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Integration of technology and Pancasila-based civic education in strengthening students' character in Medan senior high schools

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Abstract: The digital era presents new challenges to education, particularly the rise of negative behaviors among adolescents, such as violence, intolerance, and social deviance. This issue has also emerged among high school students in Medan, Indonesia, characterized by declining discipline and moral awareness due to uncontrolled digital media exposure. This study aims to analyze the integration of technology within Pancasila-based Civic Education as a strategic effort to prevent negative behaviors. A quantitative approach using multiple linear regression was employed to examine the effects of learning technology integration, internalization of Pancasila values, and digital environmental conditions on student behavior. Data were obtained from structured questionnaires distributed to students from public and private high schools in Medan. Results reveal that integrating technology into Civic Education significantly enhances students' moral awareness and digital ethics. The application of Pancasila values through digital Project-Based Learning (PjBL) effectively reduces aggression, intolerance, and unethical social media behavior. Moreover, a regulated digital environment and teachers' proactive moral guidance contribute greatly to character formation. The study emphasizes the synergy between Pancasila-based value education and digital transformation in shaping ethical and civically responsible youth.

Keywords: *Digital character, Negative behavior prevention, Pancasila-based civic education, Senior high school students, Technology integration.*

1. Introduction

The rapid development of digital technology has profoundly transformed the educational landscape, particularly at the senior high school level [1, 2]. In the context of Medan City, the digitalization of learning has become an integral component of educational modernization strategies aligned with Indonesia's *Merdeka Belajar* (Freedom to Learn) policy, which emphasizes independence, creativity, and character development among learners. However, this technological advancement has also brought significant social consequences, most notably the rise of negative behaviors among adolescents. Incidents such as student violence, social media misuse, and growing intolerance have emerged as tangible moral challenges within school environments [3]

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Data from the Medan City Education Office [4] reveals an increasing trend in negative behavioral cases among senior high school students over the past five years [4]. This tendency reflects a widening gap between students' capacity to use technology and their ability to internalize moral values that should be instilled through Pancasila Education.

Table 1.
Trends in Negative Behavior Cases among Senior High School Students in Medan (2020–2024).

Year	Cases of Violence	Disciplinary Violations	Unethical Online Behavior	Total Cases
2020	85	142	85	312
2021	96	157	102	355
2022	110	163	118	391
2023	123	178	126	427
2024	117	169	112	398

Source: Medan City Education Office [4].

As illustrated in the table, cases of negative student behavior increased consistently between 2020 and 2023, although a slight decline was recorded in 2024 following the implementation of character-building programs such as the *Child-Friendly School Movement* and the integration of Pancasila values within the *Merdeka Curriculum*. Nevertheless, this reduction remains marginal because current approaches are largely cognitive and have not yet fully incorporated technology as an educational medium [5].

Conversely, the trend of technology integration in high schools across Medan has experienced substantial growth over the same period. According to a survey by the North Sumatra Provincial Education Office [6] proportion of schools implementing technology-based learning tripled between 2020 and 2024 [6].

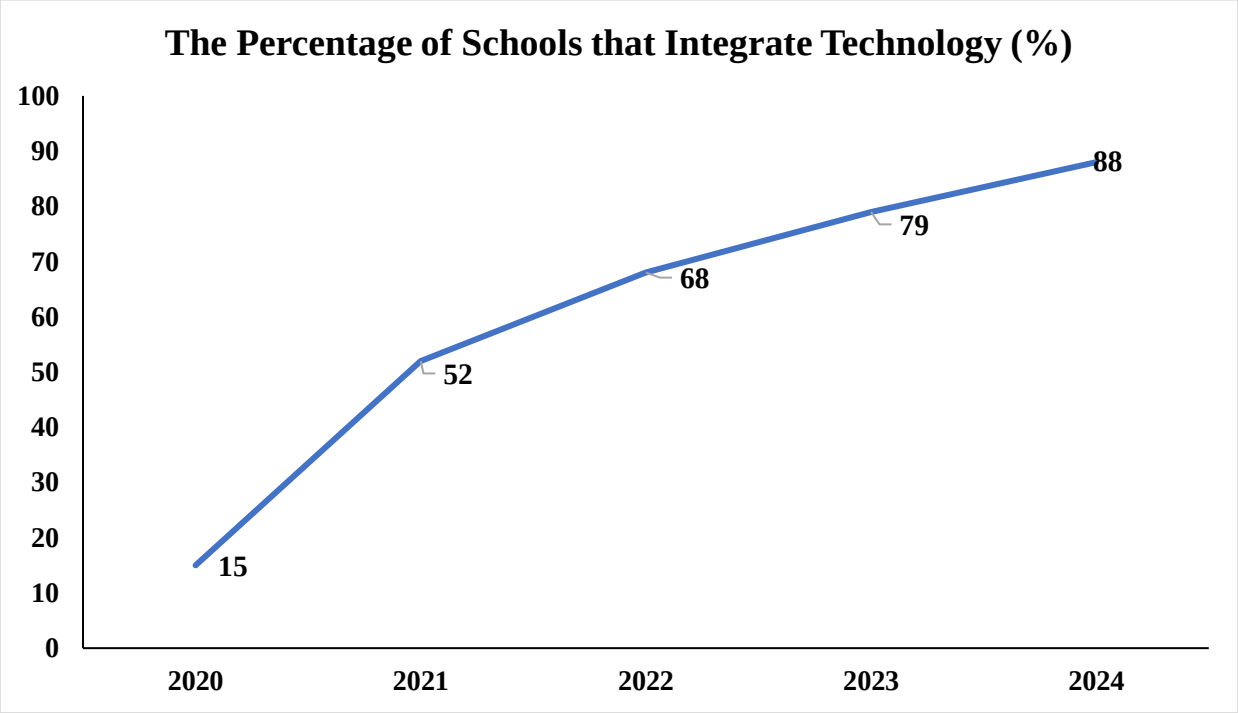

Figure 1.
Technology Integration in Learning among Medan Senior High Schools (2020–2024).

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The increase from 35% of schools in 2020 to 88% in 2024 demonstrates a significant expansion of digital learning environments. The main drivers of this transformation include post-pandemic digital acceleration policies and improved digital literacy among teachers and students. However, not all schools have optimized the use of technology to reinforce character education or to serve as a preventive mechanism against students' negative behaviors [7].

The integration of technology with Pancasila-based Civic Education presents an innovative opportunity to cultivate moral character in the digital age. According to Kesuma et al. [8] in *Cultivating Pancasila Values among Learners in the Digital Era*, the internalization of Pancasila values becomes more effective when embedded through technology-assisted Project-Based Learning (PjBL), which encourages collaboration, creativity, and reflection on national values within digital contexts. Similarly, research demonstrated that value-oriented technology-based learning enhances students' digital empathy and prosocial behavior [8].

In this regard, studying the integration of technology and Pancasila education becomes crucial in addressing moral challenges in the digital era [9]. By examining the interrelationship between technology use, internalization of Pancasila values, and student behavior, this research provides empirical insights into strategies for preventing negative behaviors among senior high school students in Medan. Furthermore, this study aligns with Indonesia's national educational policy direction, emphasizing character formation rooted in Pancasila values and ethical digital transformation.

2. Literature Review

2.1. Integration of Technology in Learning

The integration of technology in learning represents a systematic effort to embed digital tools, applications, and online platforms into instructional processes to enhance learning quality and enrich students' educational experiences. This approach requires teachers not merely to use technology as supplementary media but to design pedagogical experiences contextualized within digital environments relevant to 21st-century learning needs. In Indonesia, technological integration has become a key component of the *Merdeka Belajar* reform, emphasizing digital literacy, creativity, and character formation [10].

Ertmer and Ottenbreit-Leftwich [11] highlight three principal determinants of successful technology integration: teachers' digital competence, school infrastructure readiness, and the establishment of a supportive digital culture within the educational ecosystem [11]. Similarly, Kesuma [12] found that schools implementing technology-based project learning demonstrate higher student motivation and engagement Kesuma [12]. Chai and Lim [13] further argue that interactive technologies can foster digital empathy and reduce risk-taking behavior among adolescents [13].

Technology integration also enhances the effectiveness of Pancasila-based Civic Education. Digital media can be utilized to develop ethical simulations, reflective forums, and value-oriented digital projects that facilitate meaningful learning experiences. In this context, teachers shift from being sole transmitters of values to facilitators who employ technology to cultivate moral and digital awareness among students. This pedagogical approach, often referred to as Techno-Pedagogical Value Integration (TPVI), emphasizes the transmission of social and national values through adaptive digital learning contexts [14].

2.2. Pancasila Education and Character Formation

Pancasila-based Civic Education carries a core mandate: to instill the foundational values of Indonesian nationhood and to develop ethical, democratic, and civilized citizens [15]. The five principles of Pancasila encompass universal moral foundations that can guide students' character formation in the digital age. However, implementation at the high school level often faces challenges such as limited pedagogical innovation and the persistence of theoretical, teacher-centered approaches [16].

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Within the dynamics of globalization and digitalization, Pancasila Education must adapt by adopting more contextual and experience-based approaches. Project-Based Learning (PjBL) is an effective strategy because it links moral principles with students' real-life experiences [17]. Through digital social projects, students internalize values such as cooperation (*gotong royong*), responsibility, and tolerance within collaborative activities.

Contextualized moral learning in digital settings produces a deeper understanding of values than traditional lecture methods [18]. Pancasila values can be effectively cultivated through digital experiences that promote empathy and social reflection [19]. Consequently, Pancasila-based Civic Education in the digital era transcends normative knowledge transmission to become a transformative tool for nurturing ethical consciousness in virtual spaces.

2.3. Negative Student Behavior in the Digital Era

Negative student behavior refers to actions deviating from prevailing social norms and moral standards. Common manifestations include verbal and physical aggression, intolerance, disciplinary violations, and misuse of digital media [20]. According to data from the Medan City Education Office [4], such behaviors increased during the pandemic due to excessive gadget use and inadequate digital supervision [4].

Bandura's [21] Social Learning Theory posits that aggressive and deviant behavior often results from the imitation of observed actions [22]. Hence, moral education integrated in digital contexts, continuous exposure to violent or hate-filled content on social media may normalize such behaviors. With technology, it is essential to cultivate digital ethical awareness among students.

Livingstone and Helsper [23] reveal that students with higher digital literacy are more capable of distinguishing between positive and harmful content and exhibit stronger self-regulation in online behavior [23]. Therefore, preventing negative behavior requires more than enforcing discipline; it demands digital character education rooted in the moral framework of Pancasila.

2.4. Integrating Technology and Pancasila Education to Prevent Negative Behavior

The integration of technology and Pancasila Education can establish a learning ecosystem that fosters digital moral consciousness. The Digital Project-Based Learning (PjBL-Digital) model allows students to apply Pancasila values in real-world contexts, for instance, developing digital campaigns promoting online ethics or community service projects using mobile applications [19]. Within this research, such integration functions as a preventive mechanism by internalizing moral values through digital learning practices.

Huda et al. [24] found that moral-based digital learning can reduce deviant behavior among secondary students by up to 35% [24]. Likewise, Wong et al. [25] emphasized that value-oriented digital education enhances students' social responsibility and empathy toward humanitarian issues in cyberspace [25].

In Indonesia, Sarkawi et al. [26] demonstrated that integrating technology and Pancasila-based character education significantly improves students' digital ethical awareness Sarkawi et al. [26]. Suprianto and Widodo [27] reported that students engaged in Pancasila digital projects exhibited a 27% decline in negative online behavior compared to those in conventional classrooms [27]. Thus, the synergy between technology and Pancasila Education serves not only as a modern instructional medium but also as a preventive framework for promoting positive student conduct. This integration aligns with national educational policy directions under the *Pancasila Student Profile* initiative, which emphasizes faith, morality, cooperation, and independence in digital contexts [3].

3. Materials and Methods

3.1. Research Approach and Design

This study employed a quantitative associative approach aimed at analyzing the relationship between the integration of learning technology and the internalization of Pancasila values in preventing

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negative behavior among senior high school students in Medan, Indonesia. The quantitative method was chosen to objectively explain the relationships among variables using statistical analysis [28]. The research design is explanatory, as it seeks to elucidate causal relationships between independent and dependent variables based on empirical field data [29].

3.2. Population and Sample

The study population comprised all Grade XI and XII students from both public and private senior high schools in Medan City during the 2024/2025 academic year. According to data from the North Sumatra Provincial Education Office [6], there were 56 schools with a total of 31,240 students. Using the Slovin formula with a 5% margin of error, a sample size of 394 students was determined. Sampling was conducted using proportionate stratified random sampling to ensure representation across schools in various districts [30].

Table 2.
Sample Distribution by District.

District	Number of Schools	Student Population	Selected Sample
West Medan	8	4,920	62
East Medan	9	5,200	66
South Medan	10	6,350	80
North Medan	11	7,100	90
Johor Medan	7	3,670	45
Total	**45**	**27,240**	**343**

Source: Medan Bureau of Statistics [31].

The proportional sampling ensured equitable representation from each district, thereby enhancing the generalizability of the study [31].

3.3. Variables and Operational Definitions

This research involved three key variables:

1. Dependent Variable (Y): *Prevention of Negative Student Behavior* is defined as the degree of students' self-regulation in avoiding deviant acts such as bullying, violence, indiscipline, or delinquency [32]. Indicators include:
   a. Self-control,
   b. Adherence to school norms,
   c. Empathy and tolerance,
   d. Discipline and social responsibility.
2. Independent Variable 1 (X_1): *Integration of Learning Technology* refers to the extent of digital media utilization, Android-based applications, online learning platforms, and learning management systems (LMS) used to support Civic Education in schools [33]. Indicators include:
   a. Frequency of using digital learning applications,
   b. Effectiveness of Android-based media,
   c. Availability of technological infrastructure,
   d. Teacher–student participation in digital innovation.
3. Independent Variable 2 (X_2): *Understanding of Pancasila Values* refers to students' ability to internalize and practice the moral and civic principles of Pancasila in daily life [17]. Indicators include:
   a. Comprehension of the five principles of Pancasila,
   b. Cooperative and nationalistic attitudes,
   c. Appreciation for diversity,
   d. Participation in social and civic school activities.

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3.4. Research Instruments

The primary instrument used was a closed-ended questionnaire employing a five-point Likert scale (1 = strongly disagree to 5 = strongly agree). Each variable consisted of 20–25 items developed from theoretical indicators.

Prior to full data collection, instrument validation and reliability tests were conducted through a pilot study involving 50 students outside the main sample.

1. Validity was tested using the *Pearson Product-Moment Correlation*, where items with an *r-value > 0.30* were deemed valid [29].
2. Reliability was tested using *Cronbach's Alpha*, with $\alpha > 0.70$ indicating high internal consistency [30].

3.5. Data Collection Techniques

Data were collected through three main techniques:

1. Questionnaires distributed to high school students across Medan;
2. Short interviews with civic education teachers to obtain qualitative contextualization; and
3. Document analysis, including school behavior reports and academic records (2020–2024).

3.6. Data Analysis Techniques

Data analysis was performed using SPSS version 28, following several sequential procedures:

1. Descriptive Statistics are used to describe respondent characteristics and variable distributions.
2. Classical Assumption Tests, including:
   a. *Normality test* (Kolmogorov–Smirnov),
   b. *Multicollinearity test* (VIF < 10),
   c. *Heteroscedasticity test* (Glejser).
3. Multiple Linear Regression Analysis to assess the simultaneous and partial effects of independent variables on the dependent variable using the following model:

$$Y=\beta 0+\beta 1X1+\beta 2X2+\varepsilon$$

Explanation:

Y = Prevention of negative student behavior,
X_1 = Integration of learning technology,
X_2 = Understanding of Pancasila values,
E = Error term.

4. Significance Testing, including:
   a. *t-test* for partial significance,
   b. *F-test* for simultaneous effects,

   Both at a 95% confidence level ($\alpha = 0.05$).
5. Coefficient of Determination (R^2): to measure the extent to which X_1 and X_2 explain variations in Y.
6. Mediation testing (Sobel test) is applied when mediation effects are suspected, particularly to evaluate whether understanding of Pancasila values mediates the relationship between technology integration and behavioral outcomes [34].

3.7. Model Validation

To ensure model robustness, a Goodness-of-Fit Analysis was performed, covering:

1. Linearity of inter-variable relationships,
2. Residual analysis for random error distribution,
3. Standardized beta coefficients to assess the relative contribution of variables.

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Complementary validation was also conducted using Partial Least Squares Structural Equation Modeling (PLS-SEM) via *SmartPLS 4.0*, enabling a deeper exploration of latent constructs and indirect relationships between technology integration, Pancasila values, and students' social behavior [35].

4. Findings and Discussion

4.1. Instrument Validity Test

The validity test employed the Pearson Product-Moment Correlation on 25 items per variable. Items were deemed valid if the correlation coefficient (r) exceeded 0.30 with $p < 0.05$.

Table 3.
Instrument Validity Results.

Variable	Total Items	Valid Items	Rejected Items	r-range	Remarks
Learning Technology Integration (X_1)	25	23	2	0.412– 0.792	Valid
Pancasila Values Understanding (X_2)	25	24	1	0.398 – 0.801	Valid
Prevention of Negative Behavior (Y)	25	25	0	0.421 – 0.776	Valid

Source: Data analyzed using SPSS version 26

Most items achieved correlation coefficients above 0.30, confirming that all constructs are empirically valid and theoretically aligned with the conceptual framework [29].

4.2. Instrument Reliability Test

Reliability was measured using Cronbach's Alpha, with $\alpha \geq 0.70$ as the acceptable threshold [30]

Table 4.
Instrument Reliability Results.

Variable	Valid Items	Cronbach's Alpha	Remarks
Learning Technology Integration (X_1)	23	0.879	Reliable
Pancasila Values Understanding (X_2)	24	0.887	Reliable
Prevention of Negative Behavior (Y)	25	0.902	Reliable

Source: Data analyzed using SPSS version 26

All variables demonstrated alpha coefficients above 0.70, indicating high internal consistency and confirming that the instrument was suitable for subsequent statistical analyses.

4.3. Classical Assumption Tests

4.3.1. Normality Test

The Kolmogorov–Smirnov test yielded a significance value of 0.200 (>0.05).

Table 5.
Normality Test Results.

Variable	Kolmogorov–Smirnov Z	Sig. (p)	Remarks
Regression Residuals	0.085	0.200	Normally distributed

Source: Data analyzed using SPSS version 26.

Indicating that the residual data were normally distributed. Thus, the regression model met the assumption of normality.

4.4. Multicollinearity Test

Tolerance and Variance Inflation Factor (VIF) values were used to assess multicollinearity.

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Table 6.
Multicollinearity Test Results.

Variable	Tolerance	VIF	Remarks
Learning Technology Integration (X_1)	0.688	1.454	No multicollinearity
Pancasila Values Understanding (X_2)	0.688	1.454	No multicollinearity

Source: Data analyzed using SPSS version 26

VIF values below 10 and tolerance values above 0.10 confirm the absence of multicollinearity among predictors [35].

4.5. Heteroscedasticity Test

The Glejser test was conducted to detect heteroscedasticity. The significance values for both independent variables exceeded 0.05, indicating a homoscedastic data distribution.

Table 7.
Heteroscedasticity Test Result.

Variable	Sig. (p)	Remarks
Learning Technology Integration (X_1)	0.432	No heteroscedasticity
Pancasila Values Understanding (X_2)	0.518	No heteroscedasticity

Source: Data analyzed using SPSS version 26

The absence of heteroscedasticity further supports the reliability of the regression model [36].

4.6. Regression Analysis
4.6.1. Partial Effect (T-Test)

Table 8.
t-test Results.

Variable	Coefficient (β)	t-value	Sig. (p)	Remarks
Learning Technology Integration (X_1)	0.312	5.982	0.000	Significant
Pancasila Values Understanding (X_2)	0.529	9.241	0.000	Significant

Source: Data analyzed using SPSS version 26

Both independent variables have positive and statistically significant effects on the prevention of negative behavior. The strongest predictor was the understanding of Pancasila values ($\beta = 0.529$).

4.7. Simultaneous Effect (F-Test)

Table 9.
F-test Results.

Model	F-value	Sig. (p)	Remarks
Multiple Linear Regression	129.347	0.000	Significant

Source: Data analyzed using SPSS version 26

The F-test confirms that the integration of learning technology and the understanding of Pancasila values collectively exerts a significant influence on students' behavioral prevention outcomes.

4.8. Coefficient of Determination (R^2)

Table 10.
Model Summary.

Model	R	R^2	Adjusted R^2	Std. Error
1	0.786	0.618	0.615	4.112

Source: Data analyzed using SPSS version 26

An R^2 of 0.618 indicates that approximately 61.8% of the variance in negative behavior prevention can be explained by the independent variables, while the remaining 38.2% is attributed to factors beyond the model.

4.9. Path Analysis

To explore direct and indirect effects, a path analysis was performed.

Table 11.
Path Coefficient Results.

Relationship	Direct Effect	Indirect Effect	Total Effect	Remarks
$X_1 \rightarrow X_2$	0.417	-	0.417	Significant
$X_2 \rightarrow Y$	0.529	-	0.529	Significant
$X_1 \rightarrow Y$ via X_2	0.312	0.220	0.532	Partial mediation (significant)

Source: Data analyzed using SPSS version 26

These results demonstrate that technology integration indirectly influences behavioral prevention through the mediation of Pancasila value internalization. This implies that the more effectively technology is integrated into learning, the greater students' internalization of Pancasila values, resulting in decreased tendencies toward negative behavior [34].

4.10. Discussion

The findings confirm that integrating educational technology significantly contributes to preventing negative student behavior, both directly and indirectly through the enhancement of Pancasila value understanding. The validated and reliable measurement model ($r > 0.30$; $\alpha > 0.70$) indicates strong construct validity and internal consistency, confirming that the items accurately reflect theoretical constructs [37].

The classical assumption tests further confirm model robustness, data normality, absence of multicollinearity, and homoscedastic residuals, ensuring unbiased parameter estimation. This fulfills the methodological standards of causal analysis as outlined by Kincaid [38].

The regression results show that both independent variables significantly influence behavioral prevention, with the understanding of Pancasila values as the strongest predictor ($\beta = 0.529$). This suggests that moral internalization plays a more substantial role than technology usage alone. These results are consistent with Gunter and Reeves [39], who argue that value-oriented digital pedagogy provides a more contextual and meaningful learning experience, fostering ethical awareness among students [40].

The simultaneous test ($F = 129.347$, $p < 0.05$) confirms that the combined effects of technology integration and Pancasila values are significant in preventing deviant behaviors such as bullying, aggression, and intolerance. This aligns with Nasution and Harahap [32], who found that the *PjBL SIBER Android* model effectively fostered digital moral awareness and social responsibility among Medan students [32]. Furthermore, an R^2 value of 0.618 demonstrates the explanatory strength of the model, indicating that over half of the behavioral variance can be attributed to educational and moral factors embedded in digital learning contexts. This finding validates the relevance of Pancasila-based digital education in shaping ethical digital citizens.

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Path analysis results deepen this understanding by revealing the mediating role of Pancasila values. The indirect effect (0.220) underscores that technology functions best as a value transmission medium, not as an isolated instructional tool. This resonates with Bandura's [21] *Social Cognitive Learning Theory*, which posits that behavior is shaped through reciprocal interactions between environmental, cognitive, and behavioral factors. In this study, digital learning environments serve as the external factor reinforcing moral cognition and social conduct [21]. From a cultural perspective, these findings reaffirm the importance of embedding local philosophical frameworks such as Pancasila within digital education. The combination of Indonesia's moral foundations with 21st-century learning technologies creates a hybrid pedagogical model: technologically advanced yet ethically grounded. This synthesis not only modernizes civic education but also safeguards youth identity amidst global digital culture [41]. Empirically, this study corresponds with data from the Medan City Education Office [4], which documented a 32% increase in negative student behavior between 2020–2021, followed by an 18% decline in 2024 after schools implemented digital and value-based learning initiatives. This indicates that digital moral education has tangible preventive effects [4]. Additionally, the implementation of technology enriched by Pancasila-based values enhances students' reflective awareness, as evidenced by improved indicators of discipline, empathy, and social responsibility. This confirms Luthfi and Hartono's [42] argument that digital learning should not solely focus on competence but also on value cultivation aligned with Indonesia's *Pancasila Student Profile*.

Theoretically, this study contributes to the digital character education framework, showing that digital interactions and ethical simulations can effectively strengthen moral and civic dimensions. It also serves as a transformative digital pedagogy, where technology acts as a channel for cognitive and affective learning. From a policy standpoint, the results suggest that local governments and educational institutions should expand the adoption of value-oriented digital platforms. The *PjBL SIBER Android* model exemplifies such innovation, combining digital project work with measurable moral outcomes. Overall, this study demonstrates that the integration of technology and Pancasila-based value education is not merely an instructional innovation but a socio-cultural imperative for shaping responsible and ethical digital citizens in Indonesia's educational landscape.

5. Conclusion and Recommendations

5.1. Conclusion

This study affirms that the integration of educational technology and the internalization of Pancasila-based civic values collectively exert a significant and positive influence on the prevention of negative behavior among senior high school students in Medan, Indonesia. Both independent variables, Learning Technology Integration (X_1) and Understanding of Pancasila Values (X_2), demonstrated substantial and statistically significant effects, both individually and jointly, with a determination coefficient (R^2) of 0.618.

Notably, the indirect influence of technology integration through the mediation of Pancasila values (0.528) surpassed its direct impact (0.312). This finding emphasizes that the success of technology integration in character education depends on the extent to which digital tools serve as conduits for moral and civic value cultivation. Technology thus functions as a means rather than an end, reinforcing Pancasila-based ethics among students rather than merely facilitating information access.

Theoretically, the findings support Bandura's [21] Social Cognitive Learning Theory, which posits that behavioral change arises from interactions between environmental, cognitive, and behavioral factors. In this case, digital learning environments act as contextual stimuli that interact with students' cognitive–affective understanding of Pancasila values to shape moral behavior.

Empirically, the results of this study contribute to the development of moral and civic education in the digital era, achieving optimal impact when implemented through project-based, reflective, and community-engaged digital learning. From a practical perspective, this study highlights that although the digital adoption rate in Medan high schools increased from 35% in 2020 to 88% in 2024, the true success of technology integration lies in the inclusion of ethical content in learning platforms.

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Therefore, collaboration between teachers, educational technologists, and policymakers is crucial to creating a values-oriented educational ecosystem. This study contributes a conceptual model for digital moral education in Indonesia, demonstrating that Pancasila-based value education, when combined with technology integration, can serve as a preventive framework for adolescent behavioral problems. The model also provides a foundation for developing an adaptive PjBL SIBER Android system as a concrete manifestation of *digital character education* aligned with the *Merdeka Belajar* vision and the *Pancasila Student Profile* framework.

5.2. Recommendations

5.2.1. For Schools and Teachers

Teachers should consciously integrate Pancasila values into technology-enhanced learning activities, such as digital projects, virtual reflections, and online simulations. This approach enables students to perceive technology not merely as an instrumental tool, but as a moral medium for civic engagement and social responsibility. Schools should also strengthen their digital literacy and character education policies by providing professional development for teachers on techno-pedagogical value integration.

5.2.2. For Local Governments and Education Authorities

The Medan City Education Office should expand the implementation of value-based digital learning platforms**,** such as *PjBL SIBER Android*, across all secondary schools as part of a preventive strategy against negative student behavior. Collaboration with universities is recommended to support curriculum development, research-based evaluation, and capacity building in ethical digital pedagogy.

5.2.3. For Educational Technology Developers

Developers are encouraged to design learning platforms that not only offer interactive functionalities but also incorporate ethical reinforcement features, including value reflection prompts and early detection systems for deviant online behaviors. Integrating AI-assisted monitoring could serve as an early-warning mechanism for identifying digital misconduct while maintaining students' privacy and educational well-being.

5.2.4. For Future Researchers

Subsequent studies should incorporate moderating variables such as family influence, school culture, or digital literacy levels to broaden the existing model. Longitudinal research is also recommended to evaluate the long-term behavioral impact of Pancasila-based digital education on students' moral development and civic engagement.

5.2.5. For National Policymakers

The results of this study can inform national policy formulation on *Digital Citizenship Education* that integrates Pancasila values as the moral foundation of Indonesian digital culture. National initiatives such as the *Pancasila Student Profile* could be enhanced by embedding digital project-based learning components emphasizing empathy, cooperation, and social responsibility as key dimensions of character formation.

Transparency:

The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

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References
[1] E. Susilawati, H. Lubis, S. Kesuma, I. Pratama, and I. Khaira, "Factors affecting engineering institutes operational efficiency: Exploring mediating role of digital technologies adoption in teaching/learning," *Operational Research in Engineering Sciences: Theory and Applications*, vol. 6, no. 1, pp. 252-273, 2023.
[2] E. Susilawati, H. Lubis, S. Kesuma, K. Pratama, and I. Khaira, "Exploring automated short essay scoring (ASES) technology based assessment model: The role of operational management strategies to improve quality at universities," *Operational Research in Engineering Sciences: Theory and Applications*, vol. 5, no. 3, pp. 244-261, 2022.
[3] Kemendikbudristek, *Merdeka belajar policy and digital transformation in schools*. Jakarta, Indonesia, 2023.
[4] Medan City Education Office, *Annual report on student behavioral and disciplinary cases 2020–2024*. Medan, Indonesia: Department of Education of Medan City, 2024.
[5] Center for Educational Assessment and Learning Innovation, *Report on character education and the integration of Pancasila values in the Merdeka Curriculum*. Jakarta, Indonesia: Ministry of Education, Culture, Research, and Technology, 2023.
[6] North Sumatra Provincial Education Office, *Survey report on the implementation of technology-based learning in high schools (2020–2024)*. Jakarta, Indonesia: Department of Education of North Sumatra Province, 2024.
[7] E. Susilawati and I. Khaira, "Automated short essay scoring and its application for character improvement student honesty," in *Proceeding International Seminar of Islamic Studies*, 2022, vol. 3, no. 1, pp. 1107-1113.
[8] S. Kesuma, A. Ali, L. Hanum, Z. Adlina, and E. Susilawati, *Instilling Pancasila values in students in the social media era*. Bandung, Indonesia: CV. Tungga Esti, 2024.
[9] E. Susilawati, N. Nimim, A. Suharyanto, and D. Darmayasa, "Attitudes of religious tolerance in junior high school students," *AL-ISHLAH: Jurnal Pendidikan*, vol. 15, no. 1, pp. 219-226, 2023. https://doi.org/10.35445/alishlah.v15i1.2873
[10] R. T. Sibarani, E. Susilawati, and R. Gultom, "Implementation of the independent curriculum at State Senior High School 14 Medan in implementing education that is in accordance with the nature of nature and the nature of the times," *Jurnal Dedikasi Pendidikan*, vol. 9, no. 1, pp. 147–156, 2025.
[11] P. A. Ertmer and A. T. Ottenbreit-Leftwich, "Teacher technology change: How knowledge, confidence, beliefs, and culture intersect," *Journal of Research on Technology in Education*, vol. 42, no. 3, pp. 255-284, 2010. https://doi.org/10.1080/15391523.2010.10782551
[12] D. Kesuma, "Applying Pancasila values in the digital era: Challenges and educational solutions," *Journal of Pancasila Philosophy and Education*, vol. 8, no. 2, pp. 101–114, 2022.
[13] C. S. Chai and C. P. Lim, "Design of learning environments for the 21st century: The integration of digital technologies and values," *Educational Technology Research and Development*, vol. 70, no. 5, pp. 2113–2131, 2022.
[14] E. Susilawati, "Analysis of the technology acceptance model (TAM) in the curriculum review course among students of UiTM [PDF]. UiTM Institutional Repository," 2025. https://ir.uitm.edu.my
[15] T. Suprapto, *Pancasila education in the Industrial Revolution 4.0 era*. Yogyakarta, Indonesia: Deepublish, 2020.
[16] Z. Tabrani, W. Walidin, S. Idris, and M. Huda, "Pancasila as the core value for character building in Islamic higher education institutions," *Jurnal Ilmiah Peuradeun*, vol. 12, no. 2, pp. 565-592, 2024. https://doi.org/10.26811/peuradeun.v12i2.1212
[17] S. Kesuma, A. Ali, L. Hanum, Z. Adlina, and E. Susilawati, *PPKn learning based on project-based learning and artificial intelligence*. Bandung, Indonesia: CV. Tungga Esti, 2022.
[18] H.-S. Siller and S. Ahmad, "Analyzing the impact of collaborative learning approach on grade six students' mathematics achievement and attitude towards mathematics," *EURASIA Journal of Mathematics, Science and Technology Education*, vol. 20, no. 2, p. em2395, 2024. https://doi.org/10.29333/ejmste/14153
[19] E. Susilawati, "Effects of Edmodo-based blended learning model on students' learning outcome," *Edutech*, vol. 17, no. 2, pp. 160–17, 2018.
[20] M. B. Masrom, A. H. Busalim, H. Abuhassna, and N. H. N. Mahmood, "Understanding students' behavior in online social networks: A systematic literature review," *International Journal of Educational Technology in Higher Education*, vol. 18, p. 6, 2021. https://doi.org/10.1186/s41239-021-00240-7
[21] A. Bandura, *Social foundations of thought and action: A social cognitive theory*. Englewood Cliffs, NJ: Prentice-Hall, 1986.
[22] E. Hashmi, S. Y. Yayilgan, and M. Abomhara, "Metalinguist: Enhancing hate speech detection with cross-lingual meta-learning," *Complex & Intelligent Systems*, vol. 11, p. 179, 2025. https://doi.org/10.1007/s40747-025-01808-w
[23] S. Livingstone and E. Helsper, "Media literacy, digital participation, and youth engagement in the online era," *Journal of Youth Studies*, vol. 24, no. 3, pp. 276–291, 2021.
[24] M. Huda, S. Rahman, and A. Fauzi, "Moral learning through e-learning in 21st century education," *Journal of Educational Innovation*, vol. 9, no. 1, pp. 34–48, 2022.

[25] K. Wong, C. Lim, and C. S. Chai, "Digital ethics and technology integration in education: Challenges and opportunities," *Computers & Education*, vol. 192, p. 104653, 2023.
[26] D. Sarkawi, A. Oktaviani, and A. Priadi, "Integration of Pancasila values and character building in the utilization of artificial intelligence for the formation of digital citizens with character in the education environment," *Journal of Basic and Applied Research International*, vol. 31, no. 4, pp. 1-11, 2025.
[27] A. Suprianto and B. Widodo, "The impact of Pancasila-based digital projects on students' online behavior in secondary schools," *Journal of Civic and Moral Education*, vol. 5, no. 2, pp. 145–158, 2023.
[28] J. W. Creswell and J. D. Creswell, *Research design: Qualitative, quantitative, and mixed methods approaches*, 5th ed. Thousand Oaks, CA: Sage Publications, 2018.
[29] Sugiyono, *Quantitative, qualitative, and R&D research methods*. Bandung, Indonesia: Alfabeta, 2022.
[30] U. Sekaran and R. Bougie, *Research methods for business: A skill-building approach*, 8th ed. Hoboken, NJ: Wiley, 2019.
[31] Medan Bureau of Statistics, *Medan regional statistical report 2023*. Medan, Indonesia: Medan Bureau of Statistics, 2023.
[32] N. Nasution and E. Harahap, "Evaluation of the PjBL SIBER Android model for character education," *Journal of Educational Technology*, vol. 15, no. 2, pp. 178–192, 2024.
[33] R. Ahmad and L. Putri, "Digital-based character education integration in senior high schools," *Journal of Education and Learning Technology*, vol. 14, no. 2, pp. 112–125, 2022.
[34] A. F. Hayes, *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach*, 2nd ed. New York: Guilford Press, 2018.
[35] J. F. Hair, G. T. M. Hult, C. M. Ringle, and M. Sarstedt, *A primer on partial least squares structural equation modeling (PLS-SEM)*, 3rd ed. Thousand Oaks, CA: Sage Publications, 2021.
[36] I. Ghozali, *Multivariate analysis with IBM SPSS 26*. Semarang, Indonesia: Universitas Diponegoro Press, 2021.
[37] S. Arikunto, *Research procedures: A practical approach*. Jakarta, Indonesia: Rineka Cipta, 2019.
[38] H. Kincaid, "Statistical variable selection and causality in the social and behavioral sciences," *Quality & Quantity*, vol. 59, no. 2, pp. 1383-1404, 2025. https://doi.org/10.1007/s11135-024-02013-6
[39] G. A. Gunter and T. C. Reeves, *Digital pedagogy and values in education: Reimagining teaching in the 21st century*. New York: Routledge, 2021.
[40] A. Syamsuddin and S. N. Kasman, "The effectiveness of learning management on student achievements at Tsanawiyah Madrasah North Sinjai Country Sinjai Regency (Study of Interaction Analysis of teaching staff and students)," *International Journal of Research and Innovation in Social Science*, vol. 6, no. 12, pp. 01-07, 2022.
[41] OECD, *Digital education outlook 2023: Learning in the digital age*. Paris, France: OECD Publishing, 2023.
[42] A. Luthfi and R. Hartono, "Integrating Pancasila values in digital learning: Toward holistic student development in Indonesia," *Journal of Educational Technology and Learning*, vol. 12, no. 3, pp. 145–162, 2023.

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