

DEVELOPMENT OF ZEP QUIZ DIGITAL MEDIA AS A FORMATIVE ASSESSMENT INSTRUMENT ON ARITHMETIC SEQUENCES AND SERIES

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Abstract

Assessment is an essential part of the learning process as it functions to measure students' abilities and provide feedback for educators. In today's digital era, the use of technology-based media has become increasingly relevant for both teachers and students. This study aims to develop Zep Quiz digital media as a formative assessment instrument on the topic of Arithmetic Sequences and Series for Grade X students. The research method employed was Research and Development (R&D), consisting of the following stages: Potential and Problems, Data Collection, Product Design, Design Validation, Design Revision, Product Trial, Product Revision, and Final Product. Validation results indicate that the Zep Quiz-based assessment instrument achieved an average validity level of 91.91%, categorized as very valid. A limited trial involving 21 students and 3 teachers at SMAS Daarul Amanah showed practicality results of 86.67% for students and 96.67% for teachers, with an overall average of 91.67%, categorized as very practical. Therefore, it can be concluded that the developed Zep Quiz digital media is feasible to be used as a formative assessment instrument on the topic of Arithmetic Sequences and Series for Grade X.

Keywords: Development; Digital Media; Zep Quiz; Formative Assessment; Arithmetic Sequences and Series

Abstrak

Asesmen merupakan bagian penting dalam proses pembelajaran karena berfungsi untuk mengukur kemampuan peserta didik serta memberikan umpan balik bagi pendidik. Pada era digital saat ini, pemanfaatan media berbasis teknologi menjadi semakin relevan, baik bagi guru maupun peserta didik. Penelitian ini bertujuan untuk mengembangkan media digital Zep Quiz sebagai instrumen asesmen formatif pada materi Barisan dan Deret Aritmetika untuk peserta didik kelas X. Metode penelitian yang digunakan adalah Research and Development (R&D) dengan tahapan: Potensi dan Masalah, Pengumpulan Data, Desain Produk, Validasi Desain, Revisi Desain, Uji Coba Produk, Revisi Produk, dan Produk Akhir. Hasil validasi menunjukkan bahwa instrumen asesmen berbasis Zep Quiz memiliki tingkat kevalidan rata-rata sebesar 91,91% dengan kategori sangat valid. Uji coba terbatas yang melibatkan 21 peserta didik dan 3 guru di SMAS Daarul Amanah menunjukkan hasil kepraktisan sebesar 86,67% pada siswa dan 96,67% pada guru dengan rata-rata 91,67% yang termasuk dalam kategori sangat praktis. Dengan demikian, dapat disimpulkan bahwa media digital Zep Quiz yang dikembangkan layak digunakan sebagai instrumen asesmen formatif pada materi Barisan dan Deret Aritmetika kelas X.

Kata kunci: Pengembangan; Media Digital; Zep Quiz; Asesmen Formatif; Barisan Dan Deret Aritmetika



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INTRODUCTION

Mathematics is a discipline that studies patterns, structures, relationships, and numerical operations

used to understand and solve various real-life problems (Sharma, 2021). Along with rapid technological advancements, mathematics learning is

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no longer limited to manual calculations or abstract theories. Instead, it has evolved toward the utilization of interactive digital media that can enhance the effectiveness and engagement of the learning process (Chiu & Churchill, 2015). These developments not only influence students' learning styles but also encourage innovation in the evaluation and assessment of learning outcomes so that the learning process becomes more measurable, adaptive, and relevant to students' needs in the digital era.

Assessment plays an essential role in monitoring and improving learning quality. It is a systematic, planned, and continuous activity that employs various techniques and instruments to obtain information about students' learning processes and outcomes (Zebua & Zebua, 2024). One important type of assessment is formative assessment, which is carried out during instruction to monitor learning progress, identify students' difficulties, and provide timely feedback to improve teaching strategies and achieve learning goals (Yuni et al., 2025; Yanti et al., 2023). Thus, formative assessment acts as a bridge between technology-based mathematics learning and the achievement of expected competencies.

Teachers' abilities in developing formative evaluation instruments are increasingly important, especially in technology-integrated learning environments. Properly designed formative assessments help measure students' competencies more accurately, while interactive digital tools can improve students' motivation and engagement (Goran et al., 2025). Therefore, the availability of technology-based formative assessment instruments that are interactive,

practical, and aligned with learning objectives is highly needed.

One of the current innovations in formative assessment is the use of gamification-based digital media. Digital quiz applications accessed through smartphones allow students to engage with learning materials flexibly while receiving instant feedback, making learning more enjoyable and meaningful (Sari et al., 2022; Reza & Nopiyadi, 2022). The development of information and communication technology further supports the shift from conventional paper-based tests toward more interactive digital assessments that provide real-time data to teachers (Bilan et al., 2023; Anwar & Yuliansyah, 2025).

Zep Quiz is one of the emerging digital platforms that integrates gamification principles with technology-based evaluation. It offers several advantages, such as smartphone accessibility, instant feedback features, interactive design, and the ability to motivate students through game-like elements (Pakudu & Safaat, 2024). This aligns with the demands of 21st-century learning, which emphasizes the use of digital tools to support effective, adaptive, and engaging instruction (Gabay & Amolo, 2025).

In mathematics learning, particularly in the topic of Arithmetic Sequences and Series in Grade X of senior high school, students often face difficulties in recognizing patterns, interpreting terms, and applying formulas for the n th term or the sum of the first n terms. These difficulties make the topic appear abstract and challenging, resulting in low learning outcomes and limited engagement (Safitri & Hadi, 2024). Therefore, a digital formative assessment instrument is needed to help students strengthen

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their conceptual understanding through interactive and accessible media.

Several previous studies have examined the effectiveness of gamification-based digital media. For example, Lase (2024) found that Quizizz-based formative assessments significantly improved students' motivation and learning outcomes. Meanwhile, Yanti et al. (2023) demonstrated that Wordwall-based SPLTV question development achieved high levels of validity and practicality, proving its feasibility as a learning instrument. More recent studies emphasize the potential of gamified digital tools in enhancing mathematical problem-solving, engagement, and conceptual understanding in classroom settings. For instance, Akrom and Taufik (2025) found that integrating gamification into formative assessment significantly increased student engagement and improved learning outcomes in elementary mathematics. Moreover, Sani et al., (2025) in their systematic literature review reported that gamification strongly enhances student involvement in online mathematics learning environments.

However, despite the increasing use of gamification platforms such as Quizizz and Wordwall, research on the development of formative assessment instruments using Zep Quiz remains very limited. Existing studies mostly focus on improving learning outcomes or measuring practicality using more familiar platforms. There is still a lack of studies developing question instruments specifically tailored to mathematical topics, such as Arithmetic Sequences and Series using Zep Quiz, especially those that assess both validity and practicality in a structured development process. This becomes the research gap and forms the novelty of the present study.

Based on these gaps, this study aims to develop Zep Quiz-based formative assessment questions for the topic of Arithmetic Sequences and Series in Grade X (Phase E). The developed instrument is expected to meet the minimum criteria of validity and practicality so that it can serve as an interactive assessment medium to support students' conceptual understanding and problem-solving abilities using their smartphones.

METHODS

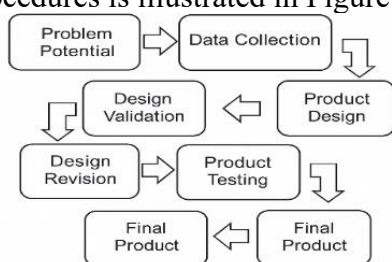
This study took place at SMA Daarul Amanah located in Majalengka, West Java. The research subjects consisted of 21 Grade X students the odd semester of the 2025/2026 academic year. Student selected from one intact class using convenience sampling, based on accessibility and the recommendation of the mathematics teacher. This class was chosen because the students demonstrated heterogeneous academic abilities and active learning engagement, making them suitable for a limited trial of the developed media. The study focused on the topic of Arithmetic Sequences and Series, following the competencies stated in the Grade X mathematics curriculum, specifically the learning objectives related to identifying patterns, determining the n -th term, and calculating the sum of terms in arithmetic sequences and series. The learning material used in this research was adapted from the Teaching Module and the learning outcomes prescribed by the national curriculum.

The research employed the Research and Development (R&D) method, which emphasizes the creation of educational products that are valid, practical, and effective. The research model referred to the steps proposed by Sugiyono, but was modified by the

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researcher to suit the needs and context of this study. Through the R&D approach, the research does not only focus on testing theories but also produces innovative products that can be directly applied in the teaching and learning process (Waruwu, 2024).

The stages of the development research included a series of procedures starting from potential and problem analysis, data collection, product design, expert validation, revision, limited trials, and broader trials. Each stage was carried out systematically to ensure that the developed product not only met academic standards but was also aligned with students' needs and easy for teachers to implement in daily classroom activities. The overall sequence of these procedures is illustrated in Figure 1.



Source: Yanti et al., (2023)

Figure 1. Research Stages

As shown in Figure 1, this research began with the potential and problem stage, which involved conducting a literature review and field observations to identify opportunities and challenges in mathematics learning, particularly on the topic of Arithmetic Sequences and Series. In the data collection stage, information was gathered through interviews and observations to determine the need for a digital-based formative assessment aligned with the grade X curriculum.

The product design stage was carried out through:

1. Learning material design, namely preparing teaching materials on

Arithmetic Sequences and Series based on the Teaching Module and learning objectives according to the curriculum.

2. Test item planning, namely developing 20 formative assessment items on the topic of Arithmetic Sequences and Series.
3. Zep Quiz design, which included selecting quiz formats, setting simple themes, choosing the available display types, and transferring the prepared items into the Zep Quiz platform, thereby producing an assessment medium that is interactive, practical, and aligned with students' needs.

In the design validation stage, the developed product was given to experts for evaluation using a validation sheet. This validation aimed to identify the strengths and weaknesses of the product so that improvements could be made before the trial stage. The aspects validated included three main components: content feasibility, media, and language. The content feasibility aspect covered the alignment of test items with the curriculum as well as the accuracy of the assessment material for the topic of Arithmetic Sequences and Series. The media aspect focused on the readability of the text format, the appropriateness of quiz display and theme selection in Zep Quiz, and the consistency of item presentation. Meanwhile, the language aspect emphasized sentence clarity, the accuracy of terminology, and the comprehensibility of the items for students.

Next, in the design revision stage, improvements were made to address the weaknesses of the product based on the validators' feedback. This was intended to ensure that the developed media was of higher quality,

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interactive, and suitable for learning needs, making the final product feasible for use as a formative assessment instrument.

The product trial stage was conducted after the validators declared the product suitable for testing. This limited trial aimed to determine the practicality level of the product and to identify its strengths and weaknesses. Through the practicality test, the researcher obtained a clear picture of the extent to which the product could be easily used by both students and teachers in the learning process. The instrument used in the trial was a questionnaire consisting of 15 questions, designed to gather information related to the practicality of Zep Quiz in presenting Arithmetic Sequences and Series problems.

Subsequently, in the product revision stage, the researcher refined the developed media based on the results of the practicality test. This revision was important to ensure that the media was not only valid in terms of content, media, and language but also truly practical, engaging, and aligned with students' needs.

The final product stage represented the result of the entire development process. The final product was a formative assessment instrument using Zep Quiz on the topic of Arithmetic Sequences and Series, which had gone through expert validation, practicality testing, and revisions based on suggestions and feedback. Therefore, this product is expected to be feasible for use as a formative assessment medium that supports the mathematics learning process in grade X.

To obtain objective research data, quantitative data were collected through interviews, validation tests, and practicality questionnaires. Measure-

ments in both expert validation and practicality tests were carried out using a Likert scale, which facilitated the researcher in processing and analyzing data to evaluate the quality of the developed product. The measurement scale used is presented in Table 1.

Table 1. Likert Scale

No	Quantitative Analysis	Positive Statement Score	Negative Statement Score
1	Strongly Agree	4	1
2	Agree	3	2
3	Disagree	2	3
4	Strongly Disagree	1	4

The analysis of teacher and student survey data was conducted quantitatively using percentages. The data were obtained from teacher and student responses to the developed media, then calculated based on the Guttman scale scores (Irsalina & Dwiningsih, 2018). This analysis aimed to determine the level of acceptance, practicality, and effectiveness of using the Zep Quiz formative assessment media on the Arithmetic Sequences and Series material. The scoring categories applied in this study are presented in Table 2.

Table 2. Guttman Scale

Response Alternatives	Score for Positive Responses	Score for Negative Responses
Yes	1	0
No	0	1

The data analysis technique used in this study is quantitative percentage analysis. The data obtained are quantitative, derived from the results of the validity test conducted by experts. The data obtained are quantitative, derived from the results of the validity test conducted by experts. In addition, this study involved six expert validators consisting of three teachers (G1, G2, and G3) and three lecturers (D1, D2, and D3). The validators were selected

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purposively based on their expertise, academic qualifications, and experience in evaluating instructional media. The validation process focused on three main aspects content, media, and language. To ensure the quality of the developed instrument. Furthermore, one mathematics teacher also participated in the practicality assessment to evaluate the usability of the formative assessment media in a real classroom setting.

Subsequently, the data were analyzed using quantitative percentage techniques to determine the validity level of the product. The percentage calculation was carried out using the formula 1 proposed by Sugiyono (2013).

$$Value = \frac{\sum \text{obtained score}}{\sum \text{total skor}} \times 100\% \quad \dots(1)$$

The results of the data calculations obtained were then transformed into Table 3 to provide an interpretation of the validity and practicality tests of the developed instrument. This interpretation was based on specific assessment criteria, making it easier for the researcher to determine the feasibility level of the developed product. The criteria used in this study are presented in Table 3.

Table 3. Validity and Practicality Criteria

Interval	Criteria
85% < x ≤ 100%	Very Valid/Practical, or can be used without revision
70% < x ≤ 85%	Valid/Practical, or can be used with minor revisions
50% < x ≤ 70%	Less Valid/Practical, recommended not to be used as it requires major revisions
0% < x ≤ 50%	Not Valid/Practical, or should not be used

RESULTS AND DISCUSSION

Based on the modified R&D model applied in this study, the results of developing the Zep Quiz digital media as a formative assessment instrument are described in the following stages:

1. Problem Potential

Interviews and observations conducted at SMA Daarul Amanah revealed that students tend to show low interest when working on exercises that only come from textbooks and are completed conventionally in exercise books. The lack of variety in practice formats makes students quickly feel bored, less active, and unenthusiastic in participating in learning activities. This condition affects students' low participation in completing exercises, which in turn results in assessments that are not fully able to represent students' understanding optimally. Therefore, there is a need for a more interactive and engaging formative assessment medium that can increase students' learning motivation. Zep Quiz was chosen as a solution because it provides digital quizzes with attractive visuals, easy accessibility, and is well-suited to the characteristics of the digital generation.

2. Data Collection

In the data collection stage, the researcher obtained school curriculum documents, including Learning Outcomes (Capaian Pembelajaran/CP), Learning Objectives Flow (Alur Tujuan Pembelajaran/ATP), and Teaching Modules (Modul Ajar/MA). These documents served as the main reference in designing the formative assessment instrument to align with the Merdeka Curriculum used in the school. The Teaching Module obtained focused on the topic of Arithmetic Sequences and Series for Phase E (Grade X), making it highly relevant to the purpose of this research. In addition, the researcher identified the needs of teachers and students for an assessment medium that not only measures understanding but also provides an enjoyable learning experience.

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3. Product Design

a. Learning Material Design

At this stage, the researcher developed learning materials focusing on the topic of Arithmetic Sequences and Series, referring to CP, ATP, and MA implemented in the school. The material was designed to align with the Merdeka Curriculum while emphasizing the achievement of the predetermined learning objectives. Thus, the questions developed through Zep Quiz were not merely exercises but also served as formative assessment instruments that support students' conceptual understanding.

b. Question Planning

The question planning process involved designing 20 items related to Arithmetic Sequences and Series that cover various cognitive levels, ranging from conceptual understanding, application, to simple problem-solving. These questions were then validated by subject teachers to ensure their alignment with learning objectives and appropriate difficulty levels for Grade X students. Based on the review results, a set of questions meeting the eligibility criteria was selected to be incorporated into the Zep Quiz media (Figure 2).

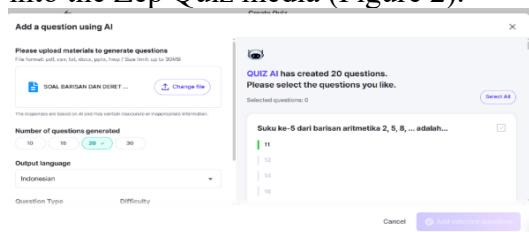


Figure 2. Question Design

c. Zep Quiz Design

At this stage, the researcher designed the digital quiz interface using the Zep Quiz platform. The design process involved discussions with teachers and the research team to determine the quiz format, theme, and display style that would be engaging for

students. The goal was for the assessment media to not only function as an evaluation tool but also provide an enjoyable learning experience that motivates students to participate actively. Selecting an appropriate theme and display is expected to increase student enthusiasm in completing the questions while helping teachers obtain formative information about students' understanding of Arithmetic Sequences and Series. The website to access the quiz is: <https://quiz.zep.us/en/public>. One of the games designed by the researcher using Wordwall can be accessed here:

<https://quiz.zep.us/en/play/jlZW4m>.

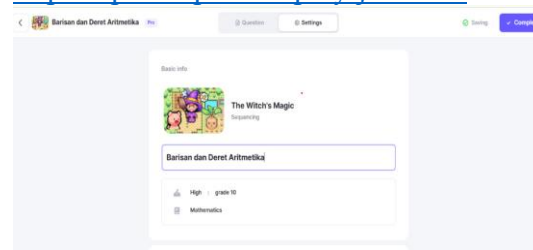


Figure 3. Zep Quiz Design

4. Design Validation

At the design validation stage, the Zep Quiz-based formative assessment instrument for the topic of Arithmetic Sequences and Series was validated by six experts, consisting of three teachers (G1, G2, and G3) and three lecturers (D1, D2, and D3). The validation process focused on three main aspects: content, media, and language, to ensure the quality of the developed instrument. The validation results are presented in Table 4.

In detail, the validation results indicate that all validators rated the instrument in the "Very Valid" category, with validity percentages ranging from 90.00% to 98.33%. The highest score was given by the first teacher validator (G1) at 98.33%, while the lowest score came from the first lecturer validator (D1) at 90.00%. The overall combined

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average was 93.06%, which falls within the “Very Valid” criteria. This confirms that the Zep Quiz instrument meets the standards of feasibility in terms of content quality, media presentation, and language clarity. Although the instrument was generally deemed suitable for use without major revisions, the researcher made minor improvements based on validator feedback, such as adjusting mathematical terms for consistency, correcting the language in several items, and refining the design layout to be more communicative for students. Based on these results, it can be concluded that the Zep Quiz-based formative assessment instrument is very valid and suitable for use in teaching Arithmetic Sequences and Series in grade X of senior high school.

Table 4. Validation Results

Validator	Aspect Assessed			Validity	Validity Criteria
	Content	Media	Language		
G1	20	19	20	98,33	Very Valid
G2	19	19	20	93,33	Very Valid
G3	19	19	19	91,67	Very Valid
D1	18	18	18	90,00	Valid
D2	19	20	19	93,33	Very Valid
D3	20	18	17	91,67	Very Valid
Combined Average				93,06	Very Valid

5. Design Revision

The researcher conducted revisions based on feedback, criticisms, and suggestions from the validators to improve the quality of the instrument. Some of these recommended improvements included technical aspects, such as ensuring consistency in the use of mathematical symbols, restructuring the wording of questions to be more communicative, and adjusting the Zep Quiz interface to make it more engaging and user-friendly for students. The following is a detailed description of the design revisions:

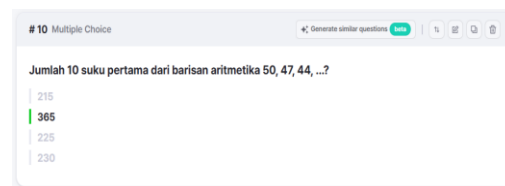


Figure 4. Question Before Revision



Figure 5. Question After Revision

In Figure 4, the question layout before revision is shown, where the validator suggested improving the wording used. Figure 5 shows the question layout after the language was revised to be clearer and more accurate. Subsequently, the validator revised the initial theme.

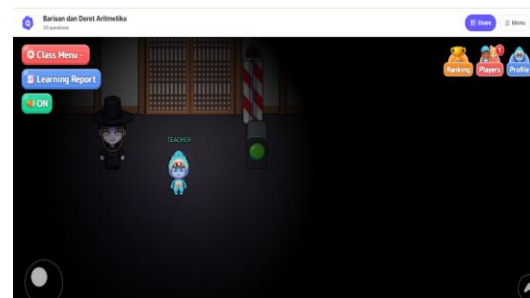


Figure 6. Theme Before Revision

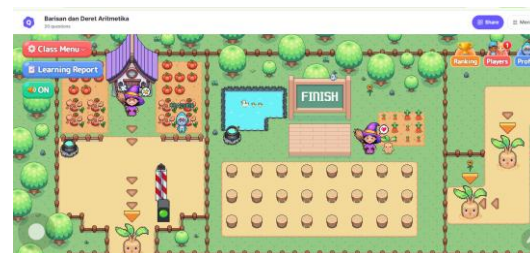


Figure 7. Theme After Revision

In Figure 4, the initial theme designed by the researcher is shown. The theme was intended to challenge students to make it more engaging. However, after review by the validators, it was considered unclear because the sequence of the questions appeared random, making it difficult for

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participants to follow the order and keep track of which questions had been completed and which had not. In Figure 7, the revised theme is shown, which has been approved by the validators. The revised theme is clear, engaging, and structured, allowing students to navigate the quiz more easily.

With these revisions, the final product, a Zep Quiz-based formative assessment instrument, is expected to be not only valid in terms of content but also more practical, interactive, and aligned with the characteristics of Grade X high school students. This supports the research objective of producing a high-quality digital formative assessment tool that enhances students' mathematics learning experience.

6. Product Testing

After completing revisions based on validator feedback, the research continued with a small-group trial (limited test) to determine the initial response of users, both teachers and students. The main focus of this stage was to evaluate the practicality of the Zep Quiz digital media as a formative assessment instrument for the Arithmetic Sequences and Series material.

The limited trial was conducted at SMAS Daarul Amanah, involving three teachers (Mathematics, Language, and ICT teachers) and 21 Grade X students. The involvement of teachers from different disciplines aimed to ensure that the media was evaluated not only in terms of mathematical content but also regarding language, interface design, and technology usability. Meanwhile, the students were selected to directly observe how Zep Quiz could increase motivation and facilitate understanding of the Arithmetic Sequences and Series problems.

The practicality assessment of the product focused on several key

aspects: ease of use, efficiency, quality of presentation, clarity of language, and usefulness in learning (Ngaeni & Saefudin, 2017). These aspects serve as the main indicators to determine how effectively the Zep Quiz digital media can be utilized by both teachers and students. The following are the results of the practicality test completed by teachers and students. The results of the practicality test are presented in Table 5.

Table 5. Results of Practicality Test

Respondent	Percentage	Criteria
Teachers	96.67%	Very Practical
Students	86.67%	Very Practical
Average	91.67%	Very Practical

Based on the results shown in Table 5, the limited trial involving teachers and students, the practicality percentage was very satisfactory. The teachers' responses showed a practicality score of 96.67%, which falls into the "Very Practical" category. This indicates that the Zep Quiz media is considered very easy to use, relevant to the material, and capable of supporting the learning process from the educators' perspective.

Meanwhile, the students' responses showed a percentage of 86.67%, also categorized as "Very Practical." This means that students felt supported by this media because the presentation of the questions is more engaging, interactive, and less monotonous compared to conventional exercises in textbooks.

Overall, the average practicality score was 91.67%, confirming that the digital Zep Quiz media is very practical. These results suggest that the product can be used directly in the learning process without major revisions, although further refinements can still be made as needed in the field.

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Based on the results of the limited trial involving teachers and students, a very satisfactory practicality percentage was obtained. The teachers' responses showed a practicality score of 96.67%, which falls into the "Very Practical" category. This indicates that the Zep Quiz media is considered very easy to use, relevant to the material, and capable of supporting the learning process from the educators' perspective.

Meanwhile, the students' responses showed a percentage of 86.67%, also categorized as "Very Practical." This means that students felt assisted by this media because the presentation of the questions is more engaging, interactive, and less monotonous compared to conventional exercises in textbooks.

Overall, the average practicality level was 91.67%, confirming that the digital Zep Quiz media is very practical. These results indicate that the product can be used directly in the learning process without major revisions, although it remains open for further refinement as needed in the field.

7. Product Revision

Based on the responses from teachers and students, the product received the category "Very Practical." This means that the Zep Quiz media can be used in learning with only minor corrections or refinements to better align with the needs of the students. Revisions were primarily made to the interface, question arrangement, and selection of game types to make the media more interactive and engaging for students.

8. Final Product

After revisions based on feedback from validators, teachers, and students, the final product was obtained in the form of a Zep Quiz formative assessment instrument on Arithmetic Sequences and Series. The product is

considered feasible as it has been tested for both validity and practicality, making it suitable for teachers as an innovative medium for evaluating learning. The final Zep Quiz design includes an interactive interface, a variety of game options, and questions aligned with the learning outcomes of the Merdeka Curriculum, thereby enhancing students' motivation, engagement, and understanding in learning Arithmetic Sequences and Series.

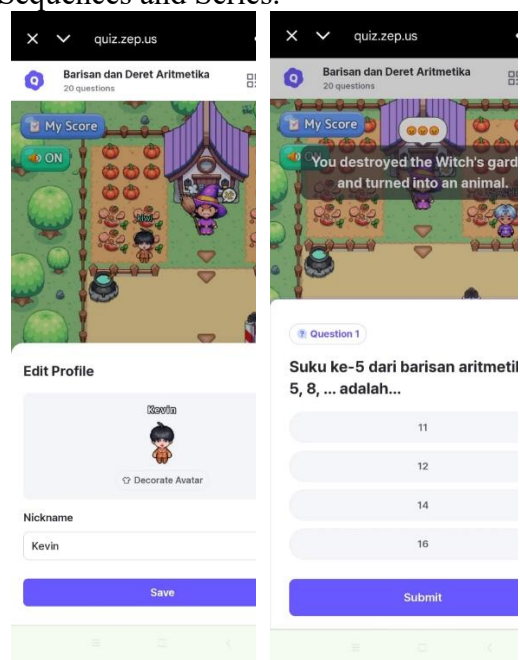


Figure 8

Figure 9

Figure 8 shows the product interface, where students can edit their profiles, including setting their names and customizing avatars. Figure 9 displays the product interface for starting the game, where students open the initial door and answer the question; after completing a question, the next door becomes accessible.

At the potential and problem stage, interviews and observations revealed that students showed low interest when working on questions solely from textbooks, and the lack of varied exercises caused boredom and reduced engagement. To address this need, the researcher conducted data

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collection by reviewing curriculum documents, including Learning Outcomes (CP), Learning Objectives Flow (ATP), and Teaching Modules (MA). The data collected served as a reference for designing questions that met students' needs. Mathematics teachers at the school also stated that developing digital assessment instruments is crucial, as they can serve as an alternative when conventional teaching methods are less effective.

Next, at the product design stage, the researcher developed the question instruments, student and teacher response questionnaires, and validation sheets. All instruments were first consulted with the supervising lecturer for feedback and then revised before being validated by experts. After the validation process, an average score of 93.06% was obtained, categorized as "Very Valid." This indicates that the questions developed are suitable in terms of content, media, and language, making them ready for further trial.

The product trial was conducted on a limited scale with 21 students. Student response questionnaires showed a practicality level of 86.67%, while teacher responses indicated a practicality level of 96.67%. The overall average was 91.67%, categorized as "Very Practical." Therefore, the digital assessment instrument developed can be used in learning with minor revisions for refinement.

Overall, it can be concluded that the Zep Quiz-based Arithmetic Sequences and Series questions developed meet the criteria of "Very Valid" and "Very Practical." This proves that this assessment media is suitable as a formative assessment instrument in mathematics learning and has the potential to increase students' motivation, engagement, and

understanding through the interactive and innovative interface provided by the Zep Quiz platform.

In general, this study has similarities and differences with previous relevant research. Its similarity with (Lase, 2024) lies in producing valid and practical question items as assessment instruments. However, the difference lies in the material developed. Consequently, the product is more tailored to the needs of upper secondary education and supports the implementation of the Merdeka Curriculum.

Another study by Sholeh et al., (2022) shares similarities with this research in that it also develops questions using an interactive digital quiz platform. The difference is that this study uses Zep Quiz as the primary platform for presenting questions. The use of Zep Quiz is considered more practical, varied, and suitable for both online and offline learning. Furthermore, this research focuses on the practicality of the digital assessment media, measured through teacher and student responses as direct users, providing a more comprehensive picture of the implementation of assessment media in mathematics learning.

During the development process, the researcher encountered several challenges. First, although Zep Quiz supports various interactive question types, there are limitations in displaying complex mathematical symbols, requiring technical adjustments to ensure the questions are clearly readable by students. Second, not all types of questions can be optimally displayed on Zep Quiz, such as essay questions that require detailed steps. Third, this study only tested validity and practicality aspects and did not reach the stage of

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effectiveness testing due to time constraints.

The results of this study indicate that the Zep Quiz-based formative assessment instrument developed for the topic of Arithmetic Sequences and Series meets the criteria of being very valid and very practical. These findings are consistent with the basic concept of formative assessment, which emphasizes providing continuous feedback through tools that are easy to use, accessible, and aligned with learning objectives. The high validation scores obtained from experts show that the product aligns with curriculum standards, contains accurate mathematical content, and uses clear and comprehensible language. This supports the theoretical foundation that effective formative assessments must reflect both pedagogical validity and content validity.

Several key findings emerged from this study. First, the media achieved very high validity scores across three components content, media, and language. Indicating that the question items, layout, display, and linguistic aspects are appropriate for high school students. Second, the practicality tests involving teachers and students showed that this media is easy to operate, efficient to use, and capable of supporting the learning of Arithmetic Sequences and Series interactively. These results indicate that Zep Quiz's design features such as simple navigation, flexible question formats, and visually appealing templates contribute significantly to its practicality.

The cause and effect relationship behind these results can be logically explained. The alignment of question items with the curriculum allowed students to engage with relevant material, thereby improving ease of use

and perceived usefulness. Additionally, the step-by-step Research and Development (R&D) process including expert validation and revisions ensured that weaknesses were addressed before the trial phase, resulting in a product with improved quality and usability. The interactive features of Zep Quiz also increased student engagement, which may explain the high practicality scores obtained from learners.

When compared to previous studies, the findings of this research are consistent with the study by Yanti et al., (2023), which reported that digital formative assessments enhance practicality and learning efficiency; Waruwu (2024), who found that digital platforms improve student engagement and motivation in mathematics; and Irsalina and Dwiningsih (2018), who emphasized the usefulness of simple scoring systems such as the Guttman scale for evaluating digital learning media. Additionally, this study is aligned with the findings of Jahring et al. (2023), who developed Quizizz-based mathematics evaluation instruments that were found to be valid and practical, demonstrating that digital quiz media can effectively support the evaluation process. This alignment is further reinforced by the study of Buchori and Wulandari (2024), which showed that mobile-based digital learning media also meet validity and practicality criteria. These similarities strengthen the position of Zep Quiz as a feasible and relevant assessment tool in mathematics learning.

The implications of this study are significant for both practice and future research. For teachers, the Zep Quiz media provides a practical and ready-to-use tool to simplify formative assessment processes, deliver immediate feedback, and make learning more interactive without requiring complex

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technical skills. For students, it offers engaging and accessible practice opportunities that help reinforce mathematical concepts. For future research, this product can serve as a foundation for investigating its effectiveness, particularly regarding its impact on learning outcomes, motivation, and long-term retention.

Overall, despite limitations related to sample size and testing duration, this study successfully provides a well-developed, validated, and highly practical formative assessment instrument that can enhance the quality of mathematics learning, particularly on the topic of Arithmetic Sequences and Series.

CONCLUSION AND SUGGESTION

The study concludes that the Zep Quiz-based formative assessment on Arithmetic Sequences and Series is appropriate for grade X mathematics learning, as it meets the “Very Valid” criteria from experts and the “Very Practical” category from teachers and students with a score of 91.67%. The questions align with learning outcomes and the Learning Objectives Flow (ATP), while also motivating students through an interactive digital platform. Thus, Zep Quiz can be recommended as an innovative tool for teachers in formative assessment, and future research is suggested to apply it to other topics and levels, as well as explore its integration with learning analytics.

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