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Developing ethnomathematics-based digital quizzes with gamification on the blooket platform

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Abstract: This study describes the development of an ethnomathematics-based digital quiz combined with a cultural context that was developed by applying the 4D methods of instruction (Define, Design, Develop, Disseminate). Focusing on the concept of number patterns, the quiz integrates local cultural elements from 3T regions such as weaving motifs, ceremonial structures, and traditional rituals to enhance relevance and engagement. The quiz items were designed to suit the Blooket platform, emphasizing short narratives, age-appropriate cognitive levels, and engaging gamification features that promote active learning. Validation results confirmed that the quiz items were content-valid, instructionally effective, and practical for classroom use. Limited trials demonstrated that the media significantly increased student motivation and engagement, particularly when mathematical concepts were presented through culturally familiar formats. Feedback from teachers and students indicated that the quiz holds promise as an inclusive and adaptive formative assessment tool, responsive to the realities of education in remote areas. The study recommends expanding the media to include a broader range of mathematical topics and cultural representations from across Indonesia. Integration with complementary learning resources such as thematic modules or game-based activity sheets, may further enhance its function as both an evaluation tool and a medium for independent, enjoyable learning. To ensure successful implementation, targeted teacher training in gamification strategies is essential, especially in schools with limited digital access.

Keywords: Ethnomathematics; gamification; Digital Quiz; 3T Education; Blooket

INTRODUCTION

Mathematics is a basic science that students often see as abstract and unrelated to everyday life (Santoso, 2017). This perception has an impact on their understanding and motivation to learn. Teachers and researchers have tried various ways to fix this, including through contextual approaches where students connect mathematical concepts to real-life situations (Mahmuti et al., 2025; Sugandi & Bernard, 2018). Ethnomathematics is one of approaches which works as a teaching strategy to connect mathematics concepts with local cultural practices, giving learning more context and meaning (D'Ambrosio & Brasil, 1980). Through the use of cultural contexts that are familiar to students, they are able to not only

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understand mathematical concepts more easily, but also realize that mathematics is part of their daily lives and identities.

The approach that links mathematics with local culture not only makes learning more meaningful, but also provides opportunities for innovation in teaching methods. There are several strategies to support this approach and increase student engagement in learning, such as gamification, which uses games to create interactive and enjoyable learning experiences (Matyakhan et al., 2024). This strategy creates a more engaging learning process and motivates students to actively understand mathematical concepts (Agustina et al., 2024; Septyana et al., 2024).

In the context of ethnomathematics learning, gamification can be used as a pedagogical tool that connects local cultural representations with mathematical concepts in a more interactive and easily understandable way for students. There are various platforms that can support this approach, including Blooket, a gamification-based platform that allows teachers to create interactive quizzes with various game modes (Nur'aeni & Hasanudin, 2023). Using Blooket, students not only practice answering questions, but also engage in games that encourage them to think critically (Y. D. Astuti, 2025). The various game modes also provide a more flexible and competitive learning experience, which encourages students to explore the connections between mathematics and their culture (Nur'aeni & Hasanudin, 2023; Pratama et al., 2024). Also, differently from some other platforms, the assignment mode on this platform gives each student the flexibility to choose the game mode they want so they can play at their own terms. Furthermore, the integration of ethnomathematics with gamification not only improves students' understanding of mathematical concepts, but also strengthens cultural identity in the learning process (Pratama et al., 2024).

The development of ethnomathematics-based digital quizzes on Blooket also contributes in improving the effectiveness of learning assessments (Y. D. Astuti, 2025). Compared to traditional evaluation methods, digital quizzes provide real-time feedback, allowing teachers to analyze student understanding more quickly and accurately (Nur'aeni & Hasanudin, 2023). In addition, this approach can reduce boredom in learning because students feel more engaged in the learning process through interesting games. The gamification feature not only tests students' understanding of concepts but also encourages them to actively participate in learning (Avşar et al., 2023; Kurniati et al., 2024).

The Blooket platform provides various features to help teachers assign tasks, including the question bank that can be used during the learning process. With this question bank, teachers only need to enter keywords related to the topic to be assessed. However, most of the available question banks are too general and do not integrate the local cultural context, especially the culture of the people of Southwest Maluku. Whereas, linking mathematical concepts with local values is the core of the ethnomathematics approach, which aims to make learning more relevant and meaningful for students. Therefore, it is important to conduct this research to develop gamified digital quizzes that are not only visually appealing and interactive, but also highlight the local culture as part of the mathematics learning activities.

The results of this study are expected to enrich the question bank with contextual content, particularly highlighting the local wisdom of Southwest Maluku.

The majority of gamified tools, including Kahoot, Quizizz, and Gimkit, still rely on generic question banks that lack cultural contextualization. While these platforms offer engaging game mechanics, they rarely incorporate local cultural elements that are central to the ethnomathematics approach. Prior studies have explored gamification in mathematics education and even linked it to cultural contexts, but few have focused on developing digital quizzes that explicitly embed the unique cultural practices of specific regions, such as Southwest Maluku. Moreover, platforms like Blooket offer flexible game modes and assignment features that allow for deeper personalization, yet their potential for supporting localized ethnomathematics content remains underexplored. This research fills a critical gap by developing digital quizzes grounded in ethnomathematics, hosted on the Blooket platform and thoughtfully aligned with the cultural heritage of Southwest Maluku. The study makes a unique contribution by emphasizing two key aspects. First, it seeks to enhance student engagement through gamified learning experiences. Second, it aims to strengthen cultural identity by embedding local wisdom into mathematics education.

Based on this urgency, this study addresses the topic of Developing Ethnomathematics-Based Digital Quizzes with Gamification on the Blooket Platform. The purpose of this study is to design, develop, and evaluate an ethnomathematics-based digital quiz that integrates elements of the local culture of Southwest Maluku through a gamification approach. This study aims to test the effectiveness of these media in increasing student motivation in solving problems that involve contextual mathematical concepts and local cultural contents.

METHOD

This research and development study uses the 4D model (Define, Design, Develop, Disseminate) to develop an ethnomathematics-based digital quiz using a gamification approach through the Blooket platform. The research was conducted at a vocational high school in Southwest Maluku, focusing on a class as the project test subject.

During media development, two expert validators were involved to assess the feasibility and suitability of questions in the platform, both in terms of material and local cultural aspects that were integrated. These validators consisted of a mathematics education lecturer with expertise in ethnomathematics and a mathematics teacher from a local school. The media that has been validated and revised then used by 22 students as initial users to assess the effectiveness of the media.

The instruments used in this research consist of expert validation sheets, student response questionnaires, observation sheets, and documentation of evaluation results through Blooket. Expert validation sheets are used to assess the validity of the developed media, including content, design, and suitability for learning evaluation purposes. Student response questionnaires were used to assess the practicality of the media in terms of usability, appeal, and flexibility. Observation sheets are used to observe student engagement during

the evaluation process, meanwhile evaluation results documentation is used to assess the effectiveness of media in facilitating interactive and enjoyable learning assessment processes. Descriptive quantitative and qualitative data analysis techniques were used, focusing on the validity, practicality, and effectiveness of the evaluation media developed.

The research procedure was conducted in stages that structured based on the 4D development model, with details of each stage as follows:

a. Define

This stage involved identifying key issues in mathematics learning, particularly the low student understanding of ethnomathematical concepts and the lack of engagement in digital-based instruction. To address these issues, a series of steps were undertaken to establish a foundation for media development that is both contextually relevant and pedagogically sound.

The process began with a literature review on ethnomathematics, gamification, and digital-based assessment to explore theoretical frameworks and practical approaches. This was followed by a needs analysis through classroom observations and interviews with teachers and students, which revealed specific difficulties in delivering mathematics content effectively. Based on these findings, an initial conceptual design was formulated for a digital quiz that integrates local cultural elements with mathematical concepts. This design serves as the basis for further development in the subsequent stages of the research.

b. Design

This stage involves designing a digital quiz that is integrated into the Blooket platform as a gamified evaluation media. This includes developing questions based on basic competencies, preparing questions with local cultural elements from Southwest Maluku, and adjusting the questions' format to fit the Blooket platform.

The assignments are also designed to have different levels of difficulty and cultural context, ensuring that each item can stand alone as a meaningful learning stimulus. Although the assignments are displayed randomly on the Blooket platform, the content structure is designed to encourage student engagement, reinforce conceptual understanding, and integrate local values into the evaluation process.

c. Develop

This stage involves developing a digital quiz based on the design that has been prepared. The questions were imported into the Blooket platform, considering the game mode that would best increase student engagement. Once the quiz prototype was developed, expert validation was conducted to assess the content, question construction, and suitability with ethnomathematics. The experts' feedback then led to revisions and improvements to the product.

Once the quiz was uploaded, a limited trial was conducted with a group of students in Southwest Maluku to gain insights into how they responded to questions contextualized with local culture, particularly in the topic of number patterns. During this trial, the researcher observed technical aspects (such as accessibility and quiz navigation), pedagogical aspects

(conceptual understanding and responses to answer choices), and affective aspects (student enthusiasm, engagement, and enjoyment).

To systematically measure student motivation, the student response questionnaire included several Likert-scale items targeting indicators such as interest, enjoyment, perceived challenge, and willingness to participate in similar activities in the future. Data from both observations and questionnaires were used as feedback to refine the media before broader implementation in the learning assessment process.

d. Disseminate

During this stage, the developed digital quiz was distributed through the Blooket platform by sharing the quiz link with teachers and the educational community. The questions that have been designed are also included in the platform's question bank, so that other users can access and utilize them openly. Moreover, the results of the development were published in scientific articles to disseminate the process, approach, and findings of the research to the academic community. Therefore, the developed products not only used in learning practices, but also contribute to the development of knowledge in the field of education.

RESULTS AND DISCUSSION

The results of the evaluation media development are described following the 4D model stages, which include Define, Design, Develop, and Disseminate, and are described systematically in the following section. This model is used to ensure that ethnomathematics-based digital quizzes and gamification developed on the Blooket platform are designed using a systematic approach.

1. Define Stage

The define stage of this study aimed to identify the core challenges in mathematics education within 3T regions and to formulate the direction for developing evaluation media that is both contextually grounded and digitally based. The analysis conducted during this stage involved three key steps: a literature review, a needs analysis, and the formulation of an initial media design.

a) Literature Review

This stage began with a literature review on ethnomathematics, gamification, and digital-based assessment. The review highlights that ethnomathematics holds great potential to bridge the gap between abstract mathematical concepts and students' lived experiences by integrating local cultural content (E. P. Astuti, 2025; Pratiwi et al., 2022; Sarwoedi et al., 2018). Prior studies emphasize that integrating local cultural content such as traditional patterns, tools, and practices can foster deeper conceptual understanding and cultural pride.

Gamification, meanwhile, has consistently demonstrated its effectiveness in boosting learning motivation (Auliyah & Kusaeri, 2024; Matyakhan et al., 2024). While previous studies often highlight general motivational benefits, this study specifically investigates how the use of game mechanics such as avatars, rewards, and thematic customization within the Blooket platform can foster increased engagement and enthusiasm among students.

Digital assessment platforms like Blooket offer interactive formats that support formative assessment, allowing teachers to monitor student progress in real time and adjust instruction accordingly (Y. D. Astuti, 2025; Nur'aeni & Hasanudin, 2023; Septyana et al., 2024). Compared to traditional paper-based tests, these platforms provide immediate feedback, adaptive question delivery, and flexible access, the features that are particularly valuable in remote or resource-limited settings.

Despite these promising findings, few studies have examined the intersection of gamification and ethnomathematics within digital platforms. This research addresses that gap by designing media that not only motivates but also embeds cultural identity into the learning process.

b) Needs Analysis

Classroom observations and interviews with teachers and students in Southwest Maluku revealed persistent challenges in mathematics instruction. Lessons were largely teacher-centered, with minimal use of contextual or culturally relevant materials. Teachers noted that students often disengaged from mathematics due to its abstract nature and lack of connection to their lived experiences.

Assessment practices were similarly limited, offering little opportunity for formative feedback or student agency. Yet, the region's rich cultural landscape including woven motifs, lutur batu (stone carving), traditional dances, and ceremonial practices that offers untapped potential for embedding mathematical ideas in familiar contexts.

Students expressed strong interest in game-based learning tools that combine entertainment with cognitive challenge. Teachers emphasized the need for practical, ready-to-use resources that connect mathematical concepts to local environments while incorporating motivational assessment strategies. These findings underscore the importance of media that is pedagogically sound, culturally resonant, and digitally engaging.

c) Initial Media Design Formulation

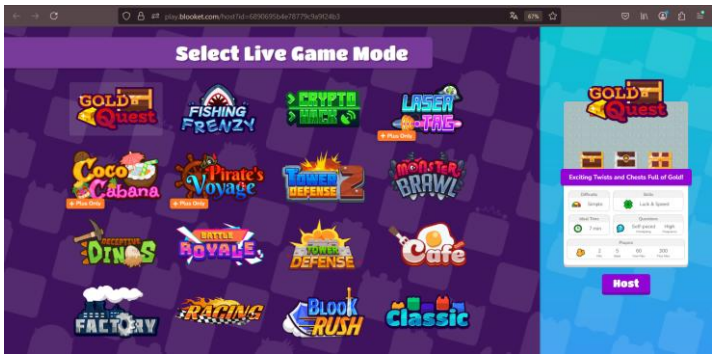

Figure 1. Twelve various game modes on the Blooket platform

Based on the literature and field data, an initial design for a digital quiz was formulated that integrates mathematical concepts with elements of local culture, presented through the interactive Blooket platform. The visual platform is attractive because it has twelve various flexible game modes (Figure 1), allowing teachers to adjust the type of evaluation to the students' learning styles. This platform is also web-based allowing students to access it without installing additional applications. This provides greater accessibility for students,

particularly in areas with limited digital resources. The avatar feature and virtual reward system also enhance motivation and make the evaluation process more competitive and interactive.

Support for asynchronous assignment mode, which can be provided for up to 14 days in free mode or 1 year in premium mode, also gives students the flexibility to access quizzes independently. This mode also gives students the opportunity to experience nine various game themes according to their preferences, allowing them to freely choose themes that suit their interests (Figure 2). Once the quiz is completed, teachers receive detailed and automated results reports, which facilitate error analysis and follow-up learning planning. With this combination of features, Blooket is considered a platform that is not only technically adaptive but also relevant to support the integration of local culture in digital mathematics learning.

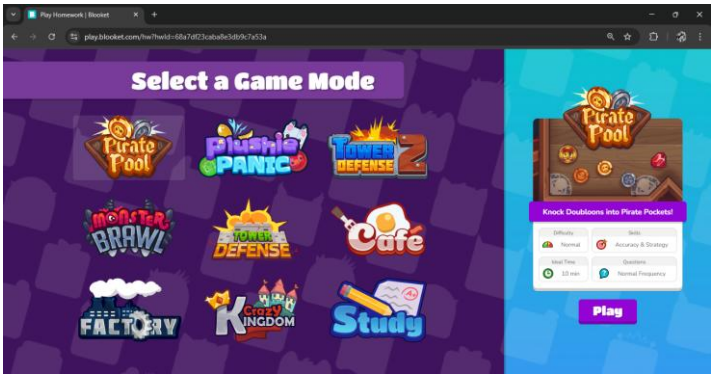

Figure 2. Nine game mode options when working in assignment mode

In the initial design, each quiz item was designed to represent ethnomathematics concepts from local cultural practices, with visual and verbal narratives adjusted to the students' social context. For instance, questions about number patterns were compiled with reference to traditional fabric motifs (Dahoklory et al., 2023), stone carving traditions (Sugiarto et al., 2024), and inter-island boat travel in Southwest Maluku (Kurniati et al., 2023). The use of Blooket not only creates a fun learning experience but also strengthens the relevance and closeness of meaning between the learning content and the students' cultural identity.

2. Design Stage

The design stage focuses on developing a digital quiz design that integrates mathematical concepts with cultural elements through an ethnomathematics approach. In this stage, researchers begin to arrange game-based evaluation content and formats by considering the social context of students and the features available on the Blooket platform. The main focus includes selecting relevant culture-based mathematical concepts, providing questions that suit the interactive game mode, and having the design validated by experts to ensure that the developed media is pedagogically and contextually appropriate.

a) Selection of relevant culture-based mathematical concepts

The initial step in this process begins with the identification and selection of mathematical concepts related to the local culture of Southwest Maluku. The selection was based on educational potential, the closeness of the concept to students' daily experiences, and the representation of meaningful cultural values. Mathematical concepts related to the local

culture of Southwest Maluku that have been introduced in previous studies include number pattern associated with weaving patterns (Dahoklory et al., 2023), such as the repetition of odd-even motifs or geometric sequences in thread arrangements, the concept of lutur batu (Sugiarto et al., 2024), which is a circular stone structure used to mark territorial boundaries, and various traditions, traditional dances, and traditional ceremonies in Southwest Maluku (Kurniati et al., 2023; Lekitoo et al., 2024).

Among these, number patterns were selected as the central focus of the digital quiz. This decision was based on both pedagogical and empirical considerations. First, number patterns are foundational to students' understanding of more advanced mathematical concepts, particularly in algebra and logical reasoning (Rizos & Gkrekas, 2024; Yasin & Nusantara, 2023). Mastery of this topic contributes significantly to the development of students' numeracy skills. Second, the visual and repetitive nature of number patterns makes them highly adaptable to contextual approaches, especially when linked to cultural artifacts that exhibit similar mathematical structures. These include traditional weaving motifs, lutur batu formations, rhythmic sequences found in dances, and ceremonial arrangements. Each of these cultural elements reflects underlying patterns that can be interpreted through mathematical representations (D'Ambrosio & Brasil, 1980; Rumtutuly et al., 2025).

Third, a review of existing quiz content on the Blooket platform revealed that most number pattern items remain generic and lack cultural contextualization, particularly for students in island regions. This gap highlights the need for educational media that not only aligns with curriculum standards but also reflects students' cultural identities and everyday experiences. To ensure the relevance and effectiveness of the selected concept, the integration of culture-based mathematics into the digital quiz was guided by three key considerations: the concept should exhibit a regular or repeating quantitative structure, be familiar and recognizable within students' local cultural context, and be adaptable into short narrative-based questions that suit the interactive mechanics of Blooket games.

b) Formulating questions compatible with interactive game modes

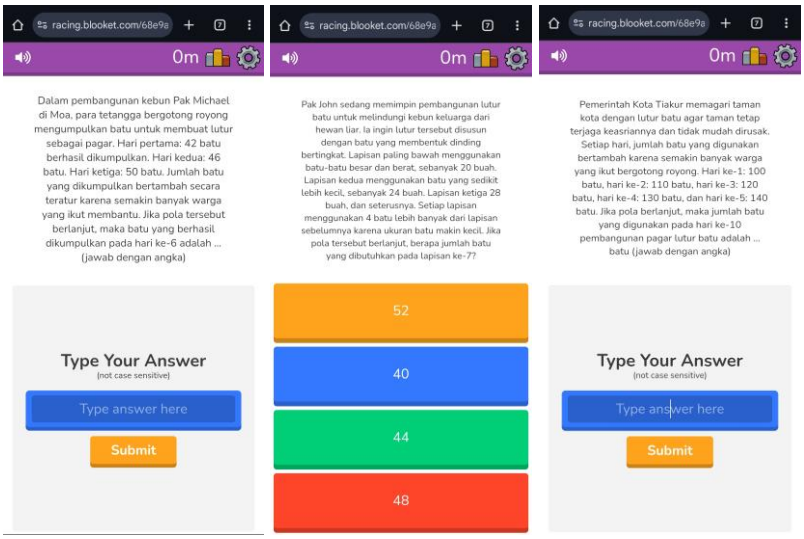

Figure 3. Appearance of questions on the Blooket platform in students screen

Translate in English

1. In the construction of Mr. Michael's garden in Moa, the neighbors worked together to collect stones to make a fence. First day: 42 stones were collected. Second day: 46 stones. Third day: 50 stones. The number of stones collected increased steadily as more and more residents joined in to help. If this pattern continues, the number of stones collected on the sixth day will be ... (answer with a number)
2. Mr. John is leading the construction of a stone wall to protect his family's garden from wild animals. He wants the wall to be built with stones that form a tiered wall. The bottom layer uses 20 large, heavy stones. The second layer uses 24 slightly smaller stones. The third layer uses 28 stones, and so on. Each layer uses 4 more stones than the previous layer because the stones get smaller in size. If this pattern continues, how many stones are needed for the 7th layer?
3. The Tiakur City Government fenced off the city park with stone walls to preserve its beauty and prevent vandalism. Every day, the number of stones used increased as more and more residents joined in the community effort. Day 1: 100 stones, Day 2: 110 stones, Day 3: 120 stones, Day 4: 130 stones, and Day 5: 140 stones. If this pattern continues, the number of stones used on the 10th day of the stone wall construction will be ... stones (answer with a number).

The development of quiz questions was guided by the interactive structure of the Blooket platform, which supports game-based learning through various competitive modes. Each question was constructed using concise, culturally contextual narratives that reflect number pattern concepts relevant to students in 3T regions. Question formats included multiple choice and short answer types, selected to align with gameplay modes such as Racing, Monster Brawl, Pirate Pool, and Fishing Frenzy. Distractors were carefully constructed to reflect common student misconceptions, allowing the questions to assess not only recall but also reasoning and discussion potential. Additional design considerations included readability, technological accessibility, and suitability for collaborative classroom sessions. An illustration of the digital quiz format developed using Blooket in students screen is presented in Figure 3.

This approach echoes findings by Huang & Chiu (2015), who argue that formative assessment becomes more effective when students engage with content that is both interactive and personally meaningful. By incorporating culturally familiar contexts into game-based questions, the quiz design fosters not only motivation but also deeper engagement with mathematical reasoning.

Although this study does not directly measure cognitive gains, it builds on the premise that culturally embedded gamification can serve as a bridge between abstract concepts and lived experience an idea supported by (Sarwoedi et al., 2018) in their work on ethnomathematics. The use of distractors based on common misconceptions further enhances the diagnostic value of the quiz, allowing teachers to identify learning gaps and adjust instruction accordingly.

c) Quiz design validation by experts

To ensure pedagogical and contextual validity, the quiz design was reviewed by two expert validators: a mathematics education lecturer and a vocational high school teacher from a 3T region. Their combined expertise in curriculum design, student characteristics, and gamified assessment informed a comprehensive evaluation of the quiz.

The validation rubric (Table 1) assessed six key aspects, including content relevance, clarity, cognitive alignment, cultural contextualization, and digital compatibility. The average

score of 85% placed the quiz in the "highly valid" category, with minor revisions suggested to improve clarity and alignment with Blooket's interface.

Table 1. Aspects assessed by validators

No	Aspects Assessed	Assessment Description
1.	Suitability of material	Whether the content of the questions is relevant to the Basic Competencies and learning objectives
2.	Readability and clarity	The readability and clarity of the context used, especially in short and digital formats
3.	Cognitive level suitability	Whether the questions reflect the levels of thinking (C1–C3) appropriate to the characteristics of the students
4.	Quality of answer choices	Clarity of correct answers and accuracy of distractors with logical reasoning
5.	Local cultural contextualization	Whether the questions reflect students' experiences in 3T regions and support learning engagement
6.	Digital format suitability	Suitability of questions with Blooket features and game modes, including duration, question types, and interface display

This validation process aligns with best practices in formative assessment design, as demonstrated by (Vattøy & Gamlem, 2024), who emphasize the importance of iterative professional development and teacher involvement in shaping effective digital feedback strategies. Moreover, the inclusion of local educators in the validation process reinforces the study's commitment to contextual relevance and practical applicability.

3. Develop Stage

The Develop stage involved implementing the validated quiz design into the Blooket platform, with careful attention to optimizing gamification features for learning effectiveness. This included configuring interactive game modes, point systems, and time settings to suit the realities of classroom conditions in 3T regions. The goal was to ensure that game elements enhanced rather than distracted from the mathematical content.

After uploading the quiz, a limited trial was conducted with students in Southwest Maluku (Figure 4). The trial aimed to evaluate student responses to culturally contextualized questions, particularly those focused on number patterns. Observations were structured around three dimensions: technical (accessibility and navigation), pedagogical (conceptual understanding and response accuracy), and affective (engagement and enjoyment).

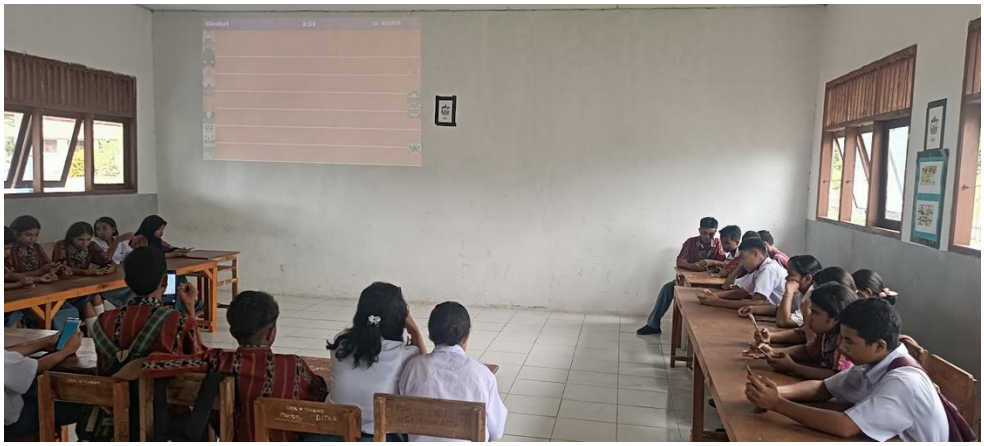

Figure 4. A limited trial was conducted with a group of students in Southwest Maluku

From a technical standpoint, observers noted that some students experienced internet connectivity issues, which delayed their participation. Pedagogically, while most questions were well-received, a few students struggled with interpreting the mathematical concepts, suggesting the need for additional scaffolding or pre-quiz instruction. Affective responses were notably positive where students expressed excitement and enjoyment, and questionnaire results indicated that over 80% felt motivated by the quiz's design and game-based components.

These findings align with prior research showing that gamification can significantly enhance student motivation and engagement in mathematics learning (Auliyah & Kusaeri, 2024; Matyakhan et al., 2024). The use of avatars, point rewards, and thematic game modes created a playful yet purposeful environment that encouraged participation and reduced anxiety often associated with formal assessment.

Moreover, the trial provided early evidence that gamification can strengthen aspects of ethnomathematics when cultural elements are embedded into game narratives. For example, students responded enthusiastically to questions referencing weaving patterns and stone formations, which suggests that the integration of familiar cultural representations helped bridge abstract mathematical concepts with lived experience. This supports Sarwoedi et al. (2018), who argue that contextualized mathematics fosters deeper cognitive engagement and cultural pride.

While the study did not measure long-term learning outcomes, the immediate motivational impact and cultural resonance observed during the trial reinforce the value of gamified ethnomathematics as both an instructional and assessment strategy. Participant feedback, including requests for more questions, extended time limits, and clearer item phrasing, will inform the next iteration of quiz development, ensuring that future versions are even more responsive to student needs.

4. Disseminate Stage

Following the development and refinement of the digital quiz through limited trials, the dissemination stage involved integrating the media into real classroom settings across several schools in 3T regions. Teachers implemented the quiz using the Blooket platform as a gamified

evaluation tool, embedding number pattern tasks within narratives and visuals drawn from local traditions. These sessions were designed not only to assess student understanding but also to explore how cultural familiarity could enhance engagement with mathematical content.

During implementation, teachers guided students through the game, encouraged reflection on the mathematical structures embedded in traditional practices, and observed student interactions. This approach aligns with findings that emphasize how culturally contextualized mathematics instruction can foster deeper conceptual understanding and strengthen cultural identity. Studies by (Arribay, 2025), (Simbolon, 2024), and (Mauladaniyati et al., 2025) highlight that integrating local cultural elements, such as traditional weaving patterns, games, and artifacts, into mathematics learning not only enhances engagement but also promotes students' appreciation of their heritage and improves conceptual mastery.

To evaluate effectiveness, the researcher focused on students' motivational responses during and after the quiz. Observations and questionnaire data revealed that gamification significantly increased students' enthusiasm for mathematics, particularly when number patterns were presented through culturally resonant stories and imagery. These results are consistent with studies by Auliyah & Kusaeri (2024) and Matyakhan et al. (2024), which found that game-based learning environments can enhance motivation and participation in mathematics classrooms. However, this study extends those findings by demonstrating that motivation is further amplified when game content reflects students' cultural backgrounds, an intersection rarely explored in previous gamification research.

Teachers also reported that the platform was easy to use and appreciated the relevance of the quiz content. They noted that the integration of local cultural elements not only increased student interest but also provided a meaningful context for discussing mathematical patterns. This supports the argument that gamified tools can serve as culturally responsive formative assessments, offering immediate feedback while reinforcing the connection between abstract concepts and lived experience.

The study's outcomes were disseminated through an academic journal article that not only documents the development and classroom implementation process but also offers a replicable framework for educators. By illustrating how gamified digital media can be adapted to reflect local cultural contexts, the article encourages teachers, especially those in remote or underserved areas, to innovate within their own communities. In addition to the publication, the researcher initiated collaborative efforts to expand the quiz's application to other mathematics topics, further bridging the gap between research-based innovation and everyday classroom practice.

CONCLUSION

This study produced a digital quiz-based learning media rooted in ethnomathematics, developed using the 4D instructional design model, which includes the stages of Define, Design, Develop, and Disseminate. The concept of number patterns was selected as the main

topic due to its pedagogical relevance and its potential for contextualization through local cultural practices in 3T regions, such as weaving motifs, ceremonial structures, and traditional rituals. The item development process was aligned with the characteristics of the Blooket platform, taking into account concise narratives, students' cognitive levels, and gamification features that promote active engagement.

Instrument validation results indicated that the quiz items were content-valid, instructionally effective, and practical for classroom use. Limited trials demonstrated that the quiz successfully enhanced student engagement through a culturally grounded and enjoyable approach. Feedback from both teachers and students confirmed that the media holds promise as an inclusive and adaptive formative assessment tool, responsive to the educational conditions in remote and underserved areas.

To build on the development of this ethnomathematics-based digital quiz, it is recommended that the media be expanded to include a broader range of mathematical concepts and cultural practices from various regions across Indonesia. Such expansion would enrich diversity while strengthening local relevance for students. Furthermore, integrating the quiz with complementary learning resources such as thematic modules or game-based activity sheets, would allow it to function not only as an assessment tool but also as a medium for independent and enjoyable learning. To ensure effective implementation in the field, teacher training in the use of gamification technologies is essential, particularly in schools with limited access to digital infrastructure.

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