findings are presented thematically, incorporating verbatim teacher responses to illustrate key patterns and perspectives observed throughout the interviews.

5.1 Perceived Impact of Gamification on Student Engagement

The international teachers consistently described gamification as having a visible and positive impact on student engagement during mathematics lessons. Engagement was discussed in relation to participation, attention, and willingness to be involved in classroom activities (Fredricks et al., 2004). Through the interviews, teachers explained that gamified tools like Kahoot and Quizizz changed how students responded during lessons, particularly during review and practice.

All four teachers reported that gamification increased student participation in mathematics lessons. They noted that more students responded to questions when gamified activities were used compared to traditional whole-class questioning. One teacher observed that students who usually remained quiet became more involved when games were introduced, explaining that "*almost everyone wants to answer when Kahoot is on, even the students who normally do not raise their hands*" (Teacher 1). Another teacher described how gamification allowed the entire class to participate at the same time, stating that "*instead of a few students answering, everyone is involved because they all submit answers on their devices*" (Teacher 3).

Teachers also observed improved student attention during gamified mathematics lessons. Three teachers explained that students remained focused for longer when lessons included time limits, scores, and immediate feedback. One teacher noted that this was because "*they want to see how they are doing after each question, so they stay locked* in" (Teacher 2). Another teacher observed fewer off-task behaviours

during gamified lessons, stating that "*there are fewer distractions because the lesson moves fast and students are waiting for the next* question" (Teacher 4).

In addition, teachers reported that gamification created a classroom environment that encouraged students to participate without fear. They explained that students were more willing to attempt answers during gamified activities because mistakes felt less serious. One teacher explained that "*students are not as scared to be wrong because it feels like a game, not a test*" (Teacher 2). Another teacher shared that students who usually avoided answering questions became more comfortable participating, noting that "*they try more because it does not feel like they are being judged*" (Teacher 4). The teachers described gamification as a tool that supported active involvement during mathematics lessons. Increased participation, sustained attention, and a more supportive classroom atmosphere were identified as keyways in which gamification influenced student engagement across the four classrooms. Table 3 summarises engagement themes and supporting teachers.

Table 3: Teachers' Perceptions of the Impact of Gamification on Student Engagement

Theme	Description Based on Interview Data	Supporting Teachers
Increased participation	More students responded to questions during gamified lessons, with teachers noting that "*almost everyone wants to answer*"	Teacher 1
Whole-class involvement	Gamified tools enabled whole-class participation, as "*everyone is involved because they all submit answers*"	Teacher 3
Sustained attention	Students remained focused for longer periods, as teachers observed that students "stay *locked in*" during activities	Teacher 2, Teacher 4
Reduced off-task behaviour	Faster lesson pacing reduced distractions, with teachers noting "*there are fewer distractions*"	Teacher 4
Reduced fear of participation	Students were "*not as scared to be wrong*" and "*tried more because it did not feel like they were being judged*"	Teacher 2, Teacher 4

5.2 Perceived Impact of Gamification on Student Motivation

The four international teachers described several ways in which gamification influenced student motivation during mathematics lessons. Their responses focused on student effort, willingness to attempt questions, confidence, and persistence during gamified activities. Teacher 1 indicated that gamification encouraged students to put more effort into mathematics tasks. When asked whether students showed more effort, the teacher responded that students "*attempted each and every question*" during gamified activities. The teacher further explained that "*students who usually struggled with motivation became more willing to participate when gamification was used*." (Teacher 1).

Teacher 2 also described increased effort and persistence during gamified lessons, stating that "*students continued working through questions instead of stopping after making mistakes*." The teacher further explained that "*the game format encouraged students to keep trying rather than giving up*." Teacher 2 also noted that "*gamification helped students remain engaged even when questions became challenging*."

Teacher 3 linked motivation to increased interest during lessons, explaining that "*students respond more positively to mathematics when gamified tools are used, and they show greater enthusiasm*." The teacher added that "*this shows students are more willing to participate because the lesson feels different from traditional instruction*."

Teacher 4 shared that students showed increased confidence and reduced fear when gamification was used, stating that "*students who were usually hesitant became more comfortable attempting questions during gamified lessons.*" The teacher further noted that "*students were less worried about being wrong and were more open to participating during activities*." (Teacher 4).

Across the four interviews, teachers perceived gamification as supporting student motivation through increased effort, willingness to attempt questions, and reduced hesitation during mathematics lessons. These motivational changes were observed during classroom activities that incorporated game-based tools. Table 4 summarises the motivation themes and supporting teachers.

Table 4: Themes on Teachers' Perceptions of the Impact of Gamification on Student Motivation

Theme	Description Based on Interview Data	Supporting Teachers
Increased effort	Students attempted more questions during gamified activities ("*attempt each and every question*")	Teacher 1, Teacher 2
Willingness to attempt tasks	Students showed greater willingness to participate ("*more willing to participate*")	Teacher 1, Teacher 3
Increased interest	Students responded more positively to mathematics ("*respond more positively*", "*show greater enthusiasm*")	Teacher 3
Increased confidence	Students showed reduced fear ("*less worried about being wrong*", "*more comfortable attempting questions*")	Teacher 4
Persistence during activities	Students continued working after mistakes ("*continued working through questions*", "*keep trying rather than giving up*")	Teacher 2

6. Discussion

This section explains the significance of the findings and how they enhance our understanding of the role of gamification in U.S. mathematics classrooms. It focuses on how international teachers interpret the impact of gamification on student engagement and motivation. Rather than repeating the results, the discussion connects the observed patterns to the study's theoretical framework and broader concepts of teaching and learning. The section first addresses student engagement and then explores student motivation. These interpretations are also informed by the cultural and professional positioning of both the international

teachers and the researcher, as prior training, classroom norms, and educational experiences shape how gamification is understood and applied in U.S. mathematics classrooms. Figure 2 links key findings to Gamified Learning Theory and supporting literature.

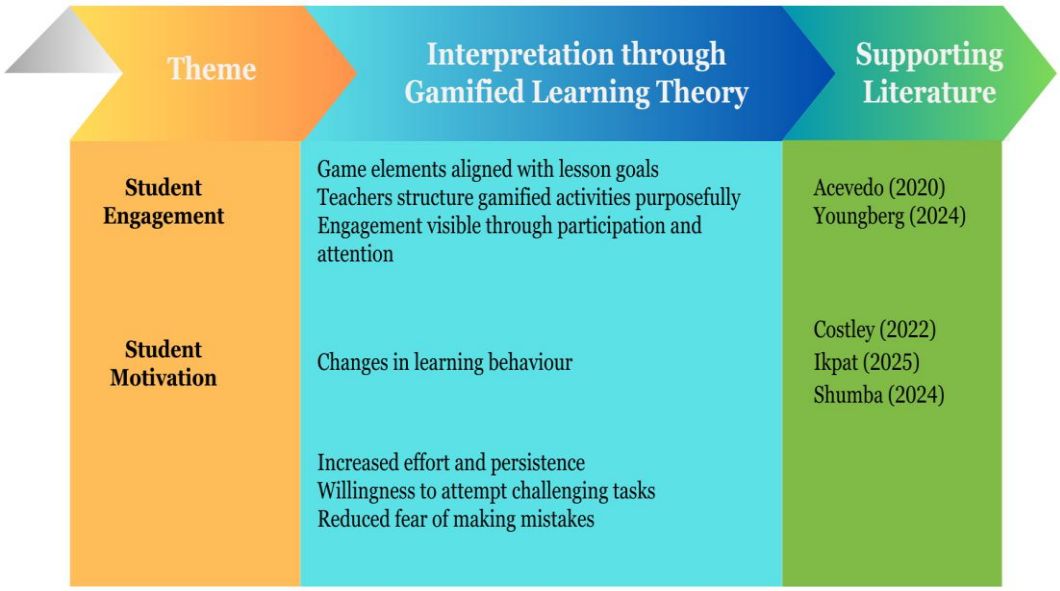

Figure 2: Results-to-Discussion Alignment through Gamified Learning Theory

6.1 Student Engagement

The findings on student engagement can be understood through Gamified Learning Theory, which explains how game elements shape learning by influencing students' behaviour during tasks (Landers, 2014). From the teachers' perspectives, engagement was reflected in increased participation, sustained attention, and greater comfort in contributing to classroom discussions, as demonstrated in teachers' verbatim descriptions of students "wanting to answer," "staying locked in," and "not being scared to be wrong" during gamified lessons (see Section 5.1). This interpretation aligns with the theory's focus on observable learning behaviours rather than instructional tools alone. Teachers associated these behaviours with specific gamification elements, including real-time feedback, time limits, visible scores, and whole-class response formats, which were intentionally used to maintain the pace of lessons and encourage broad participation.

The teachers' views are consistent with research by Acevedo (2020) and Youngberg (2024) on teacher perceptions of gamification. Research by Acevedo (2020) showed that teachers often judge engagement based on participation and willingness to respond. Youngberg (2024) reported that teachers associate gamification with increased classroom involvement and reduced hesitation. The international teachers in this study used similar indicators of engagement, suggesting that their interpretations align with existing research even though they were trained outside the U.S. education system.

The findings also emphasise the role of teacher decision-making. Gamified Learning Theory explains that game elements only support engagement when they are clearly linked to lesson goals (Landers et al., 2017). These findings suggest that teachers did not view gamification as automatically effective; instead, the structured use of Kahoot and Quizizz was seen as key to maintaining focus and active participation. This view is consistent with findings by Costley (2022) and Wines (2024), who reported that teachers see gamification as effective only when it is carefully planned and controlled. As this study relies on teacher interviews, interpretations of student engagement are based on teachers' professional judgements of observable classroom behaviours rather than direct student reports or classroom observations.

The findings indicate that international teachers bring unique professional perspectives to U.S. mathematics classrooms. Studies conducted outside the U.S. have shown that teachers' backgrounds shape how engagement is understood (Ikpat, 2025; Shumba, 2024). The teachers in this study interpreted engagement as meaningful participation rather than simple enjoyment. This adds an important perspective to the U.S. gamification literature, where international teachers' voices are still limited.

6.2 Student Motivation

The findings on student motivation can be examined through the lens of Gamified Learning Theory, which elucidates how game elements influence motivation by shaping students' task behaviours and learning experiences, rather than merely functioning as rewards in isolation (Landers, 2014). While engagement was primarily characterised as immediate classroom involvement during gamified lessons, teachers perceived motivation as a more sustained change, evidenced by students' continued effort, persistence, and willingness to tackle challenging tasks. The international educators participating in this study interpreted motivation as an increase in students' readiness to attempt tasks, heightened persistence, and diminished anxiety regarding errors during mathematics lessons, as reflected in teachers' verbatim accounts of students "attempting each and every question," "continuing after mistakes," and being "less worried about being wrong" during gamified activities (see Section 5.2).

These perspectives indicate that game elements can bolster motivation by rendering learning activities more approachable and less intimidating. Educators associated these motivational behaviours with instructional design choices such as low-stakes competition, repeated opportunities for response, and immediate corrective feedback, rather than solely with rewards. These views are in accordance with earlier research conducted by Acevedo (2020) and Youngberg (2024) regarding teachers' perceptions of gamification. Acevedo (2020) discovered that educators frequently associate gamification with enhanced student effort and persistence. In a similar vein, Youngberg (2024) reported that teachers regard gamified activities as fostering students' willingness to engage with challenging tasks. The international educators in this study articulated notions of student motivation in a comparable manner, suggesting a convergence with existing research despite variations in cultural and professional backgrounds.

Gamified Learning Theory also underscores that motivation is contingent upon the manner in which game elements are integrated with instructional objectives (Landers et al., 2017). These findings imply that motivation was not construed as arising from competition or rewards alone. Rather, motivation was understood as emerging when students felt secure in their participation and were inclined to engage without the apprehension of failure. This interpretation is corroborated by research indicating that educators value gamification for its capacity to alleviate anxiety and promote positive classroom experiences (Costley, 2022; Wines, 2024).

Research conducted by Ikpat (2025) and Shumba (2024) outside the United States supports these interpretations. Ikpat (2025) found that educators perceived gamification as enhancing students' willingness to participate and complete learning tasks. Shumba (2024) reported that teachers' readiness to implement gamification significantly influenced students' approaches to learning activities. Similarly, the international educators in this study correlated motivation with deliberate classroom utilisation rather than with the game tools themselves. The findings indicate that international teachers in U.S. mathematics classrooms interpret student motivation as a transformation in learning behaviour and attitude, not merely as an increase in enjoyment. This interpretation substantiates Gamified Learning Theory and contributes to the literature by illustrating how educators from diverse educational contexts comprehend the motivational role of gamification in mathematics learning.

7. Limitations

This study involved a small sample of international mathematics teachers working in U.S. classrooms. Given the limited sample size of four teachers, the findings are exploratory and are not intended to be transferable to all international or U.S. mathematics teachers. Consequently, the findings reflect only the experiences of these teachers and cannot be generalised to the broader population of international or U.S. mathematics teachers. The study relied on self-reported interview data, meaning the findings are based on the teachers' perspectives rather than direct classroom observations or student data.

Additionally, the teachers were drawn from different school contexts and states, which may have influenced how gamification was used and perceived. Credibility was supported through reflexive engagement with the data, careful alignment between the theoretical framework, interview questions, and thematic analysis, as well as the use of verbatim quotations to accurately represent the participants' perspectives. Despite these limitations, the study provides valuable insights into an underrepresented group of teachers and offers a foundation for future research.

8. Conclusion

This study examined how international teachers working in U.S. mathematics classrooms perceive the impact of gamification on student engagement and motivation. By focusing on teachers trained outside the U.S., the study addressed a gap in the gamification literature that has largely centred on local teacher populations. The findings suggest that international teachers view gamification as

an instructional approach that influences both how students participate in lessons and how they approach mathematics learning. Teachers described engagement and motivation in terms of observable classroom behaviours and learning attitudes, rather than entertainment. Gamified Learning Theory provided a useful lens for explaining these perceptions by demonstrating how game elements influence engagement and motivation through changes in learning behaviour, rather than rewards alone. By emphasising the voices of international teachers, this study adds an underrepresented perspective to U.S.-based research and provides a foundation for future work on how diverse teaching backgrounds shape the use and interpretation of gamified instruction.

9. Implications and Recommendations

The findings suggest that professional development should support teachers in designing and structuring gamified mathematics activities that promote meaningful participation and sustain motivation, rather than focusing solely on how to use digital tools. Schools should also recognise that international teachers bring diverse instructional perspectives that influence how gamification is applied in U.S. classrooms. Teachers may benefit from guidance on selecting game elements that encourage engagement without increasing pressure or discouraging certain students. In addition, future research should include larger samples of international teachers to better understand how professional backgrounds influence perceptions of gamification. Studies that combine teacher perceptions with classroom observations or student data could further strengthen the understanding of how gamification supports mathematics learning.

Conflict of Interest

The authors declare have no conflict of interest.

10. Acknowledgements

The authors independently completed all research work, analysis, and interpretation presented in this paper. The manuscript represents their original academic contribution. ChatGPT (OpenAI) was used only for minor language and grammar checks.

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