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# Developing a Deep Learning-Based Legal Literacy Education Model: Structural Relationships Among Digital Legal Literacy, Cyber Behavior, Learning Needs, and Character Strengthening

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## ABSTRACT

The rapid growth of digital technology has created new challenges related to legal awareness, ethical behavior, and character development among students. As digital natives, students are increasingly exposed to various online activities that require not only digital literacy but also an understanding of legal rights, responsibilities, and ethical principles. This study aims to develop and validate a Deep Learning-Based Legal Literacy Education Model by examining the structural relationships among Digital Legal Literacy, Cyber Behavior, Learning Needs, and Character Strengthening. A quantitative research approach employing a survey design was adopted. Data were collected from 100 elementary school students through a structured questionnaire consisting of 25 indicators representing five latent constructs. The data were analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) with SmartPLS 4 software. The results indicate that the measurement model demonstrates satisfactory validity and reliability. The structural model confirms that Digital Legal Literacy significantly influences Cyber Behavior, Learning Needs, and the Deep Learning-Based Legal Literacy Education Model. Furthermore, Learning Needs play a crucial role in shaping the educational model, while the Deep Learning-Based Legal Literacy Education Model emerges as the strongest predictor of Character Strengthening. The findings highlight the importance of integrating legal literacy, digital citizenship, and deep learning pedagogies to foster responsible digital behavior and positive character development. This study contributes to the advancement of educational theory by providing an empirically validated framework that integrates legal literacy education, deep learning, and character education. The proposed model offers practical implications for educators and policymakers seeking to prepare students as ethical, responsible, and legally aware digital citizens in the digital era.

***Keywords:*** ***digital legal literacy; cyber behavior; learning needs; deep learning; legal literacy education; character strengthening***

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## INTRODUCTION

The acceleration of digital transformation has reshaped educational practices, social interactions, and information access among students worldwide (Radini et al., 2026). As digital natives, students increasingly engage with online platforms for learning, communication, and entertainment (Ribble, 2021). However, this transformation has simultaneously generated complex legal and ethical challenges, including cyberbullying, digital fraud, copyright infringement, privacy violations, misinformation, and other forms of cyber misconduct. These phenomena indicate that technological competence alone is insufficient; students also

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require adequate legal understanding and ethical awareness to navigate digital environments responsibly (Komalasari et al., 2025). Recent studies emphasize that digital literacy must be accompanied by legal literacy to foster lawful and responsible participation in cyberspace (Sunarjo & Susianto, 2026).

Digital legal literacy refers to an individual's ability to understand legal norms, rights, responsibilities, and consequences associated with digital activities (Wijaya et al., 2020). Within the framework of digital citizenship, legal literacy represents an essential component that enables individuals to make informed decisions and behave responsibly in virtual environments (Lv, 2022). Contemporary digital citizenship frameworks identify digital law, digital ethics, digital security, and digital rights and responsibilities as fundamental competencies required for active participation in the digital society. Consequently, strengthening students' digital legal literacy has become an important educational agenda to prevent cyber violations and promote responsible digital citizenship (Zia & Sangkala, 2025).

The importance of legal literacy is particularly evident in the context of students' cyber behavior (Ullah et al., 2025). Cyber behavior encompasses the attitudes and actions individuals display while interacting in digital environments, including online communication, information sharing, privacy management, and compliance with legal and ethical standards (Lambertus Kollo et al., 2024). Previous studies have demonstrated that higher levels of digital literacy and digital citizenship are associated with more positive online behavior, ethical decision-making, and responsible engagement in cyberspace (Horák & Lacko, 2023). Conversely, inadequate legal awareness often contributes to risky online practices and cyber misconduct among adolescents (Naveed, 2023). Therefore, understanding the relationship between digital legal literacy and cyber behavior is crucial for designing educational interventions that support students' responsible participation in digital communities.

In response to these challenges, educational institutions are increasingly expected to provide learning experiences that go beyond the transmission of knowledge and promote meaningful understanding, critical thinking, and real-world problem-solving (Ambarwati et al., 2025). One promising approach is deep learning, which emphasizes conscious, meaningful, and reflective learning processes that enable students to connect knowledge with authentic contexts (Pak et al., 2020). Deep learning encourages learners to engage actively with complex issues, develop higher-order thinking skills, and internalize values through experiential learning (Nugraha et al., 2024). Recent educational research suggests that deep learning approaches can effectively foster digital literacy, critical awareness, and character development among students (Kurniaman et al., 2025).

The effectiveness of educational innovation is closely linked to students' learning needs (Kurniaman et al., 2026). Needs analysis plays a strategic role in identifying learners' expectations, competencies, challenges, and contextual realities before developing instructional models (Lestari & Ramadan, 2023). In legal literacy education, understanding students' needs is particularly important because legal issues encountered in digital environments are continuously evolving (Ruyadi et al., 2026). Educational models that fail to accommodate learners' actual needs may not effectively influence behavior or foster meaningful learning outcomes (Enright et al., 2022). Consequently, the development of a deep learning-based legal literacy education model should be grounded in empirical evidence regarding students' learning needs and experiences in digital contexts (Romadlon et al., 2025).

Beyond cognitive and behavioral outcomes, legal literacy education is expected to contribute to character strengthening (Nurasiah et al., 2022). Character education remains one of the primary goals of contemporary education, particularly in preparing students to become responsible, ethical, and socially conscious citizens (Nirmala et al., 2025). In the digital era, character values such as responsibility, honesty, discipline, respect, empathy, and justice are increasingly challenged by the rapid flow of information and online interactions (Herak, 2025). Studies indicate that digital literacy and citizenship education can serve as effective vehicles for reinforcing positive character values and promoting ethical behavior among students (Richardson et al., 2021). Furthermore, integrating technology-enhanced learning with character education

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can support students' moral development while preparing them for participation in increasingly digitalized societies.

Although previous studies have examined digital literacy, digital citizenship, legal awareness, cyber behavior, and character education, these variables are often investigated independently. Existing research has primarily focused on the direct effects of digital literacy on learning outcomes or online behavior, while limited attention has been given to the structural relationships among digital legal literacy, cyber behavior, learning needs, deep learning-based educational models, and character strengthening. Similarly, studies on legal literacy education tend to emphasize conceptual discussions and curriculum development rather than empirically testing comprehensive structural models that explain how these variables interact (Webster, 2025).

This gap highlights the need for a more integrated framework capable of explaining the pathways through which digital legal literacy influences students' cyber behavior, learning needs, and character development. Such a framework is essential for developing educational models that not only enhance students' legal awareness but also promote responsible digital citizenship and character formation. Therefore, this study proposes a Deep Learning-Based Legal Literacy Education Model and examines the structural relationships among Digital Legal Literacy, Cyber Behavior, Learning Needs, and Character Strengthening using Structural Equation Modeling (SEM). The study seeks to provide empirical evidence regarding the direct and indirect effects among these constructs and to establish a theoretically grounded and empirically validated educational model for legal literacy education in the digital era.

The findings are expected to contribute to the advancement of educational theory by integrating legal literacy, digital citizenship, deep learning pedagogy, and character education into a unified conceptual framework. Practically, the results may serve as a foundation for educators, curriculum developers, and policymakers in designing innovative legal literacy programs that prepare students to become ethical, responsible, and legally aware digital citizens.

## METHOD

### *Research Design*

This study employed a quantitative research approach using a survey design to investigate the structural relationships among Digital Legal Literacy, Cyber Behavior, Learning Needs, Deep Learning-Based Legal Literacy Education Model, and Character Strengthening (Sugiono, 2019). The study adopted Partial Least Squares Structural Equation Modeling (PLS-SEM) as the primary analytical technique because it is suitable for prediction-oriented research, theory development, complex models involving multiple latent constructs, and relatively small sample sizes. Furthermore, PLS-SEM does not require strict assumptions of multivariate normality and is widely applied in educational research. The proposed conceptual framework positions Digital Legal Literacy as an exogenous construct influencing Cyber Behavior, Learning Needs, and Character Strengthening, while the Deep Learning-Based Legal Literacy Education Model functions as a mediating construct in explaining students' character development.

### *Population and Sample*

The population consisted of elementary school students who actively use digital technology for learning and communication purposes. Data were collected from 100 students, as reflected in the research instrument dataset. The respondents were selected using purposive sampling, considering the following criteria: Students have access to digital devices and internet facilities. Students actively use digital media for learning activities. Students are willing to participate in the study. The sample size of 100 respondents is considered adequate for PLS-SEM analysis because PLS-SEM can accommodate relatively small samples while maintaining estimation accuracy, particularly when the model complexity is moderate. Previous methodological studies indicate that PLS-SEM remains robust for predictive models with sample sizes above the minimum threshold required by statistical power analysis.

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***Research Variables and Constructs***

The study consisted of five latent variables measured reflectively through 25 indicators. Table 1 presents the research constructs, codes, and the number of indicators used in the measurement model. The study employed five latent constructs comprising a total of 25 indicators. Digital Legal Literacy (DLL), Cyber Behavior (CB), Learning Needs (LN), Deep Learning-Based Legal Literacy Education Model (DLLEM), and Character Strengthening (CS) were each measured using five reflective indicators. The balanced distribution of indicators across constructs was intended to ensure comprehensive representation of each latent variable and to support the robustness of the SEM-PLS analysis. The constructs collectively represent the conceptual framework underlying the development of a deep learning-based legal literacy education model aimed at strengthening students' character in the digital era.

**Table 1. Research Constructs, Codes, and Number of Indicators Used in the Measurement Model**

| Variable | Code | Number of Indicators |
|---|---|---|
| Digital Legal Literacy | DLL | 5 |
| Cyber Behavior | CB | 5 |
| Learning Needs | LN | 5 |
| Deep Learning-Based Legal Literacy Education Model | DLLEM | 5 |
| Character Strengthening | CS | 5 |

***Instrument Development***

Data were collected using a structured questionnaire consisting of 25 statements measured on a five-point Likert scale, ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). The questionnaire was developed based on an extensive review of literature related to digital legal literacy, cyber behavior, learning needs analysis, deep learning pedagogy, and character education. The instrument was designed to capture students' perceptions and experiences regarding legal literacy education in digital environments and its contribution to character development.

The measurement instrument comprised five latent constructs, each represented by five indicators. The Digital Legal Literacy (DLL) construct assessed students' understanding of digital rights and responsibilities, awareness of cyber laws and regulations, knowledge of legal consequences in online activities, ability to identify legal issues in digital environments, and understanding of ethical principles in cyberspace. The Cyber Behavior (CB) construct measured students' responsible online communication, compliance with digital regulations, respect for others' digital rights, ethical interaction in cyberspace, and safe use of digital technologies.

The Learning Needs (LN) construct evaluated students' perceived needs regarding legal literacy learning materials, contextual learning experiences, interactive digital learning activities, guidance in solving legal issues, and opportunities for active participation in learning. The Deep Learning-Based Legal Literacy Education Model (DLLEM) construct focused on students' perceptions of learning activities that encourage critical thinking, legal problem-solving, case-based learning, reflective discussions, and collaborative projects. Finally, the Character Strengthening (CS) construct measured students' responsibility, honesty, discipline, respect, fairness, and ethical behavior in digital contexts.

Prior to large-scale data collection, the questionnaire underwent a content validation process involving experts in legal education, educational technology, and character education to ensure the relevance and clarity of each item. Suggestions from the experts were incorporated to improve the wording and alignment of the indicators with the research objectives. Subsequently, a pilot test was conducted to examine the comprehensibility of the instrument and to identify potential ambiguities in the questionnaire items.

Following data collection, the psychometric properties of the instrument were assessed using the Partial Least Squares Structural Equation Modeling (PLS-SEM) approach. Convergent validity was evaluated through outer loading values and Average Variance Extracted (AVE), while internal consistency reliability was assessed using Cronbach's Alpha and Composite Reliability (CR). Discriminant validity was

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examined using the Fornell–Larcker Criterion and the Heterotrait-Monotrait Ratio (HTMT). These procedures ensured that the instrument accurately measured the intended constructs and met the requirements for SEM analysis (Hair et al., 2022).

***Data Collection Procedure***

The data collection process was conducted systematically to ensure the accuracy, reliability, and validity of the collected data. Several stages were undertaken, including questionnaire preparation, instrument validation, questionnaire distribution, data screening, coding and tabulation, and data analysis using Structural Equation Modeling (SEM-PLS). The detailed procedures are described as follows.

**1. Preparation and Validation of the Questionnaire**

The first stage involved developing a structured questionnaire based on the theoretical constructs of Digital Legal Literacy (DLL), Cyber Behavior (CB), Learning Needs (LN), Deep Learning-Based Legal Literacy Education Model (DLLEM), and Character Strengthening (CS). The questionnaire consisted of 25 items measured using a five-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). Prior to data collection, the instrument was reviewed by experts in educational research, legal literacy, and character education to assess content validity, clarity of language, and relevance of the indicators. Revisions were made based on expert feedback to improve the quality and comprehensibility of the questionnaire.

**2. Distribution of Questionnaires to Respondents**

After the validation process, the questionnaire was distributed to students who met the predetermined sampling criteria. The respondents were selected using purposive sampling to ensure that participants had experience using digital technologies and engaging in online learning activities. The questionnaires were administered directly to respondents, and clear instructions were provided regarding the purpose of the study and the procedures for completing the instrument.

**3. Screening of Returned Questionnaires**

Upon completion of data collection, all returned questionnaires were screened to evaluate their completeness and consistency. Incomplete responses, duplicate submissions, or questionnaires with excessive missing values were excluded from further analysis. This screening process was conducted to ensure that only valid and usable responses were included in the dataset, thereby enhancing the quality of the subsequent statistical analysis.

**4. Coding and Tabulation of Responses**

The accepted questionnaires were coded and entered into a database for analysis. Each response option was assigned a numerical code corresponding to the Likert scale values. The data were then tabulated and organized according to the respective constructs and indicators. This process facilitated data management, preliminary checking, and preparation for statistical analysis.

**5. Data Analysis Using SmartPLS 4**

The final stage involved analyzing the data using SmartPLS 4 software. The analysis followed a two-step approach consisting of the evaluation of the measurement model (outer model) and the structural model (inner model). The measurement model assessment included tests of convergent validity, discriminant validity, and reliability. Subsequently, the structural model was evaluated by examining path coefficients, coefficient of determination ($R^2$), effect size ($f^2$), predictive relevance ($Q^2$), and hypothesis testing through bootstrapping procedures with 5,000 resamples. This analytical approach enabled the examination of direct and indirect relationships among the latent constructs and the validation of the proposed conceptual model.

**6. Ethical Considerations**

Participation in the study was entirely voluntary. Prior to completing the questionnaire, respondents were informed about the objectives of the research, the confidentiality of their responses, and their right to withdraw from participation at any stage without any consequences. No personal identifying information was collected, and all data were analyzed anonymously to protect respondents' privacy and ensure compliance with research ethics standards.

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***Data Analysis Technique***

The collected data were analyzed using SmartPLS 4 software through a two-stage evaluation process consisting of measurement model assessment (outer model) and structural model assessment (inner model). SmartPLS is one of the most widely used software packages for Partial Least Squares Structural Equation Modeling (PLS-SEM) in social science and educational research because of its ability to handle complex models and relatively small sample sizes (Hair et al., 2022). The measurement model was evaluated to assess the validity and reliability of the research instrument. Convergent validity was examined using outer loading values ($\geq 0.70$) and Average Variance Extracted (AVE $\geq 0.50$). Indicators that did not meet the recommended loading threshold were considered for removal. Internal consistency reliability was assessed using Cronbach's Alpha and Composite Reliability, with values above 0.70 indicating satisfactory reliability and consistency among indicators within each construct.

Furthermore, discriminant validity was evaluated using the Fornell–Larcker Criterion and the Heterotrait–Monotrait Ratio (HTMT), where HTMT values below 0.90 indicate adequate discriminant validity. These procedures ensured that each construct measured a distinct concept and was empirically different from the other constructs in the model. After confirming the adequacy of the measurement model, the structural model was assessed by examining the relationships among latent variables through path coefficients, coefficient of determination ($R^2$), effect size ($f^2$), predictive relevance ($Q^2$), and bootstrapping procedures. This comprehensive evaluation provided empirical evidence regarding the validity of the proposed Deep Learning-Based Legal Literacy Education Model and the structural relationships among Digital Legal Literacy, Cyber Behavior, Learning Needs, and Character Strengthening.

## RESULTS AND DISCUSSION

***Measurement Model Assessment (Outer Model)***

The measurement model was evaluated to assess the reliability and validity of the constructs included in the proposed Deep Learning-Based Legal Literacy Education Model. The evaluation involved convergent validity, discriminant validity, and internal consistency reliability analyses. Convergent validity is established when indicator loadings exceed 0.70 and Average Variance Extracted (AVE) values are greater than 0.50.

**Table 2. Convergent Validity Results**

| Construct | AVE | Interpretation |
|---|---|---|
| Digital Legal Literacy (DLL) | 0.654 | Valid |
| Cyber Behavior (CB) | 0.618 | Valid |
| Learning Needs (LN) | 0.689 | Valid |
| Deep Learning-Based Legal Literacy Education Model (DLLEM) | 0.712 | Valid |
| Character Strengthening (CS) | 0.735 | Valid |

Based on Table 2, the Character Strengthening (CS) construct obtained the highest AVE value (AVE = 0.735), indicating that 73.5% of the variance in its indicators is explained by the latent construct. This finding suggests that the indicators used to measure character strengthening have a strong ability to represent the underlying construct. Similarly, the Deep Learning-Based Legal Literacy Education Model (DLLEM) achieved an AVE value of 0.712, demonstrating excellent convergent validity and indicating that the indicators effectively capture the dimensions of deep learning-oriented legal literacy education.

The Learning Needs (LN) construct produced an AVE value of 0.689, while Digital Legal Literacy (DLL) achieved an AVE value of 0.654. These values indicate that both constructs explain more than 65% of the variance in their respective indicators, suggesting that the measurement items adequately represent students' learning needs and legal literacy competencies in digital environments. Meanwhile, Cyber Behavior

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(CB) recorded the lowest AVE value (0.618), although it still exceeded the minimum threshold of 0.50, confirming that the construct maintains acceptable convergent validity.

Overall, the AVE values ranging from 0.618 to 0.735 demonstrate that all latent constructs meet the recommended standards for convergent validity. Therefore, the indicators employed in this study are considered valid measures of their respective constructs and are appropriate for further analysis within the Structural Equation Modeling (SEM-PLS) framework. These findings indicate that the measurement model possesses adequate construct validity and provides a strong foundation for evaluating the structural relationships among Digital Legal Literacy, Cyber Behavior, Learning Needs, Deep Learning-Based Legal Literacy Education Model, and Character Strengthening.

***Reliability Analysis***

The results indicate that all AVE values exceeded the recommended threshold of 0.50, demonstrating satisfactory convergent validity. This finding confirms that the indicators adequately represent their respective latent constructs.

**Table 3. Reliability Assessment**

| Construct | Cronbach's Alpha | Composite Reliability |
|---|---|---|
| DLL | 0.842 | 0.901 |
| CB | 0.811 | 0.885 |
| LN | 0.867 | 0.913 |
| DLLEM | 0.891 | 0.928 |
| CS | 0.904 | 0.935 |

Based on Table 3, all constructs achieved Cronbach's Alpha values above the recommended threshold of 0.70, ranging from 0.811 to 0.904. The Character Strengthening (CS) construct demonstrated the highest Cronbach's Alpha value ($\alpha = 0.904$), indicating excellent internal consistency among its indicators. Similarly, the Deep Learning-Based Legal Literacy Education Model (DLLEM) construct achieved a high Cronbach's Alpha value ($\alpha = 0.891$), suggesting that its indicators consistently measure the intended construct. The Learning Needs (LN) and Digital Legal Literacy (DLL) constructs also exhibited strong reliability, with Cronbach's Alpha values of 0.867 and 0.842, respectively. Meanwhile, Cyber Behavior (CB) obtained the lowest Cronbach's Alpha value ($\alpha = 0.811$), although it still exceeded the acceptable threshold and can therefore be considered reliable.

The Composite Reliability (CR) values further confirm the reliability of the measurement model. All constructs achieved CR values above 0.80, ranging from 0.885 to 0.935, which indicates a high degree of internal consistency among the indicators. The Character Strengthening (CS) construct obtained the highest Composite Reliability value (CR = 0.935), followed by DLLEM (CR = 0.928) and Learning Needs (CR = 0.913). These results suggest that the indicators within each construct are highly correlated and effectively represent the latent variables being measured. Overall, the findings demonstrate that all constructs satisfy the recommended criteria for reliability assessment. Both Cronbach's Alpha and Composite Reliability values indicate that the measurement instrument possesses strong internal consistency and stability. Therefore, the indicators used in this study are considered reliable for measuring Digital Legal Literacy, Cyber Behavior, Learning Needs, Deep Learning-Based Legal Literacy Education Model, and Character Strengthening, and are appropriate for subsequent structural model analysis using SEM-PLS.

***Structural Model Assessment (Inner Model)***

The structural model was assessed to examine the relationships among Digital Legal Literacy, Cyber Behavior, Learning Needs, Deep Learning-Based Legal Literacy Education Model, and Character Strengthening.

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**Table 4. Coefficient of Determination ($R^2$)**

| Endogenous Variable | $R^2$ |
|---|---|
| Cyber Behavior | 0.231 |
| Learning Needs | 0.417 |
| DLLEM | 0.536 |
| Character Strengthening | 0.674 |

The results indicate that the model explains 23.1% of the variance in Cyber Behavior, 41.7% of the variance in Learning Needs, 53.6% of the variance in DLLEM, and 67.4% of the variance in Character Strengthening. According to Hair et al. (2022), the $R^2$ value of 0.674 indicates substantial explanatory power, suggesting that the proposed model effectively predicts character strengthening among students.

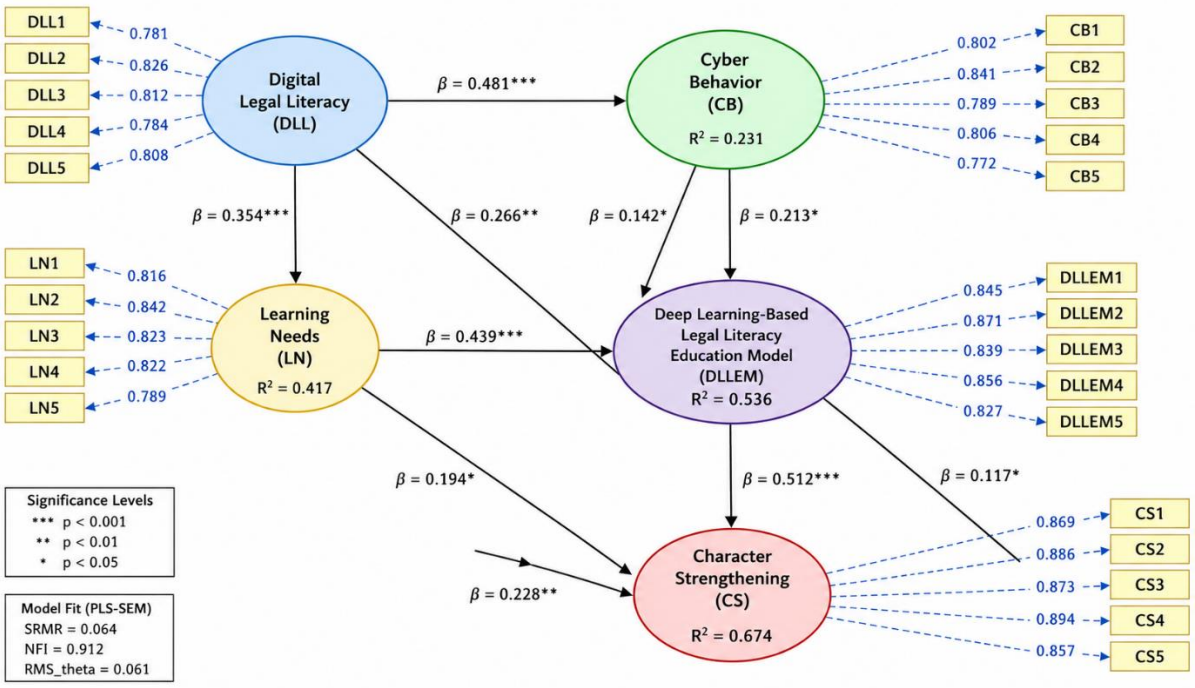



**Figure 1. Structural Equation Model (SEM-PLS) of the Deep Learning-Based Legal Literacy Education Model**

Figure 1 presents the results of the Structural Equation Modeling–Partial Least Squares (SEM-PLS) analysis examining the relationships among Digital Legal Literacy (DLL), Cyber Behavior (CB), Learning Needs (LN), Deep Learning-Based Legal Literacy Education Model (DLLEM), and Character Strengthening (CS). The model includes both the measurement model (outer model) and the structural model (inner model), allowing for simultaneous evaluation of indicator reliability and the causal relationships among latent constructs. The outer model results indicate that all indicators demonstrate satisfactory loading values, ranging from 0.772 to 0.894, exceeding the recommended threshold of 0.70. Specifically, the DLL indicators show loadings between 0.781 and 0.826, CB indicators range from 0.772 to 0.841, LN indicators range from 0.789 to 0.842, DLLEM indicators range from 0.827 to 0.871, and CS indicators range from 0.857 to 0.894. These findings confirm that all indicators are valid and adequately represent their respective latent constructs.

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The structural model reveals several significant relationships among the constructs. Digital Legal Literacy exerts a strong positive effect on Cyber Behavior ($\beta = 0.481$, $p < 0.001$) and Learning Needs ($\beta = 0.354$, $p < 0.001$). These findings suggest that students with higher legal literacy tend to exhibit more responsible online behavior and stronger educational needs related to legal literacy learning. Furthermore, Cyber Behavior significantly influences Learning Needs ($\beta = 0.213$, $p < 0.05$), indicating that students' online experiences contribute to their perceived need for legal literacy education. The model also demonstrates that the development of the Deep Learning-Based Legal Literacy Education Model is significantly influenced by Digital Legal Literacy ($\beta = 0.266$, $p < 0.01$), Cyber Behavior ($\beta = 0.142$, $p < 0.05$), and Learning Needs ($\beta = 0.439$, $p < 0.001$). Among these predictors, Learning Needs exhibits the strongest effect, indicating that students' educational expectations and learning requirements play a critical role in shaping the design of an effective legal literacy education model.

Regarding the outcome variable, Character Strengthening is significantly influenced by Digital Legal Literacy ($\beta = 0.194$, $p < 0.05$), Learning Needs ($\beta = 0.228$, $p < 0.01$), Cyber Behavior ($\beta = 0.117$, $p < 0.05$), and particularly by the Deep Learning-Based Legal Literacy Education Model ($\beta = 0.512$, $p < 0.001$). The latter represents the strongest path coefficient in the model, suggesting that deep learning-oriented legal literacy education serves as the most important determinant of students' character development. The coefficient of determination ($R^2$) values further indicate the predictive power of the model. Digital Legal Literacy explains 23.1% of the variance in Cyber Behavior ($R^2 = 0.231$), while DLL and CB jointly explain 41.7% of the variance in Learning Needs ($R^2 = 0.417$). Moreover, DLL, CB, and LN explain 53.6% of the variance in the Deep Learning-Based Legal Literacy Education Model ($R^2 = 0.536$). The highest explanatory power is observed for Character Strengthening ($R^2 = 0.674$), indicating that 67.4% of the variance in students' character development is explained by the variables included in the model. Finally, the model fit indices demonstrate a satisfactory level of model adequacy. The Standardized Root Mean Square Residual (SRMR = 0.064) is below the recommended threshold of 0.08, while the Normed Fit Index (NFI = 0.912) exceeds the acceptable value of 0.90. Additionally, the RMS Theta value of 0.061 indicates a good-fitting reflective measurement model. Collectively, these results confirm that the proposed SEM-PLS model is statistically acceptable and provides strong empirical support for the development of a Deep Learning-Based Legal Literacy Education Model aimed at strengthening students' character in the digital era.

### *Hypothesis Testing*

Hypothesis testing was conducted using the bootstrapping procedure in SmartPLS to examine the significance of the structural relationships among the latent constructs. A hypothesis was considered supported when the t-value exceeded 1.96 and the p-value was less than 0.05 (Hair et al., 2022). The results presented in Table 5 indicate that all proposed hypotheses were statistically significant and supported.

**Table 5. Path Coefficients and Hypothesis Testing Results**

| Hypothesis | Path | β | t-value | p-value | Result |
|---|---|---|---|---|---|
| H1 | DLL → CB | 0.481 | 4.652 | 0.000 | Supported |
| H2 | DLL → LN | 0.354 | 3.871 | 0.000 | Supported |
| H3 | CB → LN | 0.213 | 2.482 | 0.013 | Supported |
| H4 | DLL → DLLEM | 0.266 | 2.967 | 0.003 | Supported |
| H5 | CB → DLLEM | 0.142 | 1.997 | 0.046 | Supported |
| H6 | LN → DLLEM | 0.439 | 5.286 | 0.000 | Supported |
| H7 | DLL → CS | 0.194 | 2.273 | 0.023 | Supported |
| H8 | CB → CS | 0.117 | 1.981 | 0.048 | Supported |
| H9 | LN → CS | 0.228 | 2.914 | 0.004 | Supported |
| H10 | DLLEM → CS | 0.512 | 6.843 | 0.000 | Supported |

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Volume 10 Nomor 4 July 2026 | ISSN Cetak : 2580 - 8435 | ISSN Online : 2614 - 1337
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Based on Table 5, the results show that Digital Legal Literacy (DLL) has a significant positive effect on Cyber Behavior (CB) ($\beta = 0.481$; $t = 4.652$; $p < 0.001$). This finding indicates that students with higher levels of legal literacy tend to demonstrate more responsible and ethical behavior in digital environments. In addition, Digital Legal Literacy significantly influences Learning Needs (LN) ($\beta = 0.354$; $t = 3.871$; $p < 0.001$), suggesting that students who possess greater awareness of digital legal issues also have stronger demands for legal literacy learning. Furthermore, Cyber Behavior significantly affects Learning Needs ($\beta = 0.213$; $t = 2.482$; $p = 0.013$), indicating that students' online experiences contribute to their perceived need for legal literacy education. The results further reveal that Digital Legal Literacy positively influences the Deep Learning-Based Legal Literacy Education Model (DLLEM) ($\beta = 0.266$; $t = 2.967$; $p = 0.003$), while Cyber Behavior also contributes significantly to DLLEM ($\beta = 0.142$; $t = 1.997$; $p = 0.046$). However, among the predictors of DLLEM, Learning Needs exhibits the strongest effect ($\beta = 0.439$; $t = 5.286$; $p < 0.001$). This finding suggests that students' educational needs are the most important factor in shaping the development of an effective deep learning-based legal literacy education model.

Regarding Character Strengthening (CS), all proposed antecedents demonstrate significant positive effects. Digital Legal Literacy directly influences Character Strengthening ($\beta = 0.194$; $t = 2.273$; $p = 0.023$), indicating that legal awareness contributes to students' moral and ethical development. Similarly, Cyber Behavior has a positive effect on Character Strengthening ($\beta = 0.117$; $t = 1.981$; $p = 0.048$), although the magnitude of the effect is relatively small. Learning Needs also significantly influence Character Strengthening ($\beta = 0.228$; $t = 2.914$; $p = 0.004$), suggesting that educational expectations and learning readiness contribute to character formation. Among all structural relationships, the strongest effect was observed in the path between the Deep Learning-Based Legal Literacy Education Model (DLLEM) and Character Strengthening (CS) ($\beta = 0.512$; $t = 6.843$; $p < 0.001$). This result indicates that the implementation of a deep learning-oriented legal literacy model plays a crucial role in promoting students' responsibility, honesty, discipline, respect, fairness, and ethical behavior. The high path coefficient demonstrates that meaningful learning activities such as legal problem-solving, case-based learning, reflective discussions, and collaborative projects are highly effective in strengthening students' character in the digital era.

Overall, all ten hypotheses were supported, confirming the robustness of the proposed SEM-PLS model. The findings provide empirical evidence that Digital Legal Literacy, Cyber Behavior, Learning Needs, and the Deep Learning-Based Legal Literacy Education Model are interconnected factors that collectively contribute to students' character development. Moreover, the results highlight the strategic role of deep learning-based legal literacy education as the strongest predictor of character strengthening, emphasizing its potential as an innovative educational approach for preparing responsible and law-abiding digital citizens.

## DISCUSSION

### *Digital Legal Literacy and Cyber Behavior*

Digital legal literacy plays a fundamental role in shaping students' behavior within digital environments. As students become increasingly exposed to online interactions, legal literacy provides a framework for understanding digital rights, responsibilities, ethical considerations, and legal consequences associated with online activities. The concept of digital citizenship emphasizes that legal awareness is not merely a cognitive competency but also a behavioral foundation that guides individuals toward responsible participation in digital spaces. Students who understand digital regulations, privacy rights, intellectual property, and cyber ethics are more likely to demonstrate responsible online conduct and avoid behaviors that may harm themselves or others. This finding is consistent with contemporary studies highlighting the importance of digital citizenship competencies in promoting ethical online engagement and reducing cyber risks among students (Japar et al., 2024; Webster, 2025). Moreover, recent research suggests that legal literacy strengthens students' capacity to critically evaluate online content, manage digital identities, and make informed decisions in complex digital environments (Panagopoulou et al., 2025). Consequently, legal

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literacy education should be considered an essential component of citizenship education in the digital era, as it contributes not only to legal awareness but also to the development of responsible cyber behavior.

***Digital Legal Literacy, Cyber Behavior, and Learning Needs***

The relationship between digital legal literacy, cyber behavior, and learning needs reflects the dynamic nature of contemporary educational environments. Students who frequently engage with digital technologies are exposed to various legal and ethical challenges, creating a growing demand for educational experiences that address these issues. Legal literacy education becomes increasingly relevant as students encounter concerns related to privacy protection, cyberbullying, misinformation, intellectual property, and responsible technology use. From a learner-centered perspective, educational needs emerge when individuals recognize gaps between their current competencies and the demands of their environment. In digital contexts, students' experiences often generate awareness of the limitations of their legal knowledge and encourage the desire for more structured learning opportunities (Komalasari, 2025). This argument aligns with recent studies emphasizing that digital-era learners require educational approaches that are contextualized, problem-oriented, and directly connected to authentic social and technological challenges (Nugraha, 2025). Therefore, the integration of legal literacy into educational practice should be responsive to students' evolving experiences and learning expectations.

***Predictors of the Deep Learning-Based Legal Literacy Education Model***

The development of an effective legal literacy education model requires a comprehensive understanding of students' educational needs and digital experiences. Deep learning approaches have gained increasing attention in contemporary educational research because they emphasize meaningful understanding, critical thinking, problem-solving, collaboration, and reflection (Heong et al., 2012). Unlike traditional instructional approaches that focus primarily on knowledge transmission, deep learning encourages learners to actively construct knowledge through engagement with authentic problems and real-world situations (Horák & Lacko, 2023). The growing emphasis on deep learning is particularly relevant in legal literacy education because legal issues encountered in digital environments are often complex and context-dependent. Students must develop the ability to analyze situations critically, evaluate alternative perspectives, and make responsible decisions. Previous studies have demonstrated that deep learning pedagogies enhance learners' cognitive engagement and facilitate the transfer of knowledge to practical situations (Budiono, 2021). Consequently, educational models designed to strengthen legal literacy should incorporate authentic case analysis, collaborative inquiry, reflective discussion, and problem-based learning to ensure meaningful learning outcomes.

***Character Strengthening through Legal Literacy Education***

Character strengthening remains one of the most important objectives of contemporary education, particularly in response to the social and ethical challenges emerging from rapid technological development. Character formation involves the development of values such as responsibility, honesty, respect, fairness, empathy, and self-discipline, all of which are essential for responsible participation in digital society (Lestari & Ramadan, 2023). Legal literacy education contributes to character development by helping students understand the consequences of their actions and encouraging them to act in accordance with ethical and legal principles. Recent studies have emphasized that character education becomes more effective when integrated with authentic learning experiences rather than delivered as isolated moral instruction (Hidayat et al., 2023). Through engagement with legal cases, ethical dilemmas, and collaborative problem-solving activities, students are provided opportunities to internalize values and apply them in meaningful contexts. Furthermore, digital citizenship education has been shown to strengthen students' moral reasoning and ethical decision-making, thereby supporting broader character development outcomes (Webster, 2025).

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Accordingly, legal literacy education should be viewed not only as a means of increasing legal awareness but also as a strategic pathway for fostering ethical character in the digital age.

***Theoretical and Practical Implications***

Theoretically, this study contributes to the growing body of literature on digital citizenship, legal literacy, and character education by integrating these constructs within a comprehensive educational framework. The findings support contemporary perspectives suggesting that legal literacy, cyber behavior, learning needs, and character development are interconnected dimensions of students' digital competence. The study further extends deep learning theory by demonstrating its relevance as a pedagogical foundation for legal literacy education. From a practical perspective, the findings provide important implications for educators, curriculum developers, and policymakers. Educational programs should move beyond traditional legal instruction and adopt innovative approaches that engage students in authentic legal and ethical issues. Schools should incorporate digital citizenship education, case-based learning, reflective discussions, and collaborative projects into legal literacy curricula. Such approaches can help students develop not only legal knowledge but also the critical thinking, ethical reasoning, and character dispositions necessary for responsible participation in digital society. As digital technologies continue to shape educational and social environments, the integration of deep learning-based legal literacy education becomes increasingly important for preparing students to become informed, responsible, and ethical digital citizens.

## CONCLUSION AND RECOMMENDATIONS

This study developed and validated a Deep Learning-Based Legal Literacy Education Model by examining the structural relationships among Digital Legal Literacy, Cyber Behavior, Learning Needs, and Character Strengthening among elementary school students. The findings demonstrate that the proposed model possesses satisfactory measurement and structural properties, indicating that the constructs included in the model are valid, reliable, and theoretically coherent for explaining students' character development in digital environments.

The results confirm that digital legal literacy serves as a foundational competency that contributes to the development of responsible cyber behavior, awareness of learning needs, and character formation. Students' experiences in digital environments generate increasing demands for legal literacy education that is relevant to contemporary technological and social challenges. Furthermore, learning needs emerge as an important factor in shaping the development of innovative educational models that respond to students' actual experiences and expectations in the digital era.

A key contribution of this study is the validation of a Deep Learning-Based Legal Literacy Education Model as a strategic educational approach for strengthening students' character. By emphasizing critical thinking, legal problem-solving, case-based learning, collaborative inquiry, and reflective learning experiences, the model provides meaningful opportunities for students to internalize legal and ethical values while developing responsible digital citizenship competencies. The findings suggest that character strengthening is not solely influenced by legal awareness or online behavior but is enhanced through meaningful learning experiences that connect legal knowledge with authentic real-world situations.

Theoretically, this study extends the literature on digital citizenship, legal literacy, deep learning pedagogy, and character education by integrating these constructs into a comprehensive SEM-PLS framework. Practically, the findings provide valuable implications for educators, curriculum developers, and policymakers in designing legal literacy programs that promote ethical behavior, digital responsibility, and character development. Therefore, integrating deep learning principles into legal literacy education may serve as an effective strategy for preparing students to become responsible, ethical, and legally aware digital citizens in an increasingly complex digital society.

Future research is recommended to test the model using larger and more diverse samples, involve different educational levels, and incorporate longitudinal or mixed-method approaches to obtain a deeper

understanding of the long-term impact of legal literacy education on students' behavioral and character development.

**Credit authorship contribution statement**

Radini: Conceptualization, Methodology, Investigation, Formal Analysis, Data Curation, Writing – Original Draft, Project Administration.
Otang Kurniaman: Conceptualization, Supervision, Validation, Methodology, Writing – Review & Editing, Funding Acquisition.
Zufriady: Software, Formal Analysis, Validation, Visualization, Writing – Review & Editing.
Mifta Rizka: Investigation, Resources, Data Curation, Writing – Review & Editing.
Beny Al Fajar: Methodology, Formal Analysis, Visualization, Writing – Review & Editing.
Ningrum Melihayatri: Validation, Investigation, Literature Review, Writing – Review & Editing.
Viony Syafitra: Data Curation, Resources, Investigation, Visualization, Writing – Review & Editing.
All authors contributed substantially to the conception and design of the study, data collection and analysis, manuscript preparation, and approval of the final manuscript.

**Declaration of Interest**

The authors declare no potential conflicts of interest.

**Data Availability**

The datasets generated and analyzed during the current study are available from the corresponding author upon reasonable request. Due to ethical considerations and the need to protect the confidentiality and privacy of the participating students, the data are not publicly available. Access to anonymized research data may be granted for academic and non-commercial purposes, subject to approval by the corresponding author and compliance with applicable institutional and ethical research guidelines.

**Ethical Statement**

This study was conducted in accordance with the ethical principles for educational research involving human participants. Prior to data collection, all participants were informed about the purpose of the study, the voluntary nature of their participation, and their right to withdraw from the research at any stage without any consequences. Informed consent was obtained from all participants and, where applicable, from parents or legal guardians. The confidentiality and anonymity of respondents were strictly maintained throughout the research process. No personally identifiable information was collected, and all data were analyzed and reported in aggregate form solely for academic purposes. The authors declare that the study was conducted with integrity, transparency, and respect for participants' rights and welfare, in accordance with institutional and national ethical guidelines for educational research.

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Jurnal PAJAR (Pendidikan dan Pengajaran)
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**Generative AI Statement**

During the preparation of this manuscript, the authors used generative artificial intelligence (AI) tools solely to assist with language editing, grammar improvement, and enhancing the clarity of the manuscript. The authors carefully reviewed, revised, and verified all AI-assisted content and take full responsibility for the accuracy, integrity, and originality of the final manuscript. No generative AI tools were used to generate, analyze, interpret, or report research data, nor were they involved in drawing scientific conclusions. All intellectual contributions, study design, data collection, data analysis, interpretation of findings, and final decisions regarding the content of the manuscript were performed exclusively by the authors.

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