

Research Article

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Development of Gamification-Based Economic Learning Media as an Effort to Optimize Differentiated Learning for Inclusive High School Students

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Abstract

Background/purpose. The purpose of this research is to analyse and aim to develop a gamification-based learning tool. This is due to the diverse learning needs and responds to the challenge of differentiated learning that is student-centred in the classroom rather than teacher-centred.

Materials/methods. The research method used is a research development (RnD) approach with the development model using the ADDIE model consisting of Analyze, Design, Development, Implement, and Evaluate stages. The media developed in this research includes interactive elements such as animations, videos, minigames, and quizzes, which can then be accessed through various platforms such as websites and applications.

Results. This research goes through the validation stage contained in the development stage. Validity is carried out by material, language, and media expert validation. Based on the results of the validity that has been carried out, it shows high feasibility with an average value of 96.15%. The implementation of the pilot test involving 35 students in a small class showed positive responses, with 93.30% of students feeling that this media increased their knowledge and motivation, 93.12% appreciated the visual design, and 73.75% of students stated that it was easy to use.

Conclusion. Finally, this study suggests that gamification-based learning media can be an effective tool to support inclusive and engaging education. Further research is recommended to test the effectiveness of gamification-based teaching materials in large classes with more than 35 students.

1. Introduction

Fundamental changes in human life are influenced by the recent accelerated digitalisation (Acemoglu & Restrepo, 2020; Alenezi, 2023). Indirectly, this era wants quality resources from educational institutions (L. Yang, 2024). These demands require major changes in national education (Mundy, 2023; Thakran & Sharma, 2016). Learning requires students to have the ability to think critically, communicate, create, and renew (Calavia et al., 2021; Dwyer & Walsh, 2020). This is the main capital to improve the quality of human resources (Chahar et al., 2019; Muñoz-Pascual et al., 2021). Quality and educated human resources make moving forward easier for a country (Huang et al., 2025; Zhang et al., 2025). Learning is part of the education process (Aulakh et al., 2025; Bagherimajd & Khajedad, 2025; Xie et al., 2025). Kaewunruen (2019) stated that learning is interactive educational communication between educators and students through strategies, methods, models, and teaching materials. The achievement of a learning process is marked by changes in behavior that are better in cognitive, psychomotor, and affective domains (Kuo et al., 2024; Owan et al., 2022).

The development of science and technology in classroom learning is no longer monopolized by the presence of educators, students learn anywhere and anytime according to their interests, learning styles, and needs (Lin & Muenks, 2025; Nirmala et al., 2022; Velu et al., 2025). Learning designers are required to be able to design and utilize various types of media, learning resources, and other aids (Dalle et al., 2018; Drysdale, 2019). Learning takes place in a fun, effective, and efficient manner (Davidovitch & Wadmany, 2025; Feiyue, 2022). This is in line with Nurhidayat et al (2024) who argue that 21st-century educators are expected to utilize technology in developing learning media to motivate students in line with their potential. Good learning quality if it can facilitate student needs. Each student has different uniqueness and characteristics (Rasskazova & Soldatova, 2023; Somerton et al., 2021; Vatsalan et al., 2022).

The paradigm of humanist education gives rise to inclusive education that provides opportunities for all children to receive quality education (Fitri, 2022; Nabiullina, 2015; Surjanti et al., 2022; Zhukova et al., 2022). The existence of inclusive education has the potential to provide a meaningful contribution to every child with their diversity (Ali et al., 2024; Hogan et al., 2025; Motitswe, 2025). Inclusive education is the implementation of multicultural education that helps students understand, accept, and appreciate others who have different ethnicities, cultures, values, personalities, and physical and psychological functions (Boyle et al., 2024; Parkhouse et al., 2019). All students can participate and succeed in regular classes (Cai & Lombaerts, 2024; Cheatham et al., 2017; Rodríguez-Dorta & Borges, 2017; Scager et al., 2017; Schoem et al., 2023). Systematic learning management in secondary schools will support the academic success of students with intellectual disabilities (Alqazlan et al., 2019; de Alvarenga et al., 2023; Thompson et al., 2023).

Meanwhile, gamification-based learning is needed to support inclusive learning (Gallego-Durán et al., 2019; Sitra et al., 2017). It is also a form of applying information technology in educational economics learning. Gamification is important in inclusive education because it utilises game mechanics, such as points, badges, and leaderboards, which are very useful for increasing intrinsic motivation and student engagement in the classroom (Abenes et al., 2023; Anderle et al., 2025; Luarn et al., 2023). It helps to accommodate students' diverse learning styles, interests and readiness in a differentiated learning setting (Tsay et al., 2018). The implementation of game-based learning should provide multi-modality content representation such as animation, video, text, and various action paths or minigames and quizzes (Pérez et al., 2018). This ensures accessibility and flexibility which are essential to meet the individual needs of diverse students in an inclusive environment while facilitating effective differentiation (Bamford & Moschini, 2025; Navas-Bonilla et al., 2025; Suresh Babu & Dhakshina Moorthy, 2024).

The underlying rationale for this research stems from the increasing need and trend in inclusive education as a strategy that addresses diverse needs and potential for differentiated learning with the support of gamification-based media to improve motivation and outcomes (Bernaschina, 2024; Navas-Bonilla et al., 2025). The gap addressed in this research is the lack of gamification-based economic learning media that has been specifically developed and validated (Kam & Umar, 2023; X. Li et al., 2024; Perez-Aranda et al., 2024), which designed to optimise differentiated learning for senior high school students with inclusive learning needs, particularly in the topic of service company accounting. Furthermore, this research aims to develop game-based economic learning media using the ADDIE model. The findings imply that educators can use specialised gamification-based media as a practical tool to effectively implement differentiated learning in inclusive high school economics classrooms, potentially improving student motivation and learning outcomes. The novelty of this research lies in the specific application of gamification principles in the context of differentiated learning for inclusive education in economics to high school learning, focusing on the development and concrete validation of a multi-platform (web/Android) learning media product centred on the topic of service company accounting.

2. Literature Review

2.1. Differentiated Learning and Inclusive High School Student

Differentiated learning is a learning activity process that takes into account the abilities, likes, and learning needs of students so that they do not get frustrated and feel like failures in their learning experiences (Nouman et al., 2024; Subban et al., 2025). The essence of differentiated learning is in line with the progressivism school that strongly supports the student-centered education process and aims to develop various aspects of individual abilities in facing the progress of the times and complexity (Bukamal, 2024; Cannella-Malone et al., 2021). While providing a variety of learning opportunities, it can support the academic success of students with disabilities (Hakim et al., 2015, 2020; Hoeh & Bonat, 2020; Hosshan, 2022; Price & Slee, 2021; Surjanti et al., 2022, 2024).

In an inclusive high school environment, characterised by significant diversity in terms of readiness, interests, learning profiles, and potential disabilities (Hosshan et al., 2024; Molina Roldán et al., 2021; Triviño-Amigo et al., 2022, 2023; Yazicioğlu et al., 2025). Differentiated learning is not only beneficial, but also essential to ensure meaningful access to the curriculum and equitable participation for all students (Hakim et al., 2018; Kurniawan et al., 2019; S. W.-Y. Wan, 2017). This approach requires flexible implementation of core strategies and differentiating content, as well as tracking what students learn, their understanding of managing and associating ideas, and the process by which students demonstrate learning (Chow, 2023; Lübke et al., 2021; Molina Roldán et al., 2021). Based on ongoing assessment and rooted in Universal Design for Learning (UDL) principles to proactively remove barriers and provide multiple ways to engage, represent, act and express (Griful-Freixenet et al., 2017; Veytia Bucheli et al., 2024). Effective differentiation in inclusive secondary schools thus moves beyond simple accommodations, but actively creates varied pathways towards rigorous learning goals. This promotes academic growth and independence among diverse students (D'Intino & Wang, 2021; Jager et al., 2025; Letzel et al., 2020; Lindner & Schwab, 2020; Nketsia et al., 2024).

Implementing differentiated learning effectively in inclusive high school settings, however, presents challenges, including teacher preparedness, resource constraints, and the complexity of managing diverse needs within larger classes (Gibbs, 2023). To address these, supportive structures like collaborative teaching models, flexible grouping strategies, and the integration of adaptable learning technologies are increasingly recognized as crucial facilitators (Bukamal, 2024). The ultimate goal of differentiation within inclusive education aligns with social justice principles: to provide every high school student, regardless of individual difference or disability, with appropriately challenging

and engaging learning experiences that maximize their potential and prepare them for future education, employment, and civic participation (Hosseini et al., 2024; Lindner & Schwab, 2020).

2.2. Gamification as Learning Media

Learning media are systematically arranged materials—encompassing information, tools, and texts—designed according to learning principles to facilitate the mastery of specific competencies (Yekela et al., 2024). The integration of technology within such media enhances its versatility, allowing application across all subjects and educational levels, thereby strengthening its necessity for modern pedagogy (Kurniawan & Lestari, 2019; Qureshi et al., 2021; Sahin & Yilmaz, 2019; Tawafak et al., 2021). Empirical support for technology-enhanced media is evident in studies demonstrating the efficacy of game-based platforms like Kahoot! in flipped classrooms (Dianati et al., 2020; Özdemir, 2025), interactive e-modules for diverse subjects (Batubara et al., 2022; Panjawayati et al., 2024), and specialized tools integrating contextual or subject-specific content such as Islamic economics and banking (Ariska & Hakim, 2021; Denisa & Hakim, 2021; Langgi & Hakim, 2021). This collective evidence underscores technology's role in creating adaptable and engaging learning pathways.

On the other hand, results of the research show that by utilizing various existing technologies as teaching materials, it will influence students to understand the basics of accounting and improve their competence. In addition, learning with interactive media is considered more enjoyable, effective, and attracts students' interest in learning (Cerya et al., 2021; Kartini & Putra, 2021; Voshaar et al., 2023).

One of the advantages of games as learning media is that they increase the logic of understanding a problem through game projects that can support the education process. Research conducted shows that game-based learning can improve student understanding (Byusa et al., 2022; Hartt et al., 2020; Ke et al., 2024; Patmanthara et al., 2019; K.-H. Yang & Chen, 2023). Gamification is an element of game design used to motivate, increase user activity, and improve memory. The gamification learning approach provides an alternative to make the learning process more interesting, fun, and effective (Alsawaier, 2018; De-Marcos et al., 2016; Lee, 2023; Osipov et al., 2015; Signori et al., 2018). Gamification-based learning media have been widely used in various fields of study, including engineering and pharmacy. According to (Brull et al., 2017; Mårell-Olsson, 2021; Moseikina et al., 2022; Raju et al., 2021) digital methods in the form of gamification help improve student knowledge (D. Li & Jianxing, 2025; Lyons et al., 2023). The use of games as a medium for learning accounting can improve student motivation and learning outcomes. This is in line with research (Fadhilah & Khairani, 2024; Haji Moradkhani et al., 2023; Wardana & Sagoro, 2019). Interactive learning media applications have a positive impact on the quality of learning (Aulia et al., 2024; Yaseen et al., 2025).

Based on the analysis data, the potential of gamification-based learning media research effectively improves fun, interactive, and active learning (Balaskas et al., 2023; Imran, 2023). Previous research on gamification was conducted related to: games, medium, students, and teachers. Meanwhile, another keyword cluster shows that learning and paper have a relation with gamification-based learning (Dehghanzadeh et al., 2024; Ho et al., 2022; M. Li et al., 2023; Slamet & Meng, 2025). Several studies stated that gamification media improves the concentration of ADHD students, improves learning outcomes, motivation, activity, interest, and better memory (Alabdulkareem & Jamjoom, 2020; Antonopoulou et al., 2022; Doulou et al., 2025; Lumsden et al., 2016; Mahmoudi et al., 2024; Sergis et al., 2024; B. Wan et al., 2021). Seeing this potential, the novelty of this research focuses on the development of gamification-based learning media for economic subjects, accounting service material to optimize the implementation of differentiated learning in Inclusive High Schools.

3. Methodology

This study employs the ADDIE research and development model, comprising five iterative stages like Analysis, Design, Development, Implementation, and Evaluation. As a structured framework, ADDIE facilitates systematic product development to achieve targeted outcomes with optimal efficiency and effectiveness (Crompton et al., 2024). Field trials for the gamification-based learning media will be conducted across distinct educational settings, an inclusive classroom environment at SMAN 4 Sidoarjo (Senior High School 4 Sidoarjo), and a mainstream classroom setting at SMAN 2 Sidoarjo (Senior High School 2 Sidoarjo).

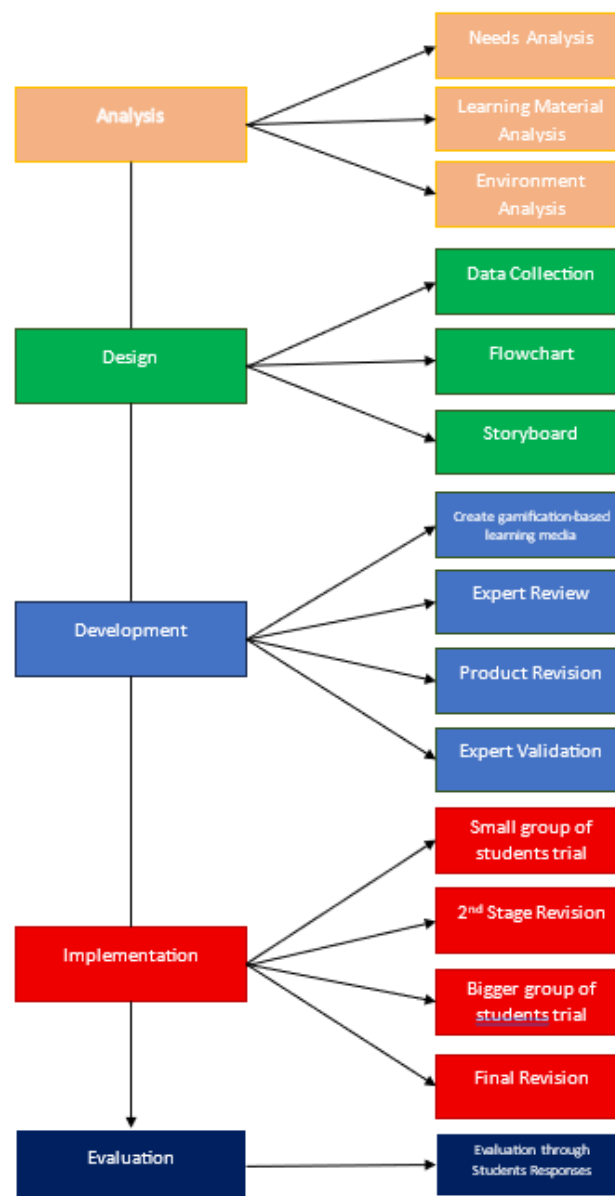


Figure 1. Research and Development Model

This product development-based research employed multimodal data collection strategies to holistically address developmental rigour and ecological validity (Andrade, 2018; Noroozi et al., 2019). Furthermore, semi-structured interviews were used to establish initial pedagogical requirements (Gaulke et al., 2024; Oplatka, 2018; Thille et al., 2021), while systematic classroom observations documented authentic learning phenomena and implementation barriers (Collier-Meek et al., 2019; Hagermoser Sanetti et al., 2018; Ketsman et al., 2024; Lowell & Tagare, 2023; Russo-Campisi, 2017; Splett et al., 2022). These formative techniques collectively informed the iterative

prototype through empirical insights on curriculum alignment and instructional challenges in inclusive settings (Pinger et al., 2018; Töllner et al., 2025; Wylie & Lyon, 2020).

The validation procedure adopted a three-tiered expert assessment protocol in which subject matter experts evaluated content accuracy, media experts assessed interface usability and technical functionality, and linguists scrutinised communicative clarity (Hemming et al., 2020; Noveanu et al., 2017). This collaboration ensures a comprehensive feasibility assessment across the content, media, and language dimensions. Finally, a structured questionnaire measured implementation outcomes by measuring learner engagement metrics, namely motivation, knowledge retention, and educators' classroom perceptions of pedagogical integration (Holmes, 2018; Lyon et al., 2018). In addition, the questionnaire was used to capture experiential data from 35 participants in different educational environments (inclusive/general classrooms).

Quantitative data were processed using a Likert scale. This scale is arranged in the form of a statement and followed by five responses shown in Table 1.

Table 1. Assessment Scores for Answer Choices

No.	Quantitative Analysis	Score
1.	Very good	5
2.	Good	4
3.	Enough	3
4.	Not enough	2
5.	Very less	1

The results of the assessment scores were averaged from a number of trial sample subjects and converted into assessment statements to determine the quality and level of usefulness of the resulting product.

Table 2. Learning Media Suitability Scale

Percentage Score (%)	Interpretation
81% - 100%	Very worthy
61% - 80%	Worthy
41% - 60%	Quite decent
21% - 40%	Not worthy
0% - 20%	Very inadequate

4. Results

The study uses a design study development, which started with stages analysis until evaluation, which refers to the model development ADDIE from Dick and Carey, which was also used in Crompton et al (2024). Model study development ADDIE consists of five stages, namely analysis, design, development, implementation, and evaluation. The ADDIE development model is a model that represents the stages systematically (organized) and systematically in use with the aim of achieving the desired results (Spatioti et al., 2023). The main objective of this development model is to design and develop a product that is effective and efficient (Mudjisusatyo et al., 2024). Implementation development material, teaching according to the ADDIE model, has now reached the development stage. The following are the results of the four stages that have been carried out by researchers:

4.1. Analysis Stage

This stage is done with activities of conducting needs analysis, learning material analysis, and environmental analysis. The following are the results of the development process description at the analysis stage:

1) Needs Analysis

The needs analysis revealed that in 2 schools, SMAN 2 Sidoarjo (Senior high school 2 Sidoarjo) and SMAN 4 Sidoarjo (Senior high school 4 Sidoarjo), through structured classroom observations and semi-structured interviews with 5 economics teachers both in Senior high school 2 Sidoarjo and Senior high school 4 Sidoarjo, critical systemic gaps were identified in the use of pedagogically appropriate learning media tailored to the needs of diverse students (Checa-Domene et al., 2024; Navas-Bonilla et al., 2025; Serrano et al., 2019), significant regional disparities in access to technology exacerbated by infrastructure inequalities (Duanmu et al., 2025; Feng et al., 2024; Zhou et al., 2019), inadequate professional development for teachers in the integration of differentiated media (Howorth et al., 2024), and widespread deficiencies in technology pedagogy skills among educators (Dinçer, 2024; Prestridge, 2017). These interrelated barriers manifest concretely in the classroom, where Grade 12 students demonstrate substandard mastery of basic accounting concepts (Park et al., 2019), which is directly attributable to the absence of adaptive resources and ineffective utilisation of technology (Tavares et al., 2023). Therefore, this development research establishes an empirically grounded framework for developing context-responsive teaching materials designed to address technological constraints while enhancing teacher capacity. A two-pronged strategy is essential to address pedagogical fragmentation and ultimately improve learning outcomes in economics education.

2) Learning Materials Analysis

Building upon the needs analysis findings—which highlighted deficiencies in accessible, engaging learning tools—this development phase employed a theory-driven approach. This research designed a web and Android-based gamified learning platform targeting fundamental accounting principles for service industries. This dual-platform strategy directly addresses regional technological disparities identified earlier, while utilizing gamification mechanics. For illustration, progress tracking, adaptive challenges were intentionally embedded to enhance intrinsic motivation and conceptual engagement—key precursors to improved learning outcomes (Kurniawan et al., 2025; Sailer & Sailer, 2021). The prototype prioritizes pedagogical efficacy over technological novelty, with usability and curriculum alignment as primary validation metrics.

The selection of a cross-platform web-Android architecture constitutes a strategic response to Indonesia's infrastructural heterogeneities identified in Phase 1. Namely the Progressive Web App (PWA) functionality ensures offline accessibility for regions with unstable connectivity, while the native Android implementation leverages high-penetration mobile devices to bypass teacher technological skill barriers (Irfan & Arifin, 2025). Crucially, usability validation transcends superficial engagement metrics. This research employs a multi-cycle Cognitive Walkthrough with target teachers to assess pedagogical navigability, coupled with heuristic evaluation for interface intuitiveness. Curriculum alignment is rigorously quantified with curricular mapping matrices, cross-referencing gamified modules with Indonesia's Learning Goal (Capaian Pembelajaran/CP) for accounting (Irfan & Arifin, 2025; Maryani et al., 2025). This systematic approach—prioritizing pedagogical fidelity over technological spectacle—explicitly targets the teacher training gap by embedding just-in-time instructional scaffolds within the platform itself, thereby operationalizing efficiency as reduced cognitive load and efficacy as demonstrable competency progression.

3) *Environmental Analysis*

This research optimizes differentiated instruction through gamification-assisted learning media, focusing specifically on service industry accounting within Indonesian high school economics curricula (Nguyen-Viet et al., 2025). The design is deliberately contextualized to Indonesia's educational ecosystem, addressing three critical policy-aligned dimensions, seems like enhancing inclusive learning and intrinsic motivation through evidence-based reward systems (Sailer & Homner, 2020), structural compliance with the Merdeka Curriculum (Indonesian Curriculum) social sciences competency framework targeting graduate profile attainment, and operational alignment with national priorities for needs-based pedagogical differentiation.

The gamification mechanics—including adaptive challenges and competency-based progression—directly respond to these tripartite requirements (Fiuza-Fernández et al., 2022). Thus, the application of gamification in learning accounting for service companies will transform abstract accounting concepts into scaffolded simulations, and the media simultaneously addresses inclusion gaps while embedding curriculum-mapped competency development. This approach operationalizes Indonesia's educational reform mandates, ensuring technological integration advances policy objectives rather than merely following trends.

5. Discussion

5.1. *Design Stage*

On stage, this researcher determines a format for media learning based on gamification. The results of the design stage are as follows:

1) *Media Selection*

The selection of gamification-based learning media is tailored to educational goals and characteristics of the participants, including the participants' educational style, time, and role of the media (J. Li et al., 2025; Toda et al., 2019). This gamification-based application makes it easier for students to learn economics and accounting material for service companies, so that the learning outcomes are obtained according to the standard. Participant students and teachers can use this learning media through a website that can be accessed on Google Chrome or Mozilla Firefox, and can be downloaded using the Play Store on an Android cellphone. This learning media application can be accessed by students using either a laptop or a smartphone.

2) *Process Initial Design*

In this process, researchers design learning media that are packaged in the form of applications, including pretests, material summaries, animated images, videos, minigames, quizzes, and posttests. The design is adjusted to the analysis that has been done in the learning material analysis stage and media selection stage.

5.2. *Development Stage*

Development done for developing product media gamification-based learning in the subject of economics, accounting material for service companies, starting from transaction evidence to closing journals. The level of media validity is obtained from the results of validation by media, material, and language experts. The following are the stages of gamification-based teaching materials that have been developed:



Figure 2. Product Development Results

The refined prototype underwent rigorous formative evaluation through expert validation. Then, it went through a critical quality control phase using a structured assessment instrument (5-point Likert scale) administered to subject matter experts, design experts, and linguists ($N = 5$). This systematic assessment aligned with the target of evidence-based refinement of the gamification materials prior to field-testing. Quantitative validity metrics (Cronbach's $\alpha > .85$ across all domains) and qualitative feedback were triangulated to optimise pedagogical coherence, adherence to multimedia principles, and linguistic accessibility, transforming interim designs into standardised designs in the learning process that were empirically pre-tested and ready for controlled effectiveness trials. The results are shown in Table 3, with expert validation test results below.

Table 3. Expert Validation Test Results

No.	Subject	Results	Criteria
1	Validation by Subject Matter Experts	97.24%	Very Worthy
2	Validation by Linguists	94.28%	Very Worthy
3	Validation by Media Experts	96.92%	Very Worthy
Average Validation By Experts		96.15%	Very Worthy

5.3. Implementation Stage

At this implementation stage, researchers will conduct trials of the learning media products that have been developed with student involvement. Researchers conducted a test limited to SMAN 2 Sidoarjo involving 35 students to find out the students' responses and trial and error during the use of the application. Researchers use a questionnaire at each school to find out the response of each student to the application product that has been developed. The learning media that will be tested have undergone a validation stage for their suitability by material, media, and language experts, as well as a limited trial. The results of the trial showed that 73.75% of students rated the media easy and comfortable to use (Software Aspects), then 93.30% of students stated that the media increases knowledge and Spirit learning (Learning Aspect), and 93.12% of students considered the appearance and features of the media interesting. (Visual Communication Aspects).

The empirical validation of this quasi-experimental study confirms that gamification-based learning significantly improves inclusivity in educational settings. These inclusive gains stem from

three main mechanisms, namely adaptive difficulty scaling that accommodates diverse cognition (Sailer & Homner, 2020) and multimodal content delivery that addresses varied learning preferences (Amalina, 2025). However, the challenges is in learning heterogeneous classrooms in Indonesia. Where technology access gaps still exist (Gayatri et al., 2023). This requires support from various parties, including the government, for equal access to technology. However, the gamification platform used in this study showed consistent engagement of 89% across regional subgroups (urban/rural), effectively operationalising the equity mandate of Merdeka Curriculum while increasing students' average accounting proficiency scores compared to conventional methods.

6. Conclusion

Based on the results of the research and discussion, the following conclusions can be drawn: the process of developing gamification-based economic learning media produces gamification-based learning media products for economic subjects, service accounting material in Inclusive High Schools using the R&D (Research and Development) Method, the ADDIE model consisting of five stages: Analysis, Design, Development, Implementation, and Evaluation. The feasibility of the developed learning media was assessed by experts, consisting of material experts, language experts, and media experts, who got an average score of 96.15%, with a very feasible category. The response of students to the development of this learning media was 73.75%, assessing the media as easy and comfortable to use (Software Aspect), 93.30% stated that the media increased knowledge and enthusiasm for learning (Learning Aspect) and 93.12% considered the appearance and features of the media attractive (Visual Communication Aspect).

7. Suggestion

1) Future research should conduct controlled experiments comparing the gamification-based media with traditional teaching methods in both inclusive and regular classrooms. Metrics such as academic performance, engagement levels, and knowledge retention should be measured over multiple semesters to statistically validate its effectiveness. This would clarify whether the media's benefits are consistent across different educational settings.

2) Investigate the media's effectiveness when scaled to larger student populations, including rural or under-resourced schools with limited technology access. Evaluate factors like internet bandwidth requirements, device compatibility, and teacher training needs to ensure equitable implementation. This would address practical barriers to adoption while maintaining inclusivity.

3) Explore the integration of AI-driven adaptive learning algorithms within the gamification framework to tailor content dynamically based on individual student progress and disabilities. Future studies could measure how personalized pathways impact outcomes for students with specific learning needs, further optimizing differentiated learning.

Declarations

Author Contributions. L.H. conceived the research idea and led the project administration. R.Y.K. and M.A.R. were responsible for the literature review and the development of the theoretical framework. M.D.B. and A.H. designed the methodology and performed the data analysis. M.H. assisted in data collection and validation processes. L.N. contributed to the interpretation of results and critical revision of the manuscript. Z.F.M.R. handled the visualization and formatting of the manuscript. All authors have read and approved the final version of the manuscript.

Conflicts of Interest. The authors declare no conflict of interest.

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Ethical Approval. (Please provide information on respect for privacy and approval by the ethics committee/ethical approval with the reference number) Ethical approval for this study was obtained from the Research Ethics Committee of Universitas Negeri Surabaya, University Approval Number: 0002/UN38.III.1/DL.01.02/2025

Data Availability Statement. The data that support the findings of this study are available from the corresponding author upon reasonable request.

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