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DEVELOPMENT OF VALUE-BASED INTERACTIVE LEARNING MEDIA "PETIK LIDI" IN INFORMATICS TO ENHANCE STUDENTS' DIGITAL LITERACY

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ABSTRACT
Insufficient digital literacy among learners and the scarcity of diverse interactive instructional media serve as the foundational motivation for this study. The research objectives encompass describing preliminary conditions of informatics instruction, constructing value-integrated interactive learning media titled "PETIK LIDI", examining educator responses, learner responses, and the operational effectiveness of the developed media product at SMP Negeri 2 Binangun. The Research and Development (R&D) methodology was applied, adopting the ADDIE framework comprising five phases: Analysis, Design, Development, Implementation, and Evaluation. Participants included students from class IX G functioning as the experimental group (32 students) and class IX F as the comparison group (32 students) at SMP Negeri 2 Binangun, Cilacap. Multiple data collection strategies were employed including observation, interviews, questionnaires, expert validation, and achievement assessments (pretest and posttest). Analytical procedures incorporated quantitative and qualitative descriptive methods, N-Gain Score computation, and Independent Sample t-test. Source and method triangulation ensured data credibility. Research outcomes demonstrated that preliminary instructional conditions relied on minimally innovative media; the developed product was verified as valid, practical, and effective. Educator responses yielded a validation result of 96%. Learner practicality responses attained 94.46% (highly practical). The operational effectiveness of the interactive media reached an average of 91.03% (excellent), with a significance value of 0.000 <0.05, confirming a meaningful statistical difference.

INTRODUCTIONS

Rapid technological advancement has profoundly reshaped educational environments across Indonesia. Growing internet penetration has enabled communication through social media channels, digital tools, and web-based

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learning systems, generating substantial prospects for educational quality enhancement (Dewi et al., 2024). Such transformation necessitates that learners acquire sufficient digital literacy competencies to navigate an evolving technological landscape. Digital literacy transcends mere device operation, encompassing capacities to interpret, assess, and generate information with critical judgment and ethical responsibility (Prastiyo et al., 2026; Nurzakia et al., 2023; Prayoga et al., 2022). Consequently, cultivating digital literacy has emerged as an indispensable priority within contemporary 21st-century education.

From an Islamic standpoint, knowledge occupies a foundational position in human existence. The Holy Qur'an in QS. Al-Mujadilah verse 11 confirms that Allah ﷻ elevates those endowed with knowledge, positioning the pursuit of learning as a spiritually meaningful endeavor. The hadith documented by Ibn Majah (No. 224) additionally reinforces the religious obligation to seek knowledge for all Muslims irrespective of gender. Technological integration in education may therefore be understood as an expression of knowledge-seeking aligned with contemporary development. These principles underscore that the convergence of technology, learning, and moral character constitutes a central dimension of education. Accordingly, digital literacy must be cultivated through both technical proficiency and ethical value foundations (Ramadhani et al., 2024; Wulandari, 2025).

Indonesian national education policy establishes a robust framework for advancing digital literacy. Law Number 20 of 2003 concerning the National Education System underscores the comprehensive cultivation of student potential, while Permendikbud Number 23 of 2015 highlights the significance of embedding character formation within interactive and purposeful learning contexts (Afrina et al., 2024; Amar & Widodo, 2022). Implementing these regulatory provisions necessitates pedagogical innovations capable of integrating both cognitive and affective dimensions cohesively. Value-integrated interactive instructional media represents a tangible manifestation of such policy implementation (Ani Daniyati et al., 2023).

From a conceptual standpoint, digital literacy encompasses multiple interconnected dimensions. Reddy et al. (2023) posits that digital literacy comprises technical proficiency, analytical reasoning, digital ethics, and responsible information management. Dewi et al. (2025) reveals that differentiated instructional strategies can simultaneously strengthen digital literacy and enhance learners' socioemotional intelligence through adaptive media and methodological variation. Fikri et al. (2025) highlights the critical importance of digital literacy in fostering student character within the social media era, while Anggoro et al. (2024) demonstrates that multiple intelligences-based approaches deliver enriching and engaging educational experiences. These findings collectively affirm that digital literacy cultivation requires an integrated, innovative, and learner-oriented pedagogical framework.

Ki Hajar Dewantara's educational philosophy stresses the necessity of harmonizing learning with contemporary developments, wherein educators assume the role of facilitators who nurture students' potential in alignment with the progression of the times (Andriani & Wakhudin, 2020; Husen & Wakhudin, 2025). Fulfilling this facilitative role demands that teachers strategically incorporate technology into instructional practice. Interactive learning media occupies a pivotal function in advancing students' digital literacy (Prastiyo et al., 2026; Wulandari, 2025). Digital platforms including Google Classroom, Edmodo, Quizizz, Kahoot!, and various Learning Management Systems can strengthen learner engagement and autonomous learning (Nurzakia et al., 2023).

Prior scholarly work confirms that interactive digital instructional media substantially influences student engagement and academic achievement (Ng, 2012; Mayer, 2021, 2024; Ramadhani et al., 2024); however, prevailing studies have concentrated primarily on technological and pedagogical dimensions, leaving the incorporation of moral values within interactive media design comparatively underexplored. Domestically relevant scholarship further supports digital literacy-based interactive media advancement. Syahraini Putri et al. (2024) reveals that interactive multimedia effectively elevates students' digital literacy and analytical thinking capacities, while Prayoga et al. (2022) underlines that value-embedded instructional media substantially enhances motivation and academic performance. Afrina et al. (2024) documented constraints in digital literacy implementation, particularly concerning educator preparedness and institutional infrastructure, whereas Amar & Widodo (2022) identified that limited access to devices and internet connectivity constitutes the foremost challenge. Collectively, these findings indicate that value-integrated interactive media requires strengthened design and implementation strategies to optimally advance digital literacy.

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Field conditions at SMP Negeri 2 Binangun, Cilacap Regency, reveal that student digital literacy remains suboptimal. Learners encounter obstacles in critically evaluating information and exhibit limited comprehension of digital ethics. Digital instructional media utilization remains inadequate, with conventional pedagogical approaches continuing to dominate. Educators simultaneously face constraints in developing interactive media attributable to limited competencies, time restrictions, and insufficient supporting resources. These circumstances underscore the urgency for learning innovations capable of integrating technology and values more productively (Wulandari, 2025; Nurzakia et al., 2023).

A gap in the existing literature is apparent, particularly regarding the limited incorporation of character values within interactive learning media development. Most preceding investigations have emphasized technological effectiveness on academic outcomes, while holistic approaches combining cognitive, ethical, and character dimensions in digital literacy instruction remain scarce (Prastiyo et al., 2026). This knowledge gap presents an opportunity for scholarly contribution through the construction of more comprehensive value-oriented learning media.

The distinctive contribution of this research resides in developing interactive learning media that holistically integrates cognitive advancement, digital ethics, and character formation within a unified instructional framework. Rather than focusing exclusively on technical digital literacy enhancement, this approach simultaneously cultivates responsible digital conduct. The developed media is engineered to facilitate contextually grounded and meaningful Informatics instruction, thereby elevating learner engagement and independent study capacities (Ramadhani et al., 2024; Wulandari, 2025).

The overarching aim of this research is to develop value-integrated interactive learning media and empirically evaluate its feasibility and effectiveness in improving Grade IX students' digital literacy at SMP Negeri 2 Binangun, Cilacap Regency. Research scope encompasses product construction, feasibility assessment, and effectiveness analysis. Anticipated outcomes include theoretical contributions to value-based digital literacy scholarship alongside practical contributions as pioneering solutions for technology-integrated junior high school instruction.

METHOD

This investigation adopts a Research and Development (R&D) design utilizing the ADDIE model (Branch, 2009). Selection of this framework was justified by its systematic, iterative, and thorough structure, comprising five successive stages: Analysis, Design, Development, Implementation, and Evaluation. Each phase proceeds reflectively and cyclically to guarantee that the resulting product attains appropriate standards of validity, practicality, and instructional effectiveness.

Research participants comprised Grade IX G students constituting the experimental group (32 students) and Grade IX F as the comparison group (32 students) at SMP Negeri 2 Binangun, Cilacap Regency. Purposive sampling was employed for participant selection, grounded in the alignment of class attributes with research objectives (Arikunto, 2019). Data collection was conducted throughout the even semester of the 2025/2026 academic year.

Data collection procedures encompassed: (1) observation to document prevailing instructional conditions; (2) structured interviews with educators and learners to obtain detailed qualitative insights; (3) expert validation instruments covering media and content dimensions; (4) educator response questionnaires evaluating media practicality and utility; (5) student response instruments; and (6) academic performance measures comprising pretest and post-test assessments. Quantitative analysis employed the formula $P = (\Sigma x / \Sigma x_{max}) \times 100\%$, supplemented by N-Gain Score computation for relative effectiveness measurement, and Independent Sample t-test analysis to detect significant intergroup differences. Data credibility was established through source and methodological triangulation (Sugiyono, 2019; Moleong, 2017).

RESULT AND DISCUSSION

Product Development Results

During the Analysis phase, existing instructional conditions in Informatics at SMP Negeri 2 Binangun were systematically examined. Observational and interview data revealed that instruction predominantly relied on lecture-

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based delivery using presentation slides and printed materials, learners exhibited relatively deficient digital literacy, and educators required engaging media capable of simultaneously cultivating character values. Learning style analysis among Grade IX G students indicated that 43.75% demonstrated kinesthetic preferences, 31.25% visual orientations, and 25% auditory inclinations. These findings guided the construction of adaptive media congruent with the diverse learning preferences of the student cohort.

The Design phase yielded a conceptual framework for an interactive instructional medium designated "PETIK LIDI" (*Pembelajaran Interaktif Informatika Literasi* Digital / Digital Literacy Informatics Interactive Learning). This medium was engineered through the Microsite S.id platform with Google services integration, subsequently transformed into an Android application via Apps Geyser. Instructional content addresses Data Security (Passwords) and Digital Crime (Malware) topics consistent with the Digital Literacy strand of the Merdeka Curriculum (B. P. K. R. Indonesia, 2025). Character virtues encompassing responsibility, discipline, honesty, and digital ethics are woven throughout via ethical narratives, contextual case analyses, and structured reflection exercises concluding each sub-topic.

The Development phase generated a prototype subsequently submitted for expert review. Media specialist validation produced a score of 97.33%, content specialist validation yielded 92%, and instructional practitioner validation registered 96%, yielding a cumulative mean validation rate of 95.11%, classified within the highly feasible category. A recapitulation of validation findings is illustrated in Figure 1.

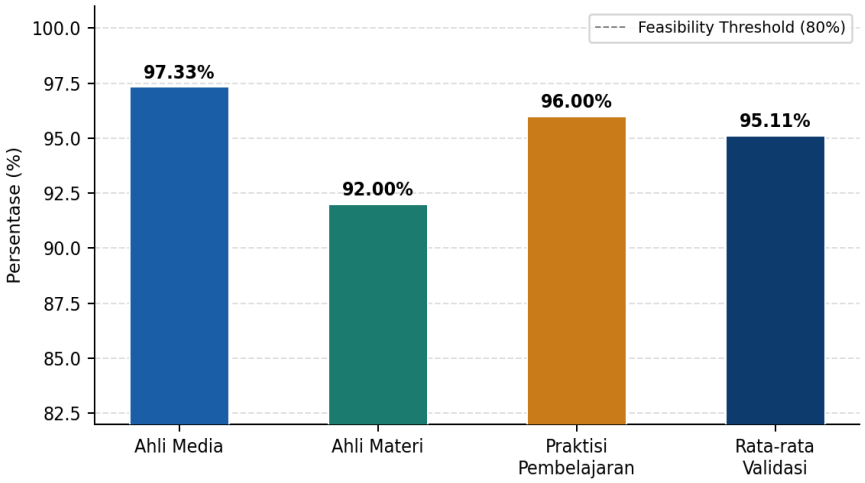

Figure 1. Expert Validation Results of Interactive Learning Media

These outcomes affirm that the media satisfactorily addressed criteria of visual presentation, navigational usability, interactivity, and curricular alignment. The exceptional media expert validation score (97.33%) confirms that the Canva-designed interface and Microsite S.id navigation architecture successfully conformed to established standards for quality digital instructional resources. Arsyad (2020) contends that superior media is distinguished by broad accessibility, visually compelling presentation, and adaptable deployment. These outcomes similarly align with Samosir et al. (2023b), whose investigation demonstrated that character-oriented interactive media can substantially elevate student motivation and academic performance

The constructed interactive learning medium, designated PETIK LIDI: Digital Literacy Informatics Interactive Learning, was designed to deliver data security and digital crime content in an engaging, contextually relevant manner for Grade IX learners. Each navigational element and functional feature was structured to enable independent exploration, material interaction, and application of character principles including responsibility, discipline, and digital ethics. The interface employs minimalist iconography, intuitive navigation architecture, and multimedia components accommodating diverse student learning modalities, thus facilitating both conceptual comprehension and applied skill

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development. Representative displays of the main menu, application icon, and PETIK LIDI user orientation are presented as follows.

Figure 2. Main Menu Display of the PETIK LIDI Application

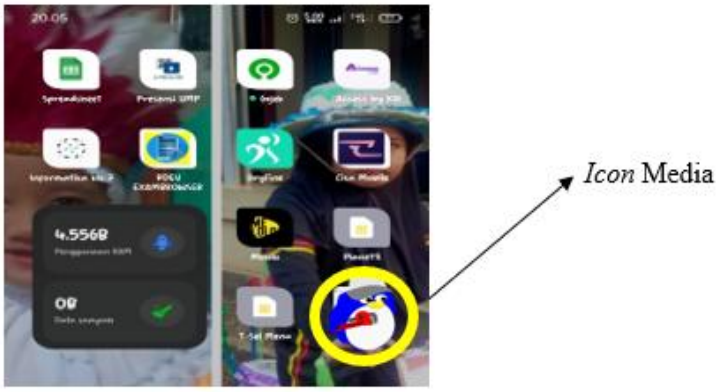

Figure 3. Application Icon of PETIK LIDI

Figure 4. User Guide of the PETIK LIDI Application

Figures 2 through 4 illustrate the structural organization and principal functionalities of the PETIK LIDI medium, encompassing the main interface, application identity marker, and operational guidance materials. These visual representations confirm that the interactive medium was systematically constructed to advance digital literacy alongside character value-based Informatics instruction. All visual components and navigation frameworks were

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calibrated for student accessibility, attention engagement, and facilitation of conceptual understanding regarding digital security principles. Presentation of these figures establishes a concrete foundation for evaluating media practicality and effectiveness prior to classroom deployment.

The Implementation phase involved structured trials across both comparison and experimental classes of Grade IX students, employing instructional modules aligned with the Merdeka Curriculum and deep learning pedagogical principles. Learners engaged with materials interactively, participated in collaborative discussions, completed practice exercises, and undertook structured reflection. The interactive medium was accessible via https://s.id/RatnaSR_27 or through installation from https://s.id/Scu4c, or alternatively through QR Code scanning as displayed in Figure 5.

Figure 5. Application QR Code

Participants proceeded to navigate the PETIK LIDI application, orienting themselves to usage procedures and menu architecture, responding to reflective prompts, and recording attendance. Instructional content spanning data security—with emphasis on password management and digital crime in the form of malware was explored through the application. Embedded instructional video resources facilitated more concrete conceptual understanding. Educators functioned as instructional facilitators throughout the learning process. Learners engaged in structured interactive activities including embedded practice exercises and collaborative group analysis of digital technology case studies. Supplementary applied exercises, such as constructing secure password credentials, further consolidated learning. An educational game component served as embedded formative assessment, enabling educators to gauge student comprehension in real time.

During concluding core activities, students engaged in guided reflection on their learning experiences, articulating insights acquired throughout the session, while educators reinforced digital literacy values and character principles such as responsible and ethical technology utilization. Instructional sessions concluded with collaborative content summarization between educators and learners. Educators delivered process and outcome feedback alongside meaningful guidance regarding prudent technology practices. Follow-up project activities were assigned to extend and deepen conceptual understanding. Media practicality assessment via questionnaire instruments yielded a mean score of 94.46%, confirming the medium's high practical utility and capacity to advance learner digital literacy and character.

The Evaluation phase integrated both formative and summative assessment strategies. Formative evaluation gauged media effectiveness in promoting digital literacy and character development, while summative evaluation assessed competency attainment relative to supplementary curricular materials. Aggregate findings confirm that this web-based interactive medium is effective, practically applicable, and appropriate as a primary instructional resource for Informatics learning contexts.

Practicality of Interactive Learning Media

The implementation phase included media trials involving 32 Grade IX G students. The results of students' responses to media practicality and the recapitulation of expert feasibility assessments are presented in Figure 6.

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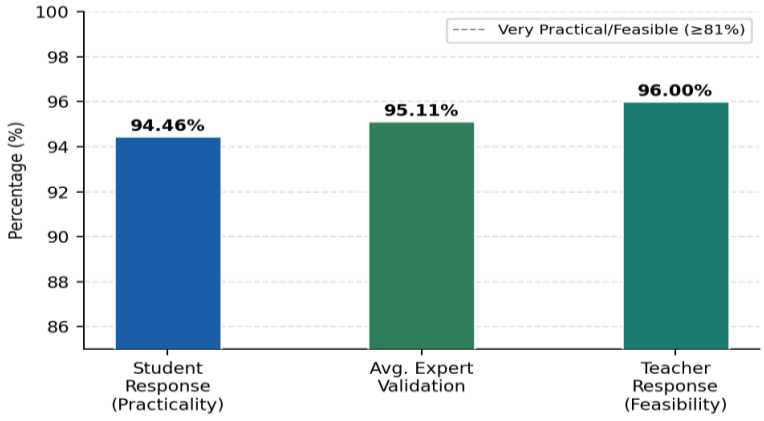

Figure 6. Practicality and Feasibility Results of the Learning Media

Student response data regarding media practicality recorded a total score of 2,267 against a maximum possible score of 2,400, generating a practicality index of 94.46%, classified within the highly practical category. This elevated practicality rating was attributable to several media characteristics: a visually engaging and interactive interface, readily comprehensible navigation systems, logically organized content presentation, integrated practice and feedback functionalities, and smartphone accessibility enabling flexible, anytime-anywhere learning. These findings align with Arsyad's (2020) position that high-quality media must effectively address learner needs through appropriately structured and comprehensible content delivery. Dewi et al. (2025) similarly demonstrated that individualized media adaptation can simultaneously strengthen digital literacy and socioemotional intelligence among students.

Effectiveness of Media on Digital Literacy

Analysis of student digital literacy advancement across individual indicators demonstrated a mean digital literacy score of 91.03%, categorized as excellent. In Figure 7.

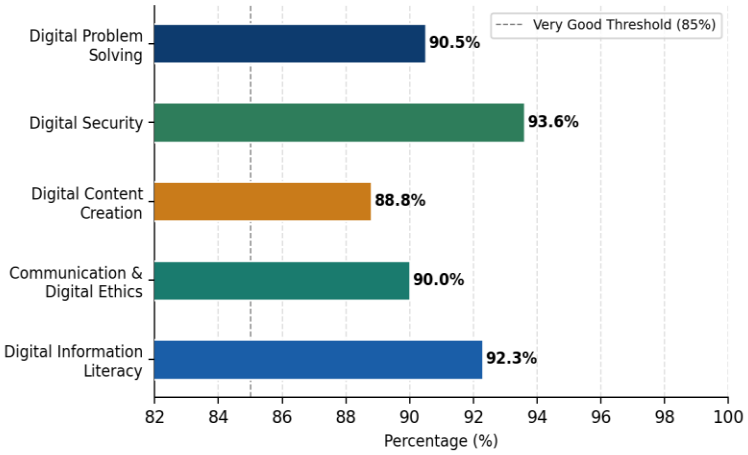

Figure 7. Digital Literacy Improvement of Students per Indicator

The Digital Security indicator recorded the highest performance at 93.6%, whereas Digital Content Creation registered the lowest at 88.8%, though still classified within the excellent range. These results confirm the medium's exceptional effectiveness in facilitating comprehension of data security and digital crime content, which constituted the primary instructional focus. This conclusion corroborates Santoso (2022), who identified digital literacy as

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contributing meaningfully to improvements in critical thinking, problem-solving proficiency, and digital responsibility. Additionally, Fikri et al. (2025) underscores that advancing digital literacy is urgently necessary for nurturing student character in an era dominated by social media.

A comparison of the average pretest and post-test scores between the control and experimental classes is presented in Figure 8.

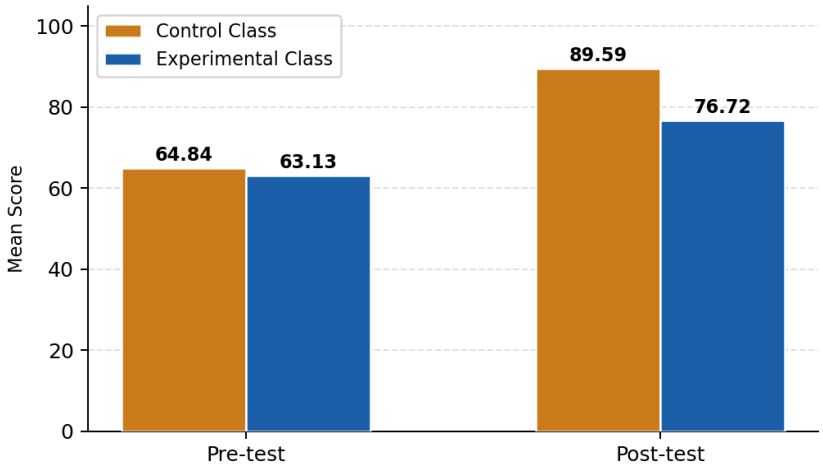

Figure 8. Comparison of Average Pretest and Post-test Scores of Control vs. Experimental Class

Comparative analysis of mean pretest and post-test performance between groups revealed that the experimental class recorded an initial score of 63.13 rising to 76.72 post-intervention, while the comparison class achieved an initial score of 64.84 advancing to 89.59. Proportional gains in the experimental class exceeded those of the comparison group, substantiating the constructive influence of value-integrated interactive learning media on academic achievement.

A comparison of the N-Gain Score between both classes is presented in Figure 9

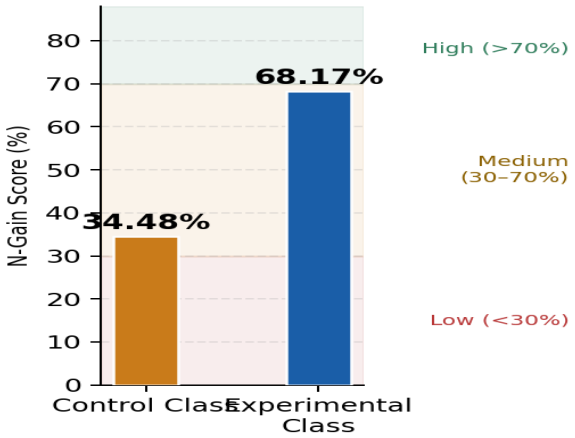

Figure 9. Comparison of N-Gain Score Between Control and Experimental Classes

N-Gain Score computation yielded 34.48% for the comparison class (medium classification) and 68.17% for the experimental class (medium approaching high classification). The substantial intergroup divergence confirms that exposure to value-based interactive instructional media exerted a meaningfully stronger positive effect on digital literacy advancement. Independent Sample t-test analysis produced a Levene's Test value of 0.063 > 0.05, confirming

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variance homogeneity across groups. The Sig. (2-tailed) value of 0.000 < 0.05 establishes a statistically significant distinction between groups, supporting acceptance of Ha: value-integrated interactive learning media meaningfully advances digital literacy among Grade IX students at SMP Negeri 2 Binangun.

These research outcomes substantiate constructivist learning theory (Piaget, 2015a; Mayer & Moreno, 1996a), which posits that learning characterized by active engagement and contextually situated experience promotes deeper conceptual understanding. Wahyuni (2021) demonstrates that fusing technology with character values generates educationally meaningful outcomes. Hidayat (2022) similarly documents that project-oriented Informatics instruction cultivates digital collaboration, creative capacities, and ethical technology practices. Character formation embedded within Informatics instruction through problem-oriented pedagogical approaches has demonstrably enhanced student motivation, learning independence, and ethical reasoning capacities (Sari, 2021), consistent with Lickona (2019), who argues that the harmonious integration of moral knowing, moral feeling, and moral action constitutes a comprehensive character development framework.

CONCLUSION

The present developmental inquiry produced the value-integrated interactive instructional medium "PETIK LIDI" for Informatics instruction at the Grade IX level, verified as valid, practical, and operationally effective. Regarding validity, the aggregate expert validation attained 95.11% (highly feasible), encompassing media specialist validation at 97.33%, content specialist validation at 92%, and instructional practitioner validation at 96%. Concerning practicality, student practicality responses registered 94.46% (highly practical) while educator responses attained 96% (highly feasible). With respect to effectiveness, student digital literacy advancement averaged 91.03% (excellent), with the experimental group's N-Gain Score reaching 68.17% (medium approaching high). Independent Sample t-test outcomes indicate a significance value of 0.000 < 0.05, confirming the statistically significant influence of media utilization on student digital literacy improvement. This interactive instructional medium is endorsed as a pedagogical innovation for Informatics instruction at the junior high school level, particularly addressing data security and digital crime content within the Merdeka Curriculum framework.

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