



Development of Deep Learning Approach-Based Teaching Materials for Fostering Peace-Loving Character in Elementary School Students

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ABSTRACT

Objective: The widespread phenomenon of bullying in Indonesian elementary schools, with 41.1% of students experiencing harassment, demonstrates the urgent need for effective character development. The deep learning approach, which emphasizes meaningful, mindful, and joyful learning, offers an innovative solution for developing students' peace-loving character. This study aims to develop teaching materials based on the deep learning approach to foster peace-loving character as an effort to prevent bullying behavior in elementary school students. The research employs a Design and Development (D&D) approach using the PPE (Planning, Production, Evaluation) method. The planning stage includes needs analysis, curriculum analysis, and literature review. The production stage develops teaching materials based on deep learning principles. The evaluation stage involves validation by material, media, and language experts through focus group discussions (FGD). The product consists of teaching materials titled "Peace-Loving Friends" integrated with deep learning principles. Validation results show feasibility scores: material expert 4.2/5.0 (excellent), media expert 4.4/5.0 (excellent), and language expert 4.3/5.0 (excellent). The teaching materials include 6 learning modules with activities that stimulate meaningful learning (89%), mindful behavior (92%), and joyful experience (87%). The deep learning-based teaching materials prove suitable for developing peace-loving character in elementary school students. This approach successfully integrates cognitive, affective, and psychomotor aspects in holistic and enjoyable learning.

INTRODUCTION

The phenomenon of bullying in Indonesian elementary schools has reached an alarming level. Based on research by the Programme for International Students Assessment, Indonesia ranks fifth highest among 78 countries, with 41.1% of students experiencing harassment (Febrianti et al., 2024). This data indicates that 22% of students experience verbal abuse and theft, 18% are physically pushed by peers, 15% experience intimidation, 19% are socially excluded, 14% are threatened, and 20% experience the spread of rumors by bullying perpetrators.

Bullying behavior not only impacts victims individually but also creates an uncondusive learning environment (Setiawan et al., 2022). Students who experience bullying tend to withdraw socially, show reluctance to interact with peers, and avoid participation in learning activities, which ultimately affects academic performance. Conversely, limited positive social interaction among students can also trigger bullying behavior, indicating a reciprocal relationship between social competence and bullying tendencies (Azmi et al., 2021).

In the context of character education, elementary school age is considered a critical period for instilling moral values and character development (Giwangsa et al., 2023). However, several studies have shown that the implementation of character education in

schools still tends to focus on cognitive achievement and formal curriculum completion, with limited emphasis on affective and behavioral dimensions. Previous research indicates that some teachers perceive bullying behaviors as part of normal child development or minor disciplinary issues, resulting in delayed or inadequate intervention (Putri & Suyanto, 2022; Rahmawati et al., 2023). This condition reflects a broader pedagogical gap in addressing bullying as a serious character-related problem rather than incidental misbehavior.

Previous character education interventions aimed at preventing bullying have largely relied on moral instruction, rule enforcement, or isolated counseling programs. While these approaches contribute to moral awareness, they often fail to foster deep internalization of peace-loving values, critical reflection, and empathetic understanding among students (Sari et al., 2022). The lack of meaningful learning experiences and contextualized teaching materials has limited the effectiveness of these interventions in shaping students' long-term attitudes and behaviors toward peaceful interaction.

The deep learning approach offers an innovative alternative solution for developing students' peace-loving character. In educational contexts, deep learning differs from surface learning, which emphasizes rote memorization and procedural understanding (McDaniel et al., 2025). Deep learning promotes critical thinking, reflective understanding, and adaptive application of values through meaningful, mindful, and joyful learning experiences (Nugraha et al., 2021).

Therefore, this study aims to develop teaching materials based on a deep learning approach to foster peace-loving character as an effort to prevent bullying behavior among elementary school students. The novelty of this research lies in integrating deep learning principles into systematically designed teaching materials that explicitly target peace-loving character development, addressing the limitations of previous character education approaches that have not effectively internalized anti-bullying values in elementary education.

RESEARCH METHOD

This research employs a Design and Development (D&D) approach. The D&D approach is defined as systematic research on design, development, and evaluation processes, aimed at building an empirical foundation for creating products, instructional and non-instructional tools, as well as new or improved models that govern their development (Sari et al., 2022; Richey & Klein, 2007). This approach was chosen because it is relevant to the research objective, namely discussing the development of deep learning approach-based teaching materials to foster peace-loving character in elementary school students.

This research uses the PPE (Planning, Production, Evaluation) method, consisting of three main stages, with clearer stages presented in the diagram below:



Figure 1. PPE Research Stage Diagram

The explanation of the three development stages adapted to this research procedure is as follows:

A. Planning Stage

The first stage is planning, which includes various activities for composing teaching material development plans. The steps include needs analysis to identify relevant problems and needs, curriculum analysis to ensure product suitability, and relevant literature review to support the theoretical foundation of teaching material development.

B. Production Stage

The second stage is the production stage, which focuses on developing teaching materials based on the outcomes of the planning stage. At this stage, the teaching materials were systematically designed and compiled according to the predetermined content structure, learning objectives, and deep learning principles.

The design of the teaching materials emphasized the principles of joyful and mindful learning, which are core components of the deep learning approach. Visual elements such as illustrations, layout, and color composition were intentionally selected to support these principles. Warm colors (e.g., soft yellows and light oranges) were used to create a friendly and emotionally engaging learning atmosphere, which is known to enhance students' motivation and enjoyment during learning activities. Meanwhile, cool colors (e.g., light blues and greens) were applied to promote calmness, concentration, and reflective thinking, supporting mindful learning processes.

These visual design choices were grounded in educational psychology, which suggests that color and visual organization influence learners' emotional states, attention, and cognitive engagement. By integrating balanced visual stimuli, the teaching materials were expected to facilitate students' focus, emotional comfort, and deeper engagement with learning content, rather than merely presenting information.

The initial prototype of the teaching materials produced at this stage served as a preliminary product and was subsequently subjected to evaluation and validation in the following stage to assess its suitability, clarity, and alignment with deep learning principles.

C. Evaluation Stage

The final stage is evaluation, which aims to assess the quality of teaching materials. This evaluation involves validation processes by experts such as material experts, media experts, and language experts to ensure accuracy, attractiveness, and product suitability. Input from validation and trials is used to revise and improve the teaching module to align with the goal of developing peace-loving character and student characteristics.

Table 1. Research Procedures

Nu.	Research Stage	Research Procedure	Outputs and Achievement Indicators
1	Planning	<ol style="list-style-type: none"> 1. Problem analysis 2. Material analysis 3. Device analysis 4. Teaching material development design 	Deep learning approach-based teaching module design
2	Production	Teaching material development	Initial results of deep learning approach-based teaching material development
3	Evaluation	<ol style="list-style-type: none"> 1. Expert validation of teaching module 2. Teaching module revision 3. Reporting and completion 	<ol style="list-style-type: none"> 1. Expert validation results 2. Revised teaching material results

Data collection techniques in this research use questionnaires given to experts to assess the feasibility of the developed teaching materials. Participants in this research involve three types of experts: material experts, media experts, and language experts, who each provide assessments and suggestions based on their expertise regarding the feasibility of the developed teaching materials.

The research instrument used employs questionnaire sheets. These questionnaire sheets are used to collect data regarding the feasibility of the developed teaching materials. These sheets will be filled out by material experts, media experts, and language experts. The data analysis technique used is quantitative analysis of teaching material development feasibility test results.

RESULTS AND DISCUSSION

Results

A. Design of Deep Learning Approach-Based Teaching Materials for Developing Peace-Loving Character in Elementary School Students

The design of teaching material development is an initial planning stage that serves as the foundation in the overall teaching material compilation process. At this stage, researchers design the structure and content of the developed teaching materials to have clear direction and align with learning needs using the Deep Learning approach. Before entering the design stage, analysis of problems and materials to be developed in the teaching materials is conducted first. The purpose of this analysis is to ensure that the compiled teaching materials are relevant and capable of addressing field challenges.

After the analysis stage, researchers begin to compile the design of teaching material components. This design is compiled referring to the completeness of teaching material structure according to guidelines from the Ministry of Primary and Secondary Education (Kemendikdasmen, 2025). This teaching module design will serve as a reference in the development stage, so that the resulting product aligns with Deep Learning approach principles that emphasize meaningful learning, mindful learning, and joyful learning atmosphere.

Problem Analysis

Problem analysis was conducted to identify obstacles in the learning process related to bullying behavior and the internalization of peace-loving character values. Based on classroom observations and Focus Group Discussions (FGD) involving elementary school teachers and educational experts, several key issues were identified. The findings revealed that bullying behavior among students was still prevalent and that peace-loving values had not been optimally internalized in daily learning activities.

The FGD results indicated that learning practices in elementary schools tend to emphasize cognitive achievement and mastery of subject matter, while character education is often treated as an additional or implicit component. One expert noted that *"character values are usually mentioned in lesson plans but are rarely translated into concrete learning activities that encourage students to reflect on their behavior."* Another participant emphasized that students often understand moral values conceptually but lack opportunities to apply them in real-life classroom interactions.

Furthermore, teachers participating in the FGD acknowledged that learning activities had not sufficiently encouraged students to engage in reflection, self-awareness, and

behavioral evaluation based on peace-loving character values. As a result, students tended to view learning as a memorization process, which limited the development of empathy, self-control, and peaceful social interaction. This condition contributed to the persistence of undesirable behaviors, including verbal teasing, exclusion, and minor physical aggression among peers.

Based on these findings, the development of teaching materials that integrate character values through a deep learning approach was considered necessary. The proposed teaching materials were designed to address these gaps by embedding peace-loving values into learning activities that promote reflection, discussion, and meaningful engagement. Through this approach, the teaching materials are expected to support students in internalizing peace-loving character values and applying them consistently in their social interactions at school.

Learning Achievement Analysis

Based on learning analysis results, there is a need for learning devices specifically designed to support IPAS (Integrated Science and Social Studies) learning in grade IV or phase B elementary schools. Materials in the teaching materials are compiled referring to IPAS learning achievements according to the applicable Merdeka curriculum, namely:

Table 2. Learning Achievements

Elemen	Capaian Pembelajaran
–	Kehidupan sehari-hari; gejala kemagnetan dalam kehidupan sehari-hari; jenis gaya dan pengaruhnya terhadap arah, gerak, dan bentuk benda; peran, tugas, dan tanggung jawab serta interaksi sosial yang terjadi di sekitar tempat tinggal dan sekolah; mengenal letak kota/kabupaten dan provinsi tempat tinggalnya melalui peta konvensional/digital; ragam bentang alam serta keterkaitannya dengan profesi masyarakat; keanekaragaman hayati, keragaman budaya, kearifan lokal, sejarah keluarga dan masyarakat tempat tinggalnya, dan upaya pelestariannya; serta perbedaan kebutuhan dan keinginan, nilai mata uang dan fungsinya.

In these achievements, students are directed to be able to have tolerance, nationalism, appreciate differences, avoid violence, be able to cooperate, and be able to solve problems through dialogue.

Teaching Material Development Design

Entering the development stage, researchers begin designing teaching materials using book format with portrait orientation sized ISO A4 (210 x 297 mm). The design process is conducted digitally using the Canva platform, which allows visual compilation of teaching materials to be more attractive and structured. The description of the initial design of each component in the teaching materials is as follows:

1. Teaching Material Front Cover

The front cover of the teaching materials contains main information including teaching material content, author names, institutional logos, and grade level information. All text on the cover uses the same font type, namely Garet, to maintain visual harmony. The illustration displayed features one of the cultural dances with a temple background. The combination of warm and cool colors accompanied by contextual visual elements aims to attract student attention while presenting the material content, namely cultural diversity.

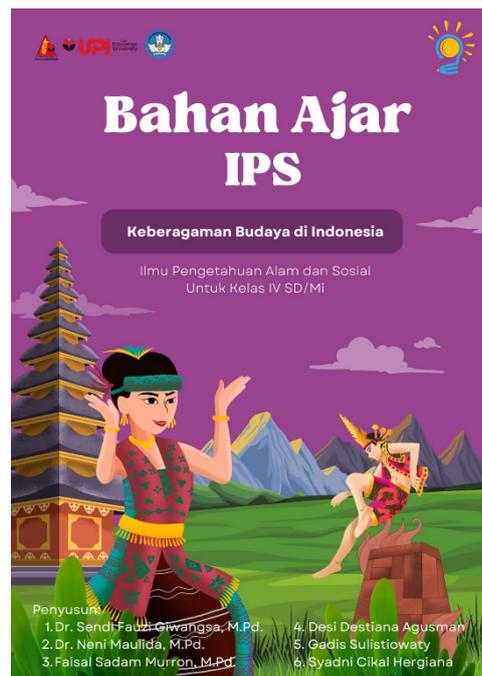


Figure 3. Teaching Material Cover

2. Core Components

Core components are the main parts of the teaching materials that contain structured learning planning according to guidelines. This section includes learning achievements, learning objectives, and student reading materials. The description of these components is as follows:

a. Learning Achievements

Learning achievements in these teaching materials refer to the element of recognizing and appreciating culture in IPAS subject Phase B, which states that at the end of Phase B, students can recognize cultural diversity, local wisdom, history (both figures and periodization) in their province of residence and connect it with current life contexts.

b. Learning Objectives

Learning objectives in these teaching materials are derived from learning achievements. Through this learning, students are expected to be able to explain various forms of cultural diversity in their province of residence and other provinces, classify cultural diversity based on certain aspects, exemplify various efforts that can be made to preserve cultural diversity in the surrounding environment, and conclude the importance of cultural preservation efforts in maintaining diversity in Indonesia.

c. Reading Materials

These reading materials are learning resources about cultural diversity that have been adapted to student needs in achieving learning objectives. The components in these reading materials are as follows:

Table 2. Reading Material Design

Nu	Desain	Deskripsi
1		<p>On page 1, the teaching material contains reading material about what cultural diversity is as an introduction to learning. In this section, students are introduced to the definition of cultural diversity, why it occurs, and examples of it. This page is also equipped with illustrations of Indonesian islands and traditional clothing characters.</p>
2		<p>On page 2, the teaching material contains reading material about forms of cultural diversity, namely traditional ceremonies from the provinces of West Java, West Sumatra, South Kalimantan, North Kalimantan, North Sulawesi, and Highland Papua.</p>
3		<p>On page 3, the teaching material contains reading material about forms of cultural diversity, namely traditional houses from the provinces of West Java, West Sumatra, South Kalimantan, North Sulawesi, and Highland Papua.</p>
4		<p>On page 4, the teaching material contains reading material about forms of cultural diversity, namely traditional clothing from the provinces of West Java, West Sumatra, South Kalimantan, North Sulawesi, and Highland Papua.</p>

5



On page 5, the teaching material contains reading material about forms of cultural diversity, namely regional dances from the provinces of West Java, West Sumatra, South Kalimantan, North Sulawesi, and Highland Papua.

6



On page 6, the teaching material contains reading material about forms of cultural diversity, namely regional foods from the provinces of West Java, West Sumatra, South Kalimantan, North Sulawesi, and Highland Papua.

7



On page 7, the teaching material contains reading material about forms of cultural diversity, namely traditional musical instruments from the provinces of West Java, West Sumatra, South Kalimantan, North Sulawesi, and Highland Papua.

8



On page 8, the teaching material contains reading material about forms of cultural diversity, namely regional songs from the provinces of West Java, West Sumatra, South Kalimantan, North Sulawesi, and Highland Papua.

9



On page 9, the teaching material contains reading material about forms of cultural diversity, namely traditional weapons from the provinces of West Java, West Sumatra, South Kalimantan, North Sulawesi, and Highland Papua.

10



On page 10, the teaching material contains reading material about the benefits of cultural diversity.

11



On page 11, the teaching material contains reading material about efforts to preserve cultural diversity.

12



On page 12, the teaching material contains reading material about the impacts of preserving cultural diversity.

13



On page 13, the teaching material contains reading material about attitudes that need to be developed toward cultural diversity. To strengthen understanding, a barcode is also provided that links to a learning video.

14



On page 14, the teaching material contains reading material about the character values of peace within cultural diversity.

15



On page 15, the teaching material provides examples of implementing attitudes that need to be developed toward cultural diversity in daily life. In addition, at the end of this page, a short narrative and a column are provided for students to summarize.

16



On page 16, the teaching material contains a story-based worksheet to assess students' understanding.

17



On page 17, the teaching material presents several games integrated with digital evaluation questions to create enjoyable learning.

18



On pages 18–20, the teaching material presents conventional evaluation questions that can be used when there are issues with the digital evaluation.

19



On page 21, the teaching material presents students' reflections on the learning process.

20



On pages 22–25, a summary of the content about cultural diversity is presented.

21



On pages 26–28, the teaching material presents a glossary of special terms along with their explanations.

22



On page 29, the list of references used in preparing the reading material is presented.

3. Teaching Material Validation Results

In the evaluation stage, the compiled teaching materials are validated by material experts, media experts, and language experts. Validation is conducted to ensure content suitability, presentation clarity, and attractiveness of teaching material appearance. The following describes the teaching material validation results.

Table 3. Material Expert Validation Results

Assessment Aspect	Average Score	Percentage	Category
Suitability with Deep Learning	4.3/5.0	86%	Excellent
Relevance to Peace-Loving Character	4.2/5.0	84%	Excellent
Material Accuracy and Depth	4.1/5.0	82%	Excellent
Overall Average	4.2/5.0	84%	Excellent

Based on the table above, the assessment from **Material Expert** regarding the compiled teaching materials is generally excellent. The material expert provides an assessment that the teaching material content is suitable with deep learning approach characteristics and relevant to social studies learning objectives, especially in developing peace-loving character.

Table 4. Media Expert Validation Results

Assessment Aspect	Average Score	Percentage	Category
Visual Design and Layout	4.5/5.0	90%	Excellent
Ease of Use	4.4/5.0	88%	Excellent
Attractiveness and Interactivity	4.3/5.0	86%	Excellent
Overall Average	4.4/5.0	88%	Excellent

Based on the table above, validation results from Media Expert regarding the developed teaching materials are assessed as excellent, both in terms of design, ease, and attractiveness and interactivity. The media expert assesses that the teaching material

appearance is attractive, interactive, and easy to use by elementary school students. Next, the teaching materials are validated by the Language Expert, the following are the teaching material validation results based on the Language Expert.

Table 5. Language Expert Validation Results

Assessment Aspect	Average Score	Percentage	Category
Language Appropriateness for Elementary Age	4.4/5.0	88%	Excellent
Clarity of Instructions and Narrative	4.3/5.0	86%	Excellent
Consistency of Term Usage	4.2/5.0	84%	Excellent
Overall Average	4.3/5.0	86%	Excellent

Based on the assessment from Language Expert above, the developed teaching materials are excellent, the language used is simple, communicative, and suitable for elementary school student development levels.

Overall, validation results show that these deep learning-based teaching materials are suitable for use with several minor revisions, such as term simplification, illustration additions, and case example adjustments.

4. Development Implications

The development of these deep learning-based teaching materials has several important implications:

- a. Pedagogical Implications These teaching materials not only emphasize cognitive aspects but also affective aspects of students. Teachers serve as facilitators of more interactive and reflective learning, directing students to internalize peace values through discussion activities, collaboration, and real problem-solving (Akbar et al., 2025).
- b. Psychological Implications Learning becomes more relevant to students' daily lives because they can connect social concepts with personal experiences or social dynamics in their surrounding environment (Maskuroh, 2023). This contributes to the formation of constructive social character.
- c. Social Implications The development of these teaching materials contributes to creating a harmonious and inclusive school culture (Jayatri et al., 2025). Students are equipped with the ability to face differences positively and make them a strength in building a peaceful society

Discussion

The development of deep learning-based teaching materials requires a paradigm shift in the teacher's role from merely delivering content to facilitating reflective, collaborative, and problem-oriented learning. These materials are designed to support structured discussions, culturally diverse collaborative tasks, and authentic problem-solving activities that enable students to internalize peace-related values within real social contexts (Garzón, Patiño, & Marulanda, 2025; Saleh, 2025). However, the effectiveness of such materials is closely linked to contextual factors, particularly access to digital infrastructure. In rural Indonesian elementary schools, limitations in internet connectivity, device availability, and teachers' digital literacy may challenge the implementation of digital features such as barcode-linked resources and online evaluation tools. Without adequate access management, these technological components risk widening learning inequalities rather than enhancing engagement. Therefore, the teaching materials were conceptually designed to allow flexible implementation,



enabling teachers to adapt digital elements into offline or teacher-mediated formats while maintaining the core principles of deep, reflective, and peace-oriented learning.

Psychologically, integrating affective elements such as personal narratives, emotional scenarios, cultural characterization, and empathy-driven visuals strengthens students' emotional engagement and intrinsic motivation, increasing the likelihood of internalizing values like tolerance and peace. Recent systematic reviews on emotional design in multimedia learning show that affective design can improve learners' motivation and mood, although its cognitive effects remain context-dependent (Bayraktar, 2024). Therefore, developers must design affective stimuli that are meaningful, measurable, and aligned with cognitive load principles to ensure deep and sustainable learning outcomes.

From a social and inclusivity perspective, teaching materials that highlight cultural diversity through multimodal formats (text, audio, video, digital games) can enhance inclusive school cultures—provided that accessibility principles (alternative text, subtitles, audio pacing, visual adaptations) are fully integrated. Systematic reviews on technology in inclusive education confirm that educational technologies can enhance participation among marginalized groups when combined with policies on accessibility, teacher training, and multimodal representation (Samaniego López et al., 2025). Conversely, without adequate access management and teacher readiness, technology may deepen existing inequalities; hence accessibility and cultural representation should be considered primary design principles.

In terms of assessment, combining interactive digital assessments (game-based tasks, adaptive quizzes, DL analytics) with conventional instruments (reflective narratives, story worksheets, affective rubrics) provides a dual advantage: rapid feedback and engagement on the digital side, as well as high-order thinking and social-value evaluation through written reflections. Recent studies on game-based assessment emphasize the need for explicit affective rubrics (e.g., empathy, tolerance) and reliable backup systems when technological failures occur to ensure both validity and reliability of peace-value assessment (Udeozor, 2024). Therefore, authentic assessment design must be carefully aligned with learning objectives, combining performance, reflection, and affective indicators.

Successful implementation of these materials depends not only on instructional design but also on institutional policy and teacher capacity. Continuous professional development programs that integrate AI/DL tools with ethical and pedagogical dimensions are crucial. As Garzón et al. (2025) and other AI-in-education reviews emphasize, teachers must be trained not just in the technical operation of tools but also in human-centered pedagogy—managing value-laden discussions, interpreting AI-driven analytics responsibly, and maintaining “human-in-the-loop” oversight. Moreover, policymakers should formulate ethical guidelines that balance personalization and algorithmic fairness, ensuring that technological integration strengthens rather than diminishes the humanistic essence of education.

In summary, *deep learning*-based teaching materials offer transformative potential to enrich the cognitive, affective, and social dimensions of peace education. However, their benefits will only be realized when (1) teachers act as facilitators of values-based learning; (2) affective elements are designed to enhance motivation without overloading cognition; (3) accessibility and cultural representation are prioritized; (4) authentic, multi-format assessment with affective rubrics is implemented; and (5) professional development and ethical governance are firmly established. These recommendations align with recent

empirical and systematic evidence, suggesting that each implementation stage should be accompanied by formative evaluation and longitudinal studies to ensure sustainable educational impact.

CONCLUSION

The development of deep learning approach-based teaching materials for fostering peace-loving character in elementary school students has been successfully implemented with excellent results. The developed "Peace-Loving Friends" teaching materials obtained validation from material experts (4.2/5.0), media experts (4.4/5.0), and language experts (4.3/5.0) with excellent categories. The integration of deep learning principles in the form of meaningful learning (89%), mindful behavior (92%), and joyful experience (87%) proves effective in developing teaching materials that not only facilitate cognitive understanding but also foster students' peace-loving character. This approach successfully integrates cognitive, affective, and psychomotor aspects in holistic and enjoyable learning. However, this study is limited to the validation stage and has not yet been tested in classroom-scale implementation. Therefore, the effectiveness of the teaching materials in improving students' peace-loving character has not been empirically measured in actual learning settings. These teaching materials are suitable for use as an alternative in social studies learning in elementary schools to develop peace-loving character as a preventive effort against bullying behavior. Future research is recommended to conduct field implementation trials to empirically measure the effectiveness of the teaching materials in developing students' peace-loving character.

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