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Digital Gamification to Support Student Engagement in Social Studies Learning at Junior High School

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ABSTRACT

Conventional Social Studies instruction often leaves junior high school students passive, while the ways digital gamification supports different dimensions of engagement remain insufficiently understood. **This qualitative** case study examined a gamified Quizlet session on Toponimi (toponymy) in class VII A at a public junior high school in Brebes, Indonesia. Six purposively selected students participated in semi-structured interviews, supported by classroom observations and a brief comprehension test. Data were analysed using the interactive model of Miles and Huberman. **The study** aimed to explore behavioral, cognitive, and emotional engagement during gamified Social Studies learning and identify supporting and hindering factors. **Students described** greater attention, participation, and confidence, alongside more deliberate strategies such as recalling explanations and reasoning through difficult questions. Rankings and competition generated enthusiasm for some students but frustration and anxiety for others. Curiosity, peer comparison, and awareness of individual scores supported engagement, whereas perceived time pressure, application lag, and reliance on individual performance hindered it. **The findings** suggest that individual accountability may connect behavioral, cognitive, and emotional engagement within this setting. Digital gamification can support multidimensional engagement, but its effects differ across learners. Flexible ranking practices, reliable technology, and inclusive instruction are recommended. Findings concern perceived and observed engagement, not demonstrated improvements in academic achievement.

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1. INTRODUCTION

The UN General Assembly has set out Sustainable Development Goal 4 (SDG 4), which aims to ensure inclusive and equitable quality education and to promote lifelong learning opportunities for all [1, 2], a goal closely tied to the wider agenda of reducing inequality [3]. This goal is pursued through 21st century education, which shifts learning from a teacher-centred to a student-centred model in which critical thinking, creativity, communication, and collaboration become key competencies [4]. In Indonesia this direction is supported by national policy. The Merdeka Curriculum, regulated through the Minister of Education, Culture, Research, and Technology Regulation No. 12 of 2024, gives teachers room to design flexible and student centred learning that respects students' talents, interests, and abilities [5]. The Minister of Primary and Sec-

ondary Education Regulation No. 1 of 2026 on Process Standards further asks teachers to create learning that is mindful, meaningful, and joyful [6]. The 2022 results of the Programme for International Student Assessment (PISA), however, show that Indonesian performance remains far below the average of the Organisation for Economic Co-operation and Development (OECD) and has declined since 2018 [7]. Although PISA does not assess Social Studies, the results reflect wider problems of learning quality that also concern this subject.

Social Studies is meant to help students understand social, economic, cultural, and political issues and to grow into critical and caring citizens, which calls for continuous innovation in how lessons are delivered [8]. In practice, students often see it as a subject of facts to be memorised, and teacher-centred lessons tend to make them passive [4]. A lack of variety in teaching methods also weakens engagement in its behavioral, cognitive, and emotional forms [9, 10]. At the same time, Indonesian education is undergoing a digital transformation [11], and students' digital literacy increasingly shapes how they accept technology based learning [12]. Digital based learning is therefore a realistic option for Indonesian classrooms.

A similar situation was found in class VII A at SMPN 3 Brebes, Central Java, based on the researcher's direct observation. Social Studies instruction was dominated by lectures and relied on student worksheets known as *Lembar Kerja Siswa* (LKS). Students dozed off, remained passive, talked to one another, and gave incorrect answers in their LKS assignments because they had not understood the material. The school already had projectors and internet access, so the problem lay in how digital resources were used. Digital gamification through Quizlet was considered a suitable response because it offers quizzes with points, rankings, and immediate feedback, and it matches the call of the process standards for joyful and meaningful learning [6].

Research on gamification in education has grown, but most studies report general motivation or engagement and do not examine how gamification supports the behavioral, cognitive, and emotional dimensions simultaneously [13–15]. Existing engagement frameworks also describe the three dimensions without explaining what connects them when students compete individually in a gamified quiz. Empirical work on Quizlet based gamification in Indonesian junior high school Social Studies remains limited, and the factors that facilitate and inhibit engagement in this setting are underexplored. This study therefore has two objectives. The first is to analyse how digital gamification supports behavioral, cognitive, and emotional engagement in Social Studies learning. The second is to identify the factors that support and hinder engagement in Quizlet based gamified Social Studies learning at the junior high school level.

2. LITERATURE REVIEW

Gamification is the application of game elements such as points, badges, levels, and rankings to promote motivation and engagement in various activities [16]. It is also described as the incorporation of game design elements such as rewards, challenges, and feedback into non game contexts [17], and it has been applied in learning systems to raise participation and learning motivation [18, 19]. Game-based learning is different, because it uses a structured game designed around specific learning objectives, so that the game itself becomes the learning environment [20]. Popular games have even been used directly as learning media, for example to build vocabulary among English learners [21]. Gamification keeps the ordinary learning task and adds game elements to it. Two related terms also need to be separated. Self-regulated learning refers to the way students plan, monitor, and take responsibility for their own understanding and effort while completing a task [22]. Self-directed learning is broader and refers to learners taking the initiative to decide their learning needs, goals, and resources over a longer period [23].

Quizlet is a digital platform that offers flashcards, quizzes, and learning games. Quiz based gamified platforms of this kind have been reported to increase engagement in e-learning [13] and to support student engagement through feedback and learning recommendations [24, 25]. Students have also described Quizlet itself as an engaging gamified tool for learning new vocabulary [26]. Repeated practice and immediate feedback allow students to review material and correct their errors right away, which supports the wider digitalisation of learning in schools and universities [27, 28]. Gamification schemes are also increasingly built into learning management systems [29]. In this study Quizlet is treated as a gamified quiz platform rather than a full game-based learning environment, and the term self-regulated learning is used for the strategies students applied while answering the quiz.

Student engagement is commonly understood as students' behavioral, cognitive, and emotional involvement in the learning process [9, 10]. Behavioral engagement covers participation, effort, and persistence in learning activities. Cognitive engagement refers to psychological investment in learning and the willing-

ness to exert effort to understand complex ideas. Emotional engagement refers to affective reactions in the classroom, including interest, boredom, happiness, and anxiety [15, 30]. The three dimensions are interrelated. Attention during an explanation makes deeper thinking possible, the success or failure of that thinking produces emotions, and these emotions influence whether students remain attentive. Self-efficacy and learning anxiety also shape how confidently students plan their learning and how they cope with pressure. Existing frameworks, however, do not specify what links the dimensions in a particular activity. One possible link is individual accountability, a principle known from cooperative learning models in which each member is responsible for his or her own contribution [31]. Figure 1 presents the conceptual framework that positions digital gamification in relation to the three dimensions.

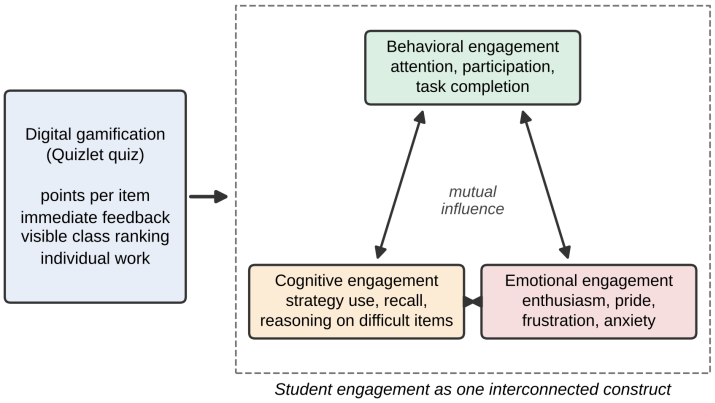


Figure 1. Conceptual framework of digital gamification and the three interconnected dimensions of student engagement

As Figure 1 shows, the gamified quiz provides points for each item, immediate feedback, a visible class ranking, and individual work. These elements are expected to act on engagement as a whole, while the two way arrows indicate that a change in one dimension can influence the others.

Many studies report positive outcomes of digital technology and gamification in learning. Meta-analyses report positive effects of gamification on academic performance [14, 32], adaptive learning systems have improved educational outcomes, and the integration of new technologies has been followed over time for its impact on learning [33]. Other studies point to risks. Poorly designed gamification can lead to shallow engagement, stress from competition, and a decline in intrinsic motivation when students focus on extrinsic rewards [34]. Public leaderboards can create peer pressure for middle and bottom ranked students [35], and anxious students tend to dislike them more than their peers [36]. The benefits of digital learning also depend on stable technical support [37, 38] and on whether learning technologies remain accessible to students with different needs and abilities [39]. These mixed results suggest that the effect of gamification depends on its design, on the learners who experience it, and on the dimension of engagement examined.

3. RESEARCH METHODS

This section describes the research design and participants, followed by the data collection and analysis procedures. The procedure is described in sequence so that other researchers can follow it in similar classrooms.

3.1. Research Design and Participants

This study employed a qualitative descriptive case study to examine students' behavioral, cognitive, and emotional engagement in Social Studies. A case study provides an in depth and contextual understanding of a phenomenon in its real setting. The case was limited to one class (VII A), one topic (Toponimi), and one gamified quiz session, which allowed the researcher to explore how engagement appeared in each dimension and which factors facilitated or hindered it.

The study was conducted at SMPN 3 Brebes because the school had adequate facilities for digital gamification while Social Studies instruction was still dominated by lectures and LKS assignments. Six of the

35 students in class VII A were chosen through purposive sampling based on their varied levels of classroom involvement, as observed before the session and confirmed by the Social Studies teacher, and on a balance of three female and three male students. Table 1 summarises the six participants, who are referred to by initials.

Table 1. Profile of the six key participants

Participant	Gender	Main pattern of experience
AP	Female	Mainly positive, less shy and more attentive
AU	Male	Mainly positive, more focused
DI	Male	Mainly positive, more strategic
LL	Female	Positive, with effort on difficult items
DW	Female	Mixed, enthusiasm and frustration
PA	Male	Mixed, appreciation and time pressure

Table 1 shows that the participants experienced the gamified quiz differently, which allowed both favourable and unfavourable experiences to be examined. The adequacy of six participants was judged by the depth of the data rather than by statistical representativeness, since saturation in qualitative interviews can be reached with a small sample when the group is fairly homogeneous and the aim is narrow [40]. The aim of the study was narrow, every participant had direct experience of the same gamified session, and the interviews produced detailed accounts. Data saturation was also checked during analysis, and no new codes emerged after the fifth interview, while the sixth interview confirmed the existing codes. The findings are therefore meant to be transferable to similar contexts rather than generalisable.

3.2. Data Collection and Analysis

The three dimensions of engagement were treated as analytical focuses that guided observation, test interpretation, and interview questions rather than as measured variables. Table 2 presents the definition, indicators, and instrument for each dimension.

Table 2. Engagement dimensions, indicators, and instruments

Dimension	Definition	Indicators	Instrument
Behavioral	Participation, effort, and involvement in learning activities [13]	Participation in question and answer sessions, engagement in the quiz, task completion	Structured observation sheet
Cognitive	Willingness to develop strategies and exert effort to understand complex ideas [9]	Strategy use, recall of prior explanations, reasoning on Higher Order Thinking Skills (HOTS) items	Brief comprehension test with analytic rubric
Emotional	Affective reactions, interest, and sense of belonging during learning [15]	Enthusiasm, frustration, anxiety, appreciation of the learning process	Semi-structured interview guide

Table 2 shows that each dimension was linked to a main instrument, while the other instruments were used to confirm the findings. The study also explored technical factors such as application stability, social factors such as peer competition and ranking, and personal factors such as self-reliance and time pressure. The teacher prepared a Toponimi study set in Quizlet with 12 multiple choice items, and students accessed it individually on their smartphones. Each correct answer earned points automatically, the platform showed immediate feedback, a ranking of all students was displayed at the end, and no explicit time limit was set. Table 3 shows how the items matched the curriculum objective that students can explain how place names reflect natural conditions, landforms, flora, fauna, and social change, in line with the learning outcomes of the Merdeka Curriculum [5].

Table 3. Alignment of the Toponimi quiz items with the learning objective

Items	Cognitive level	Indicator	Expected competency
1 to 7	Remembering and understanding	Identify the natural condition, landform, flora, or fauna that underlies a given place name	Recognise the basic relation between place names and the environment
8 to 12	Applying and analysing (HOTS)	Reason about how a place name reflects environmental or social change	Explain place names as evidence of human and environment interaction

Table 3 shows that the quiz did not only test memory of place names, since five items asked students to reason about relations between names, environments, and social change. The research followed the procedure in Figure 2, from preparation to analysis.

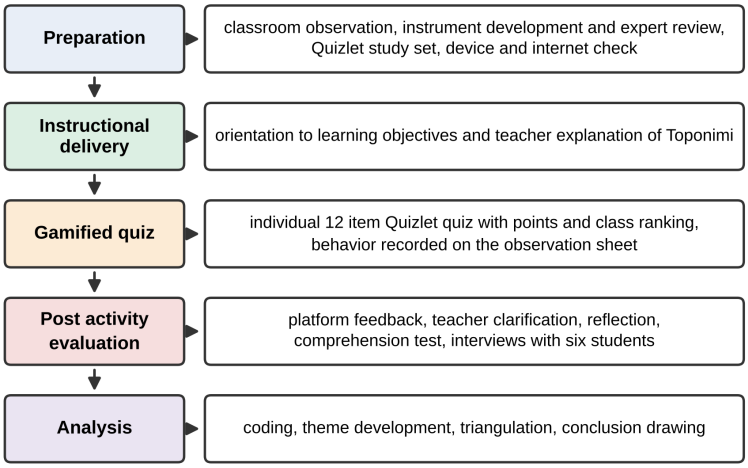


Figure 2. Research and learning procedure of the gamified Social Studies session

As Figure 2 shows, observation took place during the lesson, while the comprehension test and interviews took place after it. Before the session the researcher checked the projector, internet connection, and students' access to Quizlet. The 45 minute lesson followed the stages in Table 4.

Table 4. Sequence of the gamified Social Studies session

Stage	Activity	Duration
Orientation	Greeting, learning objectives, explanation of quiz rules, Quizlet access check	5 minutes
Instruction	Teacher explanation of the Toponimi topic	15 minutes
Quiz	Individual Quizlet quiz with 12 items, points, and ranking	15 minutes
Feedback	Immediate platform feedback and teacher clarification	7 minutes
Reflection	Brief reflection on students' learning experiences	3 minutes
Total		**45 minutes**

Table 4 shows that the quiz rules were announced at the start, so students knew before the explanation that their scores would appear in a ranking. The observation sheet recorded participation, engagement in the quiz, and task completion at each stage. Interviews were conducted individually in Bahasa Indonesia, audio recorded with consent, transcribed verbatim, and translated into English by the authors. The comprehension test consisted of 10 short answer items, and each student's answers were assessed with the analytic rubric in Table 5.

Table 5. Analytic rubric for the comprehension test

Criterion	Score 4	Score 3	Score 2	Score 1
Conceptual understanding	Explains the origin of place names accurately and completely	Mostly accurate with minor gaps	Partly accurate with clear gaps	Inaccurate or no explanation
Use of terminology	Uses Social Studies terms correctly throughout	Uses most terms correctly	Uses few terms or uses them loosely	Does not use relevant terms
Connecting concepts	Links names to environment and social change logically	Makes some relevant links	Makes weak or single links	Makes no links
Clarity of explanation	Clear, organised, and easy to follow	Mostly clear	Partly unclear	Unclear

Based on Table 5, total scores ranged from 4 to 16, with 13 to 16 categorised as very good, 10 to 12 as good, 7 to 9 as fair, and 4 to 6 as limited comprehension. The rubric indicated the depth of cognitive processing and was not a standardised measure of achievement. All instruments were developed from the engagement indicators [9, 13] and the research objectives and were reviewed by an experienced Social Studies teacher for content validity, clarity, relevance, and suitability for grade VII students. Unclear items were revised before data collection, and the use of a single reviewer is acknowledged as a limitation. The data were analysed with the interactive model of Miles and Huberman shown in Figure 3.

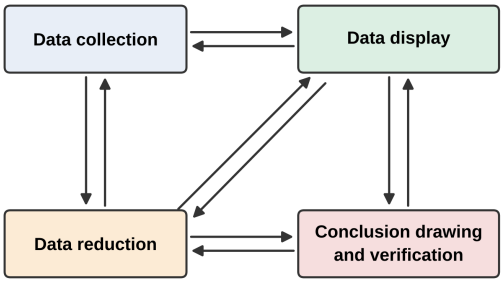


Figure 3. Interactive model of qualitative data analysis adapted from Miles and Huberman

Following Figure 3, data collection, data reduction, data display, and conclusion drawing were carried out repeatedly until data saturation was reached. Transcripts, observation notes, and test results were coded with deductive codes from the three engagement dimensions and inductive codes for supporting and hindering factors, and similar codes were grouped into themes following the steps of thematic analysis [41, 42]. Table 6 presents the resulting coding framework.

Table 6. Coding framework linking codes, themes, and research objectives

Objective	Theme	Example codes	Data sources
First	Behavioral engagement	less shyness, asking the teacher, anticipatory attention, staying focused	Interview and observation
First	Cognitive engagement	from guessing to strategy, recalling the explanation, step by step reasoning	Interview and test
First	Emotional engagement	enthusiasm from competition, pride in own process, frustration, anxiety	Interview and observation
Second	Supporting factors	ranking and peer comparison, curiosity about the format, awareness of consequences	Interview
Second	Hindering factors	perceived time pressure, application lag, anxiety of working alone	Interview and observation

Table 6 shows how each theme was tied to one research objective and to its data sources. A coding table was kept for consistency and traceability, the first author coded the data, and the coding decisions were discussed with the co-authors to reduce bias. Triangulation was performed by comparing observations, interviews, and test results. Informed consent was obtained from participants and their parents, participants could withdraw at any time, and initials are used in all reporting.

4. RESULT AND DISCUSSION

This section presents the results on the three engagement dimensions, which answer the first objective, and the supporting and hindering factors, which answer the second objective. The results are then discussed in relation to previous studies and relevant theories.

4.1. Result

The results are presented following the behavioral, cognitive, and emotional dimensions, then the differences among participants and the supporting and hindering factors. Each result is based on interview

quotations and compared with observation and test data where relevant.

In the behavioral dimension, students actively participated in the gamified lesson because they were curious about the quiz format. In conventional lessons they tended to answer only when called on, gave answers without confidence, and held back because of shyness and fear of being wrong. AP, a female student who rarely participated before, explained the change.

> *"Usually, I rarely ask questions or answer because I'm shy and afraid of getting it wrong. But after learning with interactive quizzes, I've become more active and less shy. In fact, earlier I was really paying close attention to the teacher while she was explaining the material that would be covered in the quiz, so that when the quiz started, I could get a high score." (AP, female)*

This statement shows that anticipation of the quiz raised attention during the explanation, not only during the quiz. The observation data support this account, as AP asked the teacher questions when she was confused, whereas she had remained silent in conventional lessons. AU, a male student, described a shift from dozing off to staying focused.

> *"Usually, when I listen to the teacher explain without any fun hands-on activities, I get bored quickly and end up taking a quick nap. But when I played this interactive quiz, I actually enjoyed it and chose to focus on finishing the quiz rather than slacking off." (AU, male)*

AU's account contrasts with the preliminary observation, in which students were recorded dozing off during lectures. Both statements show a shift from shyness, inattention, and drowsiness toward asking questions, listening, and staying on task, driven by the awareness that individual performance determined personal success.

In the cognitive dimension, students tended to shift from answering haphazardly to answering more carefully and strategically. DI explained this change.

> *"I used to just answer questions randomly, but after taking this social studies lesson using interactive quizzes, it made me think: if I want to win and earn points, I need my own strategy. It turns out that learning social studies isn't just about memorisation, you have to truly understand the material. So when there's a quiz like this, I don't just answer randomly." (DI, male)*

This statement reflects psychological investment in understanding rather than memorising, and the deliberate choice of a strategy is a feature of self-regulated learning as defined in the literature review. LL described how she handled the more demanding items.

> *"Learning social studies through interactive quizzes provides a unique motivation for me, as I have to give it my all to solve the quiz questions. Earlier, there was a question that I found difficult, a HOTS question, but from there, I tried to analyse it step by step and recall the material that had been explained." (LL, female)*

The difficult questions mentioned by LL correspond to HOTS items 8 to 12. Her strategy was carried out alone, which shows that the self-regulated strategies in this study were individual in nature, a characteristic of the score based gamification applied here. The test responses describe the depth of students' thinking but do not prove improved learning outcomes.

In the emotional dimension, students showed high enthusiasm, driven by competition among peers that made the classroom more lively. DW described both the excitement and the tension she felt.

> *"The interactive digital quiz session earlier was fun and exciting because I had to compete to get first place in the quiz. Everyone participated, so the classroom atmosphere was more lively, but on the other hand, I also sometimes got frustrated with myself when I accidentally pressed the wrong button or gave a random answer that caused my score to drop, and when I tried to answer quickly, the app suddenly lagged and wouldn't let me click." (DW, female)*

This statement shows the dual nature of emotional engagement when students work individually. Competition sparked ambition, but full responsibility for one's own score led to frustration over mistakes made under perceived time pressure and application lag, and DW directed this frustration at herself. PA described the more positive side of working independently.

> *"After participating in social studies lessons using interactive quizzes, I learned to appreciate my own learning process, because I had to work independently and focus on improving my understanding. On the other hand, I also struggled because of the limited time allotted for answering." (PA, male)*

PA's appreciation of his own learning process aligns with the definition of emotional engagement, yet he also felt short of time even though no time limit was set in the platform. Perceived time pressure was mentioned by more than one student.

Despite generally positive responses, the participants differed clearly. AP and AU felt encouraged and DI and LL described more careful thinking, while DW and PA felt considerable stress. For DW, the visible ranking that was meant to motivate her became a source of anxiety when lag pulled her score down, and PA felt constrained by time. These differences did not follow gender, since female and male students appeared in both groups. They were related more to how each student reacted to speed, mistakes, and public comparison. Gamification therefore has two sides, motivating some students while causing academic anxiety in those more sensitive to competition and technical problems.

In relation to the second objective, three factors supported engagement. The ranking system and peer competition fostered motivation and a sense of individual responsibility, curiosity about the quiz format made the lesson more interesting than worksheets, and awareness of the consequences of a low score encouraged students to listen closely from the start. Three factors hindered engagement. Perceived time pressure was consistently mentioned, technical problems such as unresponsive answer buttons interrupted students, and students felt anxious because they had to rely entirely on their own abilities. Some supporting and hindering factors came from the same features, as the ranking and individual work that motivated some students also pressured others.

4.2. Discussion

In relation to the first objective, digital gamification supported behavioral, cognitive, and emotional engagement in learning Toponimi. Students who had been reluctant to answer questions about place names became more confident and attentive because they wanted high scores, which shows that a gamification based assessment encourages participation even before the game begins. This aligns with the definition of behavioral engagement as participation, effort, and persistence, with the idea that game elements increase motivation and engagement, and with the studies on gamified learning systems reviewed in Section 2. In the cognitive dimension, students realised that good results required understanding how place names reflect natural conditions, landforms, flora, fauna, and social change, so they used targeted strategies and recalled the explanation independently. This fits the concept of cognitive engagement as psychological investment in learning and can be understood through self-efficacy, which shapes how confidently students plan their learning and how they cope with learning anxiety, although self-efficacy was not measured here.

The emotional dimension showed the most varied picture. Competition for high rankings made the classroom lively, in line with earlier findings that gamification raises engagement and motivation in e-learning. In relation to the second objective, however, the same ranking produced frustration and anxiety for DW and PA. This range of reactions fits the definition of emotional engagement, which includes both happiness and anxiety, and supports the warning in the literature that poorly designed gamification can create stress. A ranking that rewards quick and correct answers can disadvantage students who read slowly, think carefully, or use devices with weak connections, so they may receive low positions for reasons unrelated to their understanding. Anxiety of this kind can weaken the learning experience, as noted in the literature review.

The three dimensions interacted as a cycle, which supports the view of engagement as a unified construct. Awareness of personal scores first appeared in behaviour, as students listened closely and asked for clarification. This attention supported cognitive engagement, as students relied on their own understanding and analysed HOTS questions step by step. The success or failure of these strategies produced pride and excitement or frustration and worry, and these emotions in turn kept students focused or pushed them to answer hastily. The cycle was bound by one feature, namely that responsibility for both achievement and failure lay with each student. This study calls this mechanism individual accountability based engagement, as illustrated in Figure 4. Unlike accountability in cooperative learning, which operates within a group, accountability here existed without a group because each student worked alone and the ranking made each result public. The notion also differs from engagement frameworks that describe the dimensions without a connecting mechanism, and

from self-determination based explanations of gamification, which emphasise autonomy and enjoyment. The concept is provisional and needs testing in wider contexts.

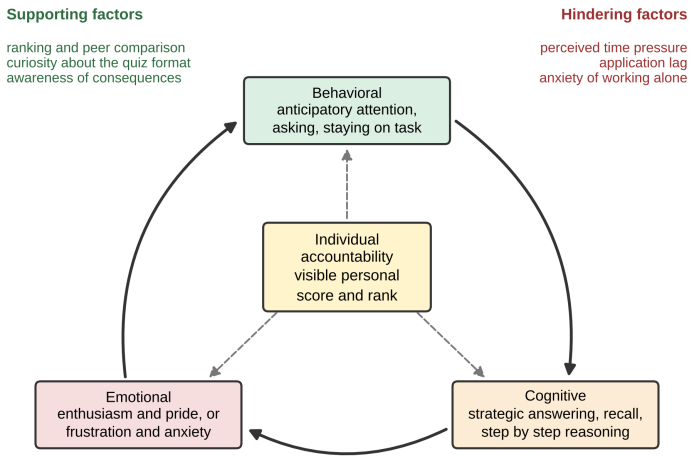


Figure 4. Individual accountability based engagement cycle with supporting and hindering factors

As Figure 4 illustrates, individual accountability sits at the centre of the cycle and acts on each dimension, while the supporting and hindering factors determine whether the cycle moves in a productive or a stressful direction.

These results reflect perceived and observed engagement rather than standardised assessments of achievement. Greater enthusiasm should not be taken as evidence of better examination results, especially because the comprehension test was given once and without a comparison group. Studies that examine the effect of educational technology on student performance measure learning outcomes directly, and similar designs are needed to test whether gamified engagement improves achievement in Social Studies. The study is also limited to six students, one class, one session, and one instrument reviewer, so further research with larger samples and direct measures of learning is needed.

5. MANAGERIAL IMPLICATION

The findings offer several implications for Social Studies teachers, school leaders, and developers of educational technology. Teachers who use gamified quizzes should announce the quiz before the explanation to encourage anticipatory attention, state clearly that there is no penalty for the time taken, and use the feedback stage to discuss errors rather than only praising the top ranks. Such practice supports the joyful and meaningful learning required by the national process standards. School leaders need to ensure that devices and internet access are reliable before gamified sessions, because technical lag directly turned enthusiasm into frustration in this study, and stable e-learning infrastructure is a precondition for effective digital learning. Platform designers should provide configurable features, such as allowing teachers to hide the public ranking, show students only their own progress, extend the time for HOTS questions, and save answers when the connection is unstable.

These steps connect directly to SDG 4, which calls for inclusive and equitable quality education and effective learning environments for all learners, and to the national commitment that every student receives education according to his or her abilities. Competitive elements should not hold back slower learners or students with limited devices, since accessible learning technologies are a condition for equal participation. Gamification that rewards understanding rather than speed allows every student to participate meaningfully without reinforcing existing educational inequalities, so that Social Studies becomes a meaningful, engaging, and inclusive learning experience.

6. CONCLUSION

This study demonstrates that digital gamification can support behavioral, cognitive, and emotional engagement in junior high school Social Studies learning on Toponimi, while producing different experiences across students. The findings reveal that gamified quizzes encourage greater attention and participation, promote self-regulated learning strategies, and generate both enthusiasm and anxiety. The study main conceptual contribution is the proposed mechanism of individual accountability-based engagement, which illustrates how personal responsibility for quiz performance may connect the three engagement dimensions. However, engagement is shaped by both supporting factors, including ranking systems, curiosity, and awareness of individual scores, and hindering factors, such as perceived time pressure, technical difficulties, and performance-related anxiety. These findings highlight that effective gamification depends not merely on competitive features but also on inclusive instructional design and reliable technological support. Practically, educators should balance competition with constructive feedback, flexible ranking practices, and appropriate learning conditions to promote meaningful participation, supporting the objectives of Sustainable Development Goal 4 (SDG 4). Nevertheless, the findings represent perceived and observed engagement rather than demonstrated improvements in academic achievement. Given the limited sample of six students from one classroom and a single learning session, future research should involve diverse educational settings, longer interventions, and validated assessment instruments to examine the transferability of the proposed mechanism and its relationship with learning outcomes.

7. DECLARATIONS

7.1. About Authors

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7.2. Author Contributions

Validation was conducted by: HS. Conceptualization was completed by: FM. The methodology was developed by: IP. Formal analysis was performed by: HS. Writing, review, and editing were carried out by: FM. Visualization was completed by: IP. All authors, including: HS, FM, and IP, have reviewed and approved the final version of the manuscript.

7.3. Data Availability Statement

The data supporting the findings of this study are available from the corresponding author upon reasonable request, subject to ethical considerations and participant confidentiality. To protect the privacy of the students involved, identifiable information and original interview recordings will not be publicly disclosed.

7.4. Funding

This research received no external funding.

7.5. Declaration of Competing Interest

The authors declare that they have no known financial or non-financial competing interests that could have influenced the research, analysis, or publication of this study.

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