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Development Of Digital Quiz Media For The Probability Topic (Grade XI)

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ABSTRACT

This study aimed to develop a Nearpod-based digital quiz medium for teaching probability in Grade XI and to determine its validity and practicality. The study employed the Research and Development (R&D) method using the ADDIE model, which consists of Analysis, Design, Development, Implementation, and Evaluation. The participants were 20 Grade XI students at MAN 1 Probolinggo. Data were collected through material expert validation sheets, media expert validation sheets, student response questionnaires, and learning outcome tests. Quantitative descriptive analysis was used to determine the validity and practicality of the developed media. The results showed that the material expert validation reached **89.1%**, while the media expert validation reached **93.75%**, both categorized as **highly valid**. Student responses obtained a score of **90.25%**, indicating that the media was **highly practical**. Furthermore, students achieved an average quiz score of **82.5**, exceeding the school's Minimum Mastery Criterion (75). These findings indicate that the Nearpod-based digital quiz medium is valid, practical, and appropriate for supporting mathematics learning on the topic of probability in Grade XI.

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1. INTRODUCTION

Advancements in information technology have brought about significant changes in the educational landscape, particularly regarding classroom instruction. The use of digital technology enables teachers to create learning experiences that are more interactive, engaging, and learner-centered. Integrating digital media into instruction serves not merely as a means of delivering content but also enhances student engagement through varied material presentation, immediate feedback, and

meaningful learning activities. Consequently, the use of technology-based instructional media is an approach that warrants continued development to improve the quality of both the learning process and its outcomes.

Mathematics plays a crucial role in fostering logical, critical, analytical, and systematic thinking skills. However, many students still perceive mathematics as a difficult subject. Probability is one topic that poses a significant challenge for Grade 11 students. Mastering probability requires not only computational skills but also a conceptual understanding of sample spaces, events, the probability of an event, compound probability, mutually exclusive events, independent events, and complementary probability. Difficulties in grasping these concepts often lead students to simply memorize formulas without understanding their real-world applications.

Observations conducted at MAN 1 Probolinggo revealed that students still struggle to understand the topic of probability. These difficulties stem from a poor grasp of fundamental probability concepts, challenges in memorizing formulas, and a learning process dominated by conventional teaching methods. A monotonous delivery style tends to result in low student engagement and diminished learning motivation. Consequently, students show little enthusiasm for mathematics lessons, a situation that potentially impacts their academic performance. One potential solution to this issue is the development of digital learning media that integrates content delivery, practice exercises, and assessment into a single platform. Interactive learning media offers students a more engaging experience through the use of instructional videos, educational games, interactive quizzes, and immediate feedback. In this way, students move beyond the role of passive information recipients to become active participants in the learning process.

Nearpod is one of the platforms that supports interactive learning. It offers a variety of learning features—such as instructional videos, "Time to Climb," multiple-choice quizzes, matching pairs, fill-in-the-blank exercises, open-ended questions, collaboration boards, and "Draw It" activities—that can be seamlessly integrated into a single lesson. These capabilities allow teachers to deliver material in stages, provide practice exercises after each segment, and conduct evaluations without switching between different applications. Furthermore, teachers can monitor students' activities and learning outcomes in real-time, thereby enhancing the overall effectiveness of the learning process.

Previous studies have shown that the use of digital learning media can boost students' learning interest, engagement, and academic performance. However, most research has focused on digital media primarily as an evaluation tool or has presented quizzes separately from the delivery of instructional content. Research regarding the development of digital quiz media that integrates instructional videos, interactive practice exercises, and evaluative quizzes into a single Nearpod-based lesson—specifically for the Grade XI probability topic—remains relatively limited. Therefore, there is a need for development research that produces learning media that is not only suitable for use but also practical and capable of supporting a more interactive mathematics learning process.

Based on this context, this study aims to develop Nearpod-based digital quiz media for the Grade XI probability topic using the ADDIE development model, which encompasses the stages of Analysis, Design, Development, Implementation, and Evaluation. The resulting product is expected to be a valid and practical learning medium that helps students grasp probability concepts through engaging, interactive instruction, ultimately fostering a more meaningful learning experience.

2. METHODS

This study employs the Research and Development (R&D) method, aiming to develop a Nearpod-based digital quiz medium for the probability topic in Grade XI. The ADDIE development model was utilized, comprising five stages: Analysis, Design, Development, Implementation, and Evaluation. The analysis stage involved observations and interviews with mathematics teachers to identify learning needs, student characteristics, difficulties students face in understanding probability, and the requirements for developing the medium.

The design stage encompassed material preparation, the creation of a test specification matrix, and the planning of the learning flow on the Nearpod platform. Subsequently, the development stage involved creating the learning medium—consisting of instructional videos, practice exercises, and interactive quizzes—integrated into a single Nearpod lesson. The resulting product was then validated by subject matter and media experts. The implementation stage involved pilot testing the medium with Grade XI students to gather data on its practicality and user response. Finally, the evaluation stage aimed to assess the validation results, implementation outcomes, and student feedback to serve as a basis for refining the product.

Two types of data were collected in this study: qualitative and quantitative. Qualitative data consisted of descriptive input, suggestions, and criticisms from validators for product revision, while quantitative data—obtained via questionnaires—were analyzed to determine the validity and effectiveness of the interactive quiz media development process carried out by the researcher. Responses were measured using a Likert scale. Susanti (2021) states that the Likert scale is used to measure the attitudes, opinions, and perceptions of an individual or group regarding a specific phenomenon. The following is the Likert scale assessment table according to Susanti (2021):

Table 2.1 Likert Scale Validation Assessment Categories

Skor Nilai	Kategori
4	Very good
3	Good
2	Fair
1	Poor

The next step is to calculate the average percentage for each component using the formula proposed by Arikunto (in Hartono & Pramukantoro, 2013:656), namely:

$$P = \frac{\sum F}{\sum F_x} X\ 100\%$$

Information:

P = Percentage score

$\sum F$ = Total score obtained

$\sum F_x$ = Maximum possible score

The percentage scores obtained from the study will be interpreted based on the criteria in the following table:

Table 2.2 Product Outcome Categories

Percentage (%)	Criteria
75% ≤ N ≤ 100%	Highly Practical / Highly Valid
50% ≤ N < 75%	Practical / Valid
25% ≤ N < 50%	Less Practical / Less Valid
N < 25%	Not Practical / Not Valid

(Adapted by Yulvani Susanti, 2021:37)

Based on Table 2.2, if the digital quiz validation yields a percentage of 50% or higher, the product meets the "good" or "valid" criteria—meaning it is considered valid or suitable for use in student learning activities; conversely, if the validation result is below 50%, the program is deemed invalid and unsuitable for use in student learning, requiring further improvement and revision.

3. FINDINGS AND DISCUSSION

This research resulted in a digital quiz medium based on Nearpod, designed for the probability topic in Grade XI. The development of this medium utilized the ADDIE model, which comprises five stages: Analysis, Design, Development, Implementation, and Evaluation. This model was selected because it provides a systematic approach to developing instructional media, ranging from needs analysis to the evaluation of the implemented product. The development outcomes at each stage are described below.

The analysis stage serves as the initial phase of the media development process. During this stage, classroom observations and interviews with the mathematics teacher at MAN 1 Probolinggo were conducted to identify learning needs, student characteristics, and the challenges encountered during the teaching of probability.

The observations revealed that the majority of students still struggle to comprehend the material on probability. These difficulties stem from a tendency among students to memorize formulas without grasping the fundamental concepts of probability. Furthermore, students face challenges in applying probability concepts to contextual problems, resulting

in suboptimal learning outcomes. The prevalence of the lecture method in the teaching process leads to low student engagement and negatively impacts learning motivation.

In addition to analyzing the students' circumstances, the researcher also assessed the tools required for the media development process. The development utilized hardware—specifically laptops—and an internet connection to support the use of the Nearpod platform. The software employed included Nearpod as the primary medium and Canva for creating instructional videos. The findings from this needs analysis served as the foundation for designing an instructional medium capable of integrating content delivery, practice exercises, and assessment within a single platform, thereby making the learning process more interactive and engaging.

Table 3.1 Results of the Needs Analysis

Aspect	Analysis Results
Student Characteristics	Grade 11 students experienced difficulties in understanding probability concepts.
Learning Problems	The learning process was still conducted using conventional methods, resulting in low learning motivation.
Learning Objectives	tudents are expected to understand probability concepts and solve probability-related problems.
Solution	Developing an interactive Nearpod-based digital quiz as a learning medium.

The next phase is the design stage, which is based on the results of the needs analysis. During this stage, the structure of the learning media to be developed on the Nearpod platform is outlined. The media is designed as a single lesson, ensuring that all learning activities proceed sequentially without requiring students to switch to other applications. The media design comprises an introductory page, six instructional videos, six practice exercises utilizing the "Time to Climb" feature, and an evaluation quiz using the "Multiple Choice" feature. Each video explains a specific sub-topic regarding probability and is followed by practice exercises serving as formative evaluation before students move on to the next topic. This allows students to receive immediate feedback after studying each concept.

The material is organized systematically, progressing from the definition of probability, sample space and events, and the probability of a single event to the probability of compound events and complementary events. This sequence aligns with the Grade 11 learning outcomes, ensuring that more complex concepts are addressed only after students have grasped the fundamental concepts. Every presentation of material is followed by practice exercises, enabling students to immediately gauge their level of understanding. Furthermore, the use of instructional videos aims to help students comprehend abstract concepts through illustrations, animations, and examples that relate closely to everyday life.

The next phase is the development stage, which involves transforming the media design into a ready-to-use product. All instructional content is first created as videos using Canva and then integrated into Nearpod alongside practice exercises and an evaluation quiz. The resulting product is a digital quiz-based learning tool comprising 14 slides. The

media begins with a login page and a title slide, followed by the presentation of content through instructional videos. After completing each video, students engage in practice exercises using the "Time to Climb" feature. At the end of the lesson, students take an evaluation quiz covering the entire probability topic using the "Multiple Choice" feature.

The use of the "Time to Climb" feature fosters a more interactive learning atmosphere, as students answer questions within an educational game format. In addition to receiving scores, students get immediate feedback, allowing them to identify and correct errors before moving on to the next topic. Meanwhile, the evaluation quiz serves to assess the students' level of mastery regarding the material covered. The developed media features an engaging visual design, consistent color schemes, supporting illustrations, and simple navigation, making it easy for both teachers and students to use. Integrating all learning components into a single platform is a key advantage of this tool, as students do not need to switch between applications during the learning process.

Overall, the analysis, design, and development phases successfully produced a Nearpod-based digital quiz medium that integrates instructional videos, interactive practice exercises, and evaluative quizzes into a cohesive learning sequence. The product was subsequently validated by subject matter and media experts before being implemented with students to assess its feasibility, practicality, and effectiveness. The validation process aimed to determine the medium's suitability prior to its implementation with students. This process involved a team of validators comprising two subject matter experts, one media expert, and a validator responsible for assessing the user response questionnaire instrument. The validation results served as the basis for determining whether the medium met the required standards regarding content, visual design, functionality, and the validity of the research instruments.

Subject matter expert validation was conducted to evaluate the alignment of the medium's content with the curriculum, the accuracy of mathematical concepts, the presentation of material, and language usage. The validation team consisted of two individuals: a Mathematics Education lecturer from Universitas Muhammadiyah Jember and a mathematics teacher from MAN 1 Probolinggo.

Table 3.2 Analysis of Data from Subject Matter Expert Validation Results

Aspect	Indicator	Material Expert 1	Material Expert 2	$\sum F_x$
		$\sum F$	$\sum F$	

Curriculum Alignment	The material is aligned with the learning objectives.	3	4	8
	The probability concepts are accurat and correct.	4	3	8
Presentation of Learning Material in the Digital Quiz	The material is presented in a logical sequence.	4	3	8
	The illustrations, videos, and questions are relevant to the learning material	3	3	8
	Feedback is provided appropriately.	3	3	8
Readability and Comprehensibility	The language is appropriate for Grade 11 students.	4	4	8
	The material is communicative and unambiguous.	4	4	8
	Standard mathematical terminology is used.	4	4	8
Total Score		29	28	64
Percentage		89,1%		

Based on Table 3.2, a feasibility percentage of 89.1% was obtained, placing the media in the "highly practical" category. These results indicate that the presented material aligns with the learning competencies for Grade XI and demonstrates conceptual accuracy. Furthermore, the material is

organized sequentially—progressing from basic to more complex concepts—thereby making it easier for students to follow the learning flow.

Validators also assessed that the language used is appropriate for the developmental level of Grade XI students. The use of standard mathematical terminology and the inclusion of simple examples make the material easier to comprehend. Based on these validation results, the media is deemed suitable for use in the subsequent stage without requiring substantial revisions to the content. The media validation was conducted to assess the quality of the interface, ease of use, visual aspects, language, and functionality of the learning media. The validation was performed by a mathematics teacher experienced in using technology-based learning media.

Table 3.3 Analysis of Data from Media Expert Validation Results

Aspect	Indicator	Media Expert $\sum F$	$\sum F_x$
Design	The appearance of the media is attractive.	4	4
	The colors, font type, and images are appropriate.	4	4
	The font size and images are appropriate	3	4
	The media is easy to operate without significant assistance.	3	4
Language	The language used is easy to understand	4	4
	The language is appropriate for the target users.	4	4
Content and	The media provides appropriate	4	4

Functionality	feedback to users' actions.		
	The media enhances students' interest and learning motivation.	4	4
Total Score		30	32
Percentage		93,75%	

Media expert validation yielded a score of 93.75%, placing it in the "highly practical" category. This result indicates that the media possesses high visual quality, is easy to operate, and provides an engaging learning experience for students. The visual aspect received high ratings because the media was designed with a consistent color scheme, supporting illustrations, and a simple, easily understandable layout. Furthermore, integrating instructional videos, practice exercises, and quizzes into a single lesson offers convenience for both teachers and students, as all learning activities can be completed without switching to other applications.

The validators also noted that the media required no revisions regarding its visual design or navigation. Consequently, the media is considered to meet the technical suitability requirements for implementation in the learning process. In addition to validating the learning media, this study also validated the student response questionnaire. This validation aimed to ensure that each statement in the questionnaire accurately measures student responses to the use of the Nearpod-based digital quiz media.

Table 3.3 User Questionnaire Validation Results

Indicator	Validator $\sum F$	$\sum F_x$
The questionnaire items are aligned with the purpose of using the Nearpod-based digital quiz.	4	4
The questionnaire items are able to measure students' responses to the use of the Nearpod-based	4	4

digital quiz.		
The questionnaire items are able to measure the ease with which students use the Nearpod-based digital quiz.	4	4
The questionnaire items are able to reflect the usefulness of the Nearpod-based digital quiz in helping students understand probability concepts.	3	4
The language used in the questionnaire is appropriate for Grade 11 students.	4	4
The questionnaire items are clearly written, easy to understand, and free from ambiguity.	4	4
The rating scale used is appropriate for measuring students' responses.	3	4
The student response questionnaire is appropriate for collecting students' feedback on the use of the Nearpod-based digital quiz.	3	4
Total Score	29	32
Percentage	90,1%	

Validation results indicate that the instrument achieved a score of 90.1%, placing it in the "highly practical" category. This demonstrates that all statement items align with the research objectives, are easily understood by students, and effectively capture aspects such as ease of use, the media's utility, and student responses following the lesson. The validated instrument was subsequently used during the implementation phase to gather data on student responses to the developed media. Consequently, the data obtained from the questionnaire is reliable and serves as a basis for assessing the learning media's level of practicality.

Overall, validation results from subject matter experts, media experts, and the questionnaire instrument indicate that the Nearpod-based digital quiz media meets feasibility standards regarding content, visual design, and data collection tools. All validation results fell into the "highly practical" category; thus, the media was deemed suitable for implementation with students during the field trial phase.

The implementation phase followed the determination of the Nearpod-based digital quiz media's suitability, based on the validation results from subject matter experts, media experts, and the questionnaire instrument. This phase aimed to assess the media's practicality and observe student responses after using the learning media for the topic of probability. The trial was conducted with a group of 20 students from the Class XI PK program at MAN 1 Probolinggo. During the lesson, the teacher acted as a facilitator, while students participated in the entire learning sequence via the Nearpod platform. The session began with the presentation of material through instructional videos, followed by practice exercises using the "Time to Climb" feature for each sub-topic. Once the material had been fully covered, students completed an evaluation quiz encompassing the entire topic of probability. All these activities were conducted within a single lesson, ensuring a structured learning process without the need to switch to other applications.

Upon completion of the lesson, students were asked to fill out a user response questionnaire comprising five assessment indicators: media interface/design, ease of use, the media's utility in understanding probability concepts, interest in learning with the media, and increased learning motivation. The questionnaire results were used to determine the media's practicality based on the students' firsthand experience using it.

Table 3.5 Students' Responses to the Media

Assessment Aspect	**Result**
Number of Respondents	20 students
Obtained Score	361
Maximum Score	400
Percentage	**90,25%**
Criterion	Highly Practical

Based on Table 3.5, a practicality score of 90.25% was obtained, placing it in the "highly practical" category. These results indicate that students responded positively to the use of the Nearpod-based digital quiz medium. The majority of students stated that the medium was easy to use and visually

appealing, helped them understand the topic of probability, and boosted their enthusiasm for learning during the instructional process.

The high practicality score demonstrates that the medium is not only easy to operate but also capable of fostering a more active learning environment compared to conventional instruction. Integrating instructional videos, practice exercises, and quizzes into a single platform provides a more systematic learning experience, allowing students to master the material in a step-by-step manner. In addition to gathering data on student responses, this study also collected results from an evaluation quiz administered after the entire topic had been covered. Quiz scores were used to assess the students' level of understanding regarding probability concepts after using the developed medium.

Table 5.6 Students' Quiz Scores

Description	Value
Number of Students	20 students
Highest Score	100
Lowest Score	70
Total Score	1650
Average Score	82,5
Minimum Mastery Criterio	75

Based on Table 5.6, the average quiz score was 82.5, with a high of 100 and a low of 70. When compared to the Minimum Mastery Criterion (KKM) of 75, the students' learning outcomes generally met the mastery standard established by the school. These results indicate that the Nearpod-based digital quiz medium is not only practical to use but also effective in supporting students' understanding of probability concepts.

4. CONCLUSION

Research results indicate that the Nearpod-based digital quiz medium achieved a "highly practical" rating based on evaluations by subject matter experts, media experts, and instrument validators. Validation scores—89.1% from subject matter experts, 93.75% from media experts, and 90.63% from user questionnaire responses—demonstrate that the medium meets standards regarding content, visual design, language, and functionality. Consequently, the medium is deemed suitable for use in mathematics instruction covering the topic of probability.

The medium's success in achieving a "highly practical" rating is attributed to a systematic development process utilizing the ADDIE model. Each stage of development was guided by learner needs, ensuring the final product aligned with user characteristics. A needs analysis served as the foundation for determining content, structuring learning activities, and selecting the specific Nearpod features incorporated into the medium. Implementation results show that students responded very positively to the use of this learning medium. A response rate of 90.25% indicates a high level of practicality. Students found the material easier to grasp because the instruction integrated videos, illustrations, practice exercises, and quizzes. The step-by-step presentation of material also helped students understand the relationships between concepts, resulting in a more structured learning process.

A key advantage of the developed medium is the integration of all learning activities into a single platform. In conventional instruction, teachers typically use multiple applications to deliver content, assign practice exercises, and conduct assessments. This approach often causes students to lose focus as they switch between applications. In contrast, Nearpod enables all learning activities to be conducted within a single lesson, making the learning process more effective and efficient. The "Time to Climb" feature offers a distinct learning experience compared to conventional practice exercises. By packaging practice questions as educational games, it boosts student participation during the lesson. In addition to receiving a score, students get immediate feedback on their answers, allowing them to identify and understand their mistakes before moving on to the next topic. Consequently, the practice exercises serve not only as a means of assessment but also as a tool for reinforcing concepts.

This study is supported by the students' average quiz score of 82.5. This figure exceeds the school's established Minimum Mastery Criterion (KKM), demonstrating that the media effectively helps students better understand the subject of probability. These findings align with Saputri (2016), who noted that the use of digital learning media improves learning outcomes compared to instruction that does not utilize such media. Digital media enables students to engage in more active learning through a combination of text, images, videos, and interactive activities, thereby making the learning process more meaningful. Beyond improving learning outcomes, the developed media offers several other advantages. It integrates instructional videos, practice exercises, and evaluative quizzes into a single platform, resulting in a more systematic learning process. Teachers can monitor student performance in real-time via their Nearpod accounts, simplifying the assessment process. Furthermore, the media is reusable across different classes without the need to create new materials and is accessible via both laptops and smartphones, provided there is an internet connection.

Nevertheless, this study has certain limitations. Using Nearpod requires a stable internet connection for all features to function correctly. Additionally, the free version of Nearpod has limited storage capacity and restricts access to certain premium features. Teachers also require basic knowledge of how to operate Nearpod to ensure optimal instruction. Therefore, future developments should ideally utilize the premium version or combine Nearpod with other digital platforms to further enhance the learning experience. Overall, the research results indicate that the Nearpod-based digital quiz medium possesses a high level of validity, is practical for classroom use, and effectively helps students understand the topic of probability. These findings demonstrate that integrating instructional videos, interactive practice exercises, and evaluative quizzes into a single platform offers an effective alternative for improving the quality of mathematics education in high schools.

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