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Development and Feasibility Evaluation of NotebookLM-Assisted Interactive Video Media for Pancasila Education in Madrasah Ibtidaiyah

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Abstract

The transformation of *Artificial Intelligence* in primary education encourages the need for learning media innovations that substantively accelerate students' exploration capacity. This research develops an *interactive video* media based on *NotebookLM* with the integration *of Artificial Intelligence* for learning Pancasila Values for grade IV students at Madrasah Ibtidaiyah Miftahul Ulum Pandanwangi, Tempeh District, Lumajang Regency. The gap in previous research lies in the lack of exploration of the use of *generative AI* in the development of character learning media in madrasah ibtidaiyah, especially in Pancasila material which is abstract and requires a contextual visual approach. The research uses *the Research and Development (R&D)* model with *the ADDIE* approach which includes *the stages of analysis*, *design*, *development*, *implementation*, and *evaluation*. Validation was carried out by media experts and material experts, followed by small group trials and field tests involving 28 grade IV students. The results of the media expert validation achieved a score of 89.6% in the "Very Feasible" category and the material expert validation obtained 91.3% in the same category. The mean score increased in *the exploratory learning indicator*, with the average score increasing from 62.4 to 84.7. NotebookLM integration has been shown to optimize the quality of AI-based narrative content that is responsive to the cognitive characteristics of grade IV students. This research contributes to the development of AI-based interactive learning models in madrasah ibtidaiyah while offering a new conceptual framework for the integration *of generative AI* in basic character education.

Keywords: *Artificial Intelligence*; *Interactive Videos*; *NotebookLM; Exploratory Learning*; Madrasah Ibtidaiyah

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INTRODUCTION

Artificial intelligence transformation In the global education landscape, it has transcended the boundaries of mere technological discourse and developed into a fundamental pedagogical imperative. Over the past decade, the integration of *AI* in the formal learning system has experienced a significant acceleration, characterized by the proliferation of *ai-assisted learning tools*, platform *adaptive learning*, and ecosystems *digital classroom* that are responsive to the individual learning needs of students (Crompton & Burke, 2023; Ouyang & Jiao, 2021). In this context, traditional learning paradigms that rely on one-way transmission of information face serious

epistemological challenges, as cutting-edge research consistently shows that the effectiveness of learning actually depends on students' levels of active involvement and exploratory capacity for constructing knowledge independently (Chiu, 2024; Kaye & Hanzalik, 2024). Convergence between technological advances *AI* and contemporary pedagogical demands create transformative opportunities that have not been fully exploited, especially in the context of value-based basic education in Indonesia.

urgency *exploratory learning* as a pedagogical approach is further strengthened by empirical findings that show a positive correlation between the capacity of exploratory learning and the formation of deep conceptual understanding. *exploratory learning*, which is rooted in the epistemological tradition of constructivism and sociocultural perspectives, emphasizes students' active processes of asking questions, testing hypotheses, and building meaningful connections between new concepts and existing knowledge structures (Kim, 2021; Morcom & MacCallum, 2022). The Contribution of Artificial Intelligence in facilitating *Exploratory Learning* lies in its capacity to provide *scaffolding* Adaptive dynamics, information-rich visual representations, and personalized learning experiences to each student's cognitive rhythm. However, the implementation of this approach in religious-based basic education institutions in Indonesia still faces limited access to pedagogically designed technology that is targeted in a pedagogical manner.

learning pancasila values at madrasah ibtidaiyah faces substantive challenges that are epistemological and didactic. epistemologically, pancasila values are abstract constructs that require concrete contextualization so that they can be captured by the cognitive capacity of grade iv students who are in the concrete operational stage. students aged 9 to 10 need strong visual representations, real-life analogies, and learning experiences that touch on the affective dimension to internalize noble values such as divinity, humanity, unity, democracy, and social justice (Chen et al., 2021; Mayer, 2002). Didactically speaking, the majority of teachers face limited resources and competencies in developing learning media that are able to translate the abstraction of pancasila values into an attractive, interactive, and contextual visual narrative for elementary school students.

Initial observations conducted at Madrasah Ibtidaiyah Miftahul Ulum Pandanwangi, Tempeh District, Lumajang Regency, reveal a representative picture of learning problems while indicating the urgency of research intervention. The majority of grade IV teachers still rely on textbooks and lecture methods in delivering Pancasila materials, while the use of interactive visual media is almost not found in daily learning practices. This condition has a direct impact on the low *Student Engagement* and students' capacity for exploration, which is reflected in the limited exploratory questions asked by students and the lack of substantive discussion about the implementation of Pancasila values in the context of daily life. These preliminary findings are in line with research Liao & Chang (2022) that identify conventional lecture-based learning as a major limiting factor of development *High-Level Thinking* elementary school students.

Development *generative AI* In recent years, it has opened up significant new horizons for learning media innovation. *generative ai*, which includes *large language models*, system *text-to-image*, and a multimodal content synthesis platform, has proven its ability to produce learning materials that are rich, adaptive, and responsive to the pedagogical specifications given (Kasneci et al., 2023; Su & Yang, 2023). Chiu (2024) in

his study of the transformation of education through *generative ai* emphasizing that the potential of this technology goes beyond just the efficiency of content production, but lies in its capacity to produce learning narratives with high conceptual coherence that can be customized according to the level of cognitive development of students. deng & yu (2023) in meta-analysis of use *generative ai* in education found a significant positive impact on *learning outcomes*, particularly when these technologies are pedagogically integrated in planned, theory-based instructional design.

NotebookLM, an *AI-based platform* developed by Google, represents the latest evolution in learning content development helper technology (Mehta et al., 2025; Shor et al., 2026; Silva Cunha, 2026). Unlike generic *AI tools*, *NotebookLM* is designed to work contextually with user-uploaded sources, allowing for precise and relevant synthesis of information on the specific topic being developed (Sikri & Nuguri, 2026). *NotebookLM*'s ability to generate analytical summaries, exploratory questions, and multi-perspective narratives from complex source materials makes it a potential instrument in the development of *interactive video* content for learning Pancasila values. The integration *of NotebookLM* in the media development workflow provides a comparative advantage in the form of a substantial improvement in content quality as well as significant development time efficiency, a combination that is very relevant in the context of limited developer resources in madrasah ibtidaiyah.

The theoretical foundation of this research rests on two complementary conceptual frameworks, i.e. Theory *constructivism* and *multimedia learning theory*. The constructivist perspective asserts that knowledge is not transferred passively but is actively constructed by students through meaningful interaction with a stimulus-rich learning environment (Beal & Hontvedt, 2023; Dibra et al., 2025; Ouyang dkk., 2024). In the context of the media *Interactive Videos*, constructivism explains why interactive elements such as exploratory questions and animated visualizations are able to drive *cognitive engagement* which is deeper than passive media. *multimedia learning theory* delivered Mayer (2002) offers empirical principles on how a combination of visual and verbal narratives can optimize the process *coding* and *intake* information in working memory, with immediate implications on design *interactive videos* which is effective for elementary school students who have dominant visual-kinesthetic learning characteristics.

Study state of the arts relevant research reveals a diverse landscape while showing gaps that need to be filled. Kaye & Hanzalik (2024)Develop a strategy reverse learning with interactive annotations for elementary school students and found significant improvements in conceptual understanding as well as learning motivation. chen et al. (2021) through a systematic review of smart learning environment confirms that visual interactivity has been shown to substantially improve content retention compared to conventional passive media. Crompton & Burke (2023) in a systematic review of *AI* in K-12 education found that applications *AI* pedagogically designed to have a positive impact on *student engagement* and learning outcomes. Nazari et al. (2021) Research the app *AI conversational tools* and found that the interactive dialogue feature substantially improved students' self-exploration. Yi-Ming Kao & Ruan (2022) Explore *augmented reality* exploration-based and identifying visual elements as effective mediators of abstract concepts. Ouyang & Jiao (2021) Classifying the paradigm *AI* in education and emphasizing the importance of placing students as active agents in a learning ecosystem based on *AI*. Liao & Chang (2022) found that the integration *gamification* in educational media increase *cognitive engagement* which is the

key mediator of the achievement of learning outcomes. Zawacki-Richter et al. (2019) in a systematic review they identified *adaptive learning*, *rating*, and *profile creation* as the most productive area of the application *AI* in education. Kasneci et al. (2023) Analyze opportunities and challenges *Large language models* for education and emphasizing that the success of integration depends on a learner-centered instructional design. Rise & Yang (2023) Propose an implementation framework *generative ai* in education that emphasizes the importance of pedagogical contextualization as a prerequisite for effectiveness.

From this comprehensive review, there are two significant and urgent research gaps to be filled. First, there is a lack of studies that specifically integrate *generative AI* such as *NotebookLM* in the development of learning media for Pancasila values in madrasah ibtidaiyah. Second, there is limited research investigating the effectiveness *of AI-based interactive videos* in improving student *exploratory learning* in the context of character education in *Islamic elementary schools* in Indonesia. The novelty of this study lies not merely in the use of NotebookLM, but in its pedagogical integration into the development of an interactive video designed specifically to facilitate exploratory learning of Pancasila values among madrasah ibtidaiyah students. This innovation not only has practical relevance for the development of character education in madrasah ibtidaiyah, but also makes a theoretical contribution to the understanding of how *generative AI* can be pedagogically integrated appropriately in the development of basic learning media. Based on the identification of research gaps, this research is directed at four interrelated objective. First develop NotebookLM-assisted interactive video media for learning Pancasila values among fourth-grade madrasah ibtidaiyah students, second determine the feasibility of the developed media based on media and material expert validation, and third examine changes in students' exploratory learning behavior following the implementation of the developed media. These four goals integratively lead to meaningful scientific contributions to the development *of educational technology* in the context of Indonesian madrasah ibtidaiyah.

RESEARCH METHODOLOGY

Research Design

This study adopts an approach *Research and Development (R&D)* with development model *ADDIE* which consists of five systematic stages: *Analysis*, *Design*, *Development*, *Implementation*, and *Evaluation* (Branc RM, 2009; Sugiyono, 2015). Models *ADDIE* It was chosen for its iterative nature, empirical evidence-based, and has a strict gradual validation procedure, so that it is in accordance with the complexity of developing learning media-based learning *Artificial Intelligence* which is intended for the context of Islamic basic education. The advantage of this model lies in the flexibility of its evaluation cycle that allows for progressive refinement of the product based on expert feedback and real user feedback, a very critical feature given the complexity of integration *NotebookLM* in the media development flow.

Stages of Analysis

The needs analysis was conducted at MI Miftahul Ulum Pandanwangi, Tempeh, Lumajang, using a triangulation of structured classroom observations, in-depth interviews, and a diagnostic survey. The subjects came from two groups. The first group was three grade IV teachers who taught Pancasila Education, selected through purposive sampling because they had direct knowledge of the learning conditions and the media used in the classroom. The second group was 28 grade IV students, generally aged 9 to 10 years. Total sampling was applied, so every student in the grade IV class was included and none were excluded. This decision

was taken because the class was small enough to be observed as a whole, and the purpose was to describe the learning needs of that class and not to generalize to a wider population. Data were collected with three instruments, namely an observation sheet with 15 classroom dynamics indicators, a semi-structured interview guide organized around key themes, and a diagnostic questionnaire on student learning preferences with 12 items. In addition, the Learning Outcomes (CP) of Pancasila Education for grade IV in the Independent Curriculum were analyzed to identify the concepts that require visual media support for effective contextualization.

Design Stage

The design stage includes drafting *Storyboard* Media *Interactive Videos* in five main segments that each discuss one precept of Pancasila, along with its symbols, deep meanings, and examples of its application in students' daily lives. The design of the content architecture is carried out with reference to the principle *Cognitive load theory* Swelling (2022) to ensure optimal distribution of information and not overload the working memory processing capacity of students aged 9 to 10 years. Integrations *NotebookLM* carried out intensively at this stage, where source documents about Pancasila values are uploaded to the platform *AI* to produce a learning narrative that is cohesive, content-accurate, and adapted to the language characteristics of grade IV students. The visual design of the interface takes into account the aesthetic preferences of elementary school-aged children with the use of bright color palettes, relatable animated characters, and a non-confusing layout.

Development Stage

Media development is carried out using a combination of educational animation software and *professional video editing*. The audio narrative content is developed based on scripts generated with the help of *NotebookLM,* which are then refined through editorial revisions to ensure suitability with the language comprehension level of grade IV students. The educational character animation is designed by adopting *a child-friendly visual design approach* that emphasizes clear emotional expression, natural movements, and visual contexts that are familiar to students from the rural environment of Lumajang. Each video segment is equipped with exploratory questions that arise in the middle and end of the segment to encourage active reflection, as well as illustrative animations that illustrate the application of Pancasila values in the context of daily life that are relevant to students.

Implementation and Evaluation Stage

Implementation is carried out through two consecutive phases with different evaluative objectives. The *small group trial* involved nine grade IV students who were selected *purposively* to represent three categories of academic ability (high, medium, and low). Based on the findings of the small group test, product revisions were carried out before entering the field test phase involving 28 full grade IV students. Formative evaluation runs in parallel throughout the development process through expert validation, while summative evaluation is carried out after *field testing* to measure the effectiveness of media on students' *exploratory learning*.

Instruments and Data Analysis

The research instruments include four types of data collection tools. The media expert validation sheet consists of 20 indicators that evaluate aspects of visual display quality, animation quality, audio narrative accuracy, interactivity, and clarity of visual

symbols. The material expert validation sheet consists of 18 indicators that assess the suitability of Pancasila material, the depth of value content, the relevance of application examples, language accuracy, and age level suitability. A 15-item student response questionnaire measures user *experience* and learning interest assessments. Student engagement observation sheets with 12 indicators were used to measure changes in student learning exploration behavior directly.

Table 1. Research Instruments and Their Characteristics

No	Instruments	Objectives	Number of Items	Analytical Techniques
1	Media Expert Validation Sheet	Media Members	20 items	Eligibility percentage
2	Subject Matter Expert Validation Sheet	Material Expert	18 items	Eligibility percentage
3	Student Response Questionnaire	Grade IV Students	15 items	Likert Scale 4 points
4	Student Engagement *Observation Sheet*	Grade IV Students	12 indicator	Comparative analysis

The validity of the instrument was verified through *expert judgment* by two independent validators, while the reliability of the instrument was calculated using *Cronbach's Alpha* coefficient which yielded a value of 0.87, indicating a very adequate level of reliability. Quantitative data was analyzed using descriptive statistics with percentage score conversion referring to the Riduwan scale (2021). Eligibility criteria are set: 81 to 100% categorized as Very Worthy, 61 to 80% Worthy, 41 to 60% Fairly Worthy, and 21 to 40% Less Worthy. *Exploratory learning* data was analyzed using *pre-post* comparative analysis to identify the amount of increase (*gain score*) in each exploratory learning indicator.

RESULTS

Needs Analysis

The results of the needs analysis reveal three main findings that are the basis for media development. First, 89.3% of teachers stated that the available Pancasila learning media were inadequate to encourage active student learning exploration. Second, classroom observations show that the average student's active learning time (*active learning time*) only reaches 38% of the observed instructional time (Guo et al., 2020). Third, a diagnostic survey showed that 78.6% of grade IV students responded positively to information presented in visual-animated format than static text, students showed a preference for visually animated learning materials

The curriculum analysis identified that the Learning Outcomes of Pancasila Education grade IV of the Independent Curriculum emphasized students' ability to relate Pancasila values with real-life practices, not just memorize symbolic formulas. This curricular demand explicitly requires learning media that is able to present vivid and interactive contextual examples, not just static expository texts. The findings of this needs analysis confirm the suitability of *the* AI-based *interactive video* approach as a pedagogical appropriate response to the gap between curricular demands and the availability of media in the field.

In-depth interviews with teachers revealed three main obstacles in learning Pancasila: (1) the limitations of visual media that are able to contextualize the abstract values of Pancasila into concrete situations that are relevant to students; (2)

difficulty maintaining *student engagement* throughout the duration of learning which requires high concentration; and (3) lack of resources and competence to develop technology-based media independently. This third obstacle specifically indicates the need for a media that can be developed with high efficiency using *AI,* which then becomes one of the strongest justifications for the integration *of NotebookLM* in this study.

Product *Development*

The interactive video *media* developed consists of five main segments that are systematically structured according to the order of the precepts of Pancasila. The first segment discusses the Precepts of the One Godhead with a visualization of the golden star symbol, a narrative of religious diversity coexisting harmoniously, and an illustrative animation featuring children from various religious backgrounds interacting reverently. The second segment explores the Precepts of Just and Civilized Humanity through visual representations of gold chains, with narratives that contextualize the value of humanity in school and family life situations close to the experiences of grade IV students.

The third segment featured the Indonesian Unity Precept with a strong visualization of the banyan tree as a metaphor for togetherness, equipped with animations that depict teamwork in the context of school and community activities. The fourth segment discusses the People's Precepts Led by Wisdom through the bull's head symbol, with a narrative that explains the concept of deliberation and *democratic values* using the analogy of choosing a class leader that is familiar to students. The fifth segment explores the Precepts of Social Justice for All Indonesian People with the symbols of rice and cotton, illustrating the value of justice and mutual cooperation through narratives and animations that are contextual with the life of the agrarian community that is close to the background of students in Lumajang.

The integration *of NotebookLM* in the development process is carried out on three levels. First, at the *content generation level*, source documents about the values of Pancasila and the Independent Curriculum materials are uploaded to *NotebookLM* to produce a cohesive and content-accurate initial narrative. Second, at the *question design level, this* AI *platform* is used to produce exploratory questions that have a level of *cognitive demand* that matches the thinking characteristics of grade IV students. Third, at the *contextual adaptation level*, *NotebookLM* helps to produce contextual examples that are relevant to the socio-cultural background of Madrasah Ibtidaiyah students in Lumajang. This integration resulted in a significant improvement in content quality while reducing the development time of the narrative script from an initial estimate of four weeks to about a week and a half.

Storyboard developed following the principles *Segmentation* from *Multimedia Learning Theory* Mayer (2002), where complex information about Pancasila values is broken down into conceptual units that can be optimally processed by students' working memory. Each segment is designed with an optimal duration of between three to four minutes, according to the capacity of the attention span (*Attention span*) students aged 9 to 10 years who range from 10 to 15 minutes for one learning session. Exploratory questions inserted in the middle and end of each segment serve as *Cognitive checkpoints* which encourages students to reflect on the content they have just witnessed and relate it to their personal experiences.

Product Validation and Testing

The validation of media experts is carried out by an *educational technology* expert from a university with at least ten years of experience in the development of technology-based learning media. The assessment covers five key aspects that comprehensively describe the technical and pedagogical quality of the media. The validation results showed that *the interactive video* media developed obtained an overall score of 89.6% with the category "Very Feasible", indicating that the technical quality and visual design of the media have met the standards of modern learning media development.

Table 2. Media Expert Validation Results

No	Assessment Aspects	Shoes	Percentage	Category
1	Visual Display Quality	18/20	90%	Highly Worth It
2	Educational Animation Quality	17/20	85%	Highly Worth It
3	Audio Narrative Accuracy	18/20	90%	Highly Worth It
4	Media Interactivity	17/20	85%	Highly Worth It
5	Visual Symbol Clarity	19/20	95%	Highly Worth It
Quantity	*Overall*	89/100	89,6%	***Highly Worth It***

The validation of material experts was carried out by a teacher at madrasah ibtidaiyah miftahul Ulum Pandanwangi Tempeh Lumajang. The assessment includes five dimensions of content that evaluate accuracy, relevance, depth, language appropriateness, and overall age-level appropriateness. The acquisition of a score of 91.3% with the category "Very Feasible" confirms that the content developed with the help *of NotebookLM* has high academic accuracy and strong curricular alignment with the Pancasila Education standards of the Independent Curriculum.

Table 3. Material Expert Validation Results

No	Assessment Aspects	Shoes	Percentage	Category
1	Suitability of Pancasila Material	19/20	95%	Highly Worth It
2	Depth of Content Value	18/20	90%	Highly Worth It
3	Relevance of Implementation Examples	17/20	85%	Highly Worth It
4	Language Accuracy	18/20	90%	Highly Worth It
5	Age Appropriateness of Students	19/20	95%	Highly Worth It
Quantity	*Overall*	91/100	91,3%	***Highly Worth It***

The field *test* involved 28 students in grade IV in full using *a pre-post observation* design. The measurement results using *the student engagement* observation sheet showed a consistent and significant increase in all *exploratory learning* indicators measured. The average *exploratory learning score* increased from 62.4 on the initial measurement to 84.7 on the post-intervention measurement, representing an average gain of 22.3 points indicating the substantive impact of the media intervention.

Table 4. Improvement of Exploratory Learning Indicators for Grade IV Students

No	Exploratory Learning *Indicators*	Initial Score	Final Score	*Advantages*
1	Exploratory Questioning Skills	58,3	82,1	23,8
2	Self-Paced Content Exploration	61,7	84,5	22,8
3	Conceptual Connections of Values	63,2	87,4	24,2
4	Contextual Critical Reflection	66,4	85,2	18,8
Quantity	*Overall Average*	62,4	84,7	**22,3**

A student response questionnaire collected after the field test showed that 92.9% of students stated that *interactive video* media made it easier for them to understand the values of Pancasila, while 89.3% stated that they felt more motivated to ask questions about the material they witnessed. This positive response is consistent with the findings of Hwang et al. (2021) which show that *interactive learning environments* significantly increase the intrinsic motivation and *cognitive engagement of* elementary school students.

DISCUSSIONS

The findings of this study provide strong empirical support for the theory *Constructivism* in the context of Pancasila learning at Madrasah Ibtidaiyah. Significant improvement in the indicator "Conceptual Connection of Values" (from 63.2 to 87.4, *Advantages* 24,2) specifically reflects the process of active knowledge construction facilitated by the media: students do not simply receive information about the precepts of Pancasila, but actively build a network of understanding by relating these abstract values to the context of concrete life presented through animation. This mechanism is fully aligned with the constructivist proposition that meaningful knowledge is formed through a process of active assimilation and accommodation, rather than through the passive absorption of information (Koehler et al., 2021).

From perspective *Multimedia Learning Theory*, the success of this media can be explained through the work of several principles Mayer (2002) synergisically. Principle *Coherence* embodied in a strictly structured content design avoiding irrelevant information; Principle *Signaling* implemented through the use of color, animation, and narrative that consistently directs students' attention to key information about each self-discipline; Principle *Segmentation* It is implemented through the division of content into five independent segments, each of which has a complete conceptual unity. The combination of these principles results in a cognitively efficient learning experience, where information about Pancasila values can be optimally processed by students' working memory without the occurrence of *Cognitive Advantages*.

Improvement in the indicator "Exploratory Questioning Ability" (from 58.3 to 82.1, *Advantages* 23,8) provides compelling empirical confirmation of the role of exploratory questions integrated in the media as triggers *metacognitive engagement*. These findings resonate strongly with the research Nazari et al. (2021) which indicates that the interactive dialog feature is based on *AI* increase students' self-exploration, while extending the findings to the media context *Interactive Videos* pedagogically designed with *Checkpoint questions* systematically. Exploratory questions in the media

are not just an evaluation tool, but a pedagogical stimulus that encourages students to activate knowledge *Previous* and construct new conceptual connections.

Successful integration *NotebookLM* In the development of content media, it contributes indirectly but substantively to the effectiveness of observed learning. The quality of the narration generated with the help *NotebookLM*, which was then editorially refined, showcasing a depth of content and contextualization accuracy that was difficult to achieve through manual development within the constraints of time. These findings support the Chiu (2024) and Rise & Yang (2023) tResist Potential *Generative AI* Going beyond production efficiency towards substantive content quality improvements, it is important note that this effectiveness depends on a mature instructional design and competent pedagogical supervision from the developer.

Comparison of the results of this study with related studies reveals the consistency of the pattern as well as the distinctive contribution. Crompton & Burke (2023) Reporting positive impacts *AI* on *Student Engagement* in a similar range, but their research is not specific to the context of value education in *Islamic primary schools*. (Yi-Ming Kao & Ruan (2022) Discovering the effectiveness of technology-based visual media for abstract concepts, but in the context of *augmented reality* which differs significantly from two-dimensional interactive videos. The distinctive contribution of this study lies in proving that the combination of *NotebookLM* as a content development tool and *Interactive Videos* as a medium of delivery is able to produce a significant learning impact in a context that has never been researched before, namely Pancasila learning in madrasah ibtidaiyah Indonesia.

The theoretical implications of these findings stretch across two dimensions. In the dimension *of educational technology*, this study provides empirical evidence that *generative AI* can function as a catalyst for the development of high-quality learning media in the context of limited resources that are prevalent in madrasah ibtidaiyah. In the dimension of *character education research*, these findings confirm that AI-based interactive video media is able to mediate the understanding of abstract concepts in character education more effectively than conventional media, by opening up an exploration dimension that was previously not facilitated. These two implications together strengthen the position of this research as a meaningful *novelty* contribution at the intersection between *AI in education*, *character education technology*, and *Islamic elementary school pedagogy*.

CONCLUSION AND RECOMMENDATIONS

This development study produced a NotebookLM-based interactive video medium for learning Pancasila values among grade IV students of a madrasah ibtidaiyah, developed through the ADDIE model. Expert validation placed the medium in the "Very Feasible" category, with scores of 89.6% from media experts and 91.3% from subject matter experts. The field test also showed that the average exploratory learning score rose from 62.4 to 84.7. These results indicate that the medium is feasible for classroom use and shows positive learning potential, although the score gain cannot be attributed to the medium alone because the design did not include a comparison group. Generative AI is best seen here as a supporting tool that helped the teacher prepare instructional content, while pedagogical decisions and the grounding in constructivism and Multimedia Learning Theory remained in human hands. The findings are also specific to one madrasah ibtidaiyah in Lumajang

Regency, so they should be read as context-bound evidence that still needs further validation.

Future studies are encouraged to test the medium with stronger comparative designs, such as quasi-experiments with control groups, and with larger samples drawn from more diverse regions. Researchers may also compare NotebookLM with other AI tools to see how far the tool itself matters for the quality of the resulting media. In addition, longitudinal work is needed to examine whether the learning gains persist and how they relate to the internalization of Pancasila values over time. Until such evidence accumulates, the medium is best positioned as a promising option that teachers can adapt, not as a proven solution for Islamic primary education in general.

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