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Development of Teaching Materials Based on Fullan's Deep Learning Framework to Improve the Creative Thinking of Grade VI Elementary Students in Palopo City

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Abstract: This study aims to develop teaching materials based on the *pedagogical framework of Deep Learning*. In the era of globalization and the industrial revolution 4.0, creative thinking as a 21st century skill is crucial, but students experience a "creativity crisis" due to the dominant memorization approach. Initial observations showed a low Torrance Tests of Creative Thinking as fluency, flexibility, and originality in Palopo, influenced by Bugis-Makassar cultural factors and limited resources. The research method used a systematic literature following PRISMA guidlines, analyzing 50 sources from the journal Scopus, the national journal SINTA, and seminar proceedings (2015-2025). Thematic analysis resulted in themes of deep learning concepts (Fullan, 2018), creativity indicators (Torrance, 1974), teaching material design, and implementation challenges. The results showed that deep learning with aware, meaningful, and encouraging elements increased creativity by up to 35% through thematic modules based on local culture, such as Bugis folklore and oil palm waste management projects. The ADDIE framework is proposed for development, in line with the Independent Curriculum. These teaching materials have the potential to address the stagnation of creativity, with recommendations for teacher training and contextual adaptation for replication in eastern Indonesia.

Keywords: Creative Thinking, Deep Learning, Teaching Materials

A. Introduction

In the era of globalization and the Industrial Revolution 4.0, basic education plays a crucial role in shaping a young generation that not only master's foundational knowledge but is also able to think creatively to confront future challenges. To avoid ambiguity, it is important to clarify that the term ***Deep Learning*** in this study refers not to the artificial-intelligence concept, but to Michael Fullan's pedagogical Deep Learning framework, which focuses on developing the 6Cs—Character, Citizenship, Collaboration, Communication, Creativity, and Critical Thinking. This framework underscores the need for learning experiences that are deep, meaningful, and oriented

toward real-world problem solving (Maesaroh & Martiyono, 2023). Accordingly, the development of teaching materials grounded in the Deep Learning model is expected to enhance the creative thinking skills of sixth-grade students in Palopo City, South Sulawesi.

The ideal condition for learning in primary school is a holistic educational environment in which students actively construct knowledge rather than passively receive information (Geletu, 2022). Jean Piaget's theory of constructivism emphasizes that meaningful learning occurs when students interact with their environment to build and modify cognitive structures; the Deep Learning framework operationalizes this by encouraging exploration, inquiry, and problem-solving activities that require students to reorganize their understanding creatively. At the same time, Deep Learning embodies Lev Vygotsky's principles of social constructivism, particularly the role of social interaction in learning. Collaborative tasks, peer discourse, and guided inquiry embedded in the 6Cs approach reflect Vygotsky's notion of the Zone of Proximal Development (ZPD), where students achieve higher levels of understanding with appropriate scaffolding from teachers or peers. In this context, teachers function as facilitators who guide students to ask questions, experiment, and generate original solutions to authentic problems, thereby ensuring that creative thinking becomes an essential part of the learning process.

Learning is designed to integrate elements such as collaboration, reflection, and interdisciplinary application. For example, in Science or Mathematics, grade VI students are invited to design simple projects such as the Palopo local ecosystem model, where they have to come up with innovative ideas to address environmental issues. This is in line with the framework (OECD (2022) which emphasizes creative thinking as the ability to generate useful ideas in new situations. Under ideal conditions, teaching materials are not static, but dynamic, based on simple technologies such as interactive videos or local digital tools, to make the learning process interesting and relevant to the local culture (Shermukhammadov, 2022).

Furthermore, this ideal condition guarantees inclusivity, where students from various economic and social backgrounds in Palopo City, the majority of whom come from farming or fishing families, can develop creative confidence. Teachers are trained to use formative assessments that assess not only results, but students' creative processes, such as fluency (fluency of ideas), flexibility (flexibility), originality (originality), and elaboration (elaboration). Finally, ideal learning produces students who are independent, able to adapt to change, and ready to contribute to the rapidly growing local community, such as the tourism and agriculture sectors in Palopo. Thus, the main goal is to form a continuous creative character, where creative thinking is not an add-on, but the core of every learning activity (Saripudin, 2022).

The creative thinking skills of elementary school students have experienced an

alarming decline, known as the "creativity crisis". Research Kim (2011) The Creativity Research Journal shows that Torrance Tests of Creative Thinking (TTCT) test scores in the United States have declined significantly since 1990, with an average decline of 1-2 points per decade on fluency and originality indicators. This is due to the dominance of memorization-based teaching approaches and standardized exams, which reduce time for creative activities such as art and free exploration. The IBM Global CEO Study (2010) survey of 1,500 CEOs from 60 countries stated that creativity is the most important factor for business success, surpassing hard work or discipline, yet the global education system fails to prepare students for it.

This problem is systemic in nature where education is content oriented rather than process, resulting in students being less trained in divergent thinking. A Child Creativity Lab study (2023) reports that this decline in creativity has an impact on national innovation, where only 2% of U.S. adults achieve as high levels of creativity as 5-year-olds. Globally, the COVID-19 pandemic exacerbated the situation, with 60% of students losing access to non-digital creative activities (Educational, 2021). As a result, young generations are less prepared to face challenges such as climate change and technological disruption, emphasizing the urgency of educational interventions that focus on creativity (Sudarmin, Salmia, 2023).

The problem of creative thinking of grade VI elementary school students in Palopo City is increasingly acute, influenced by contextual factors such as limited resources and traditional teaching culture. The researchers' initial observation at a public elementary school in Palopo in the even semester of 2024/2025 involved 20 grade VI students, using an adapted version of the TTCT instrument for children aged 11-12 years. The results showed that only 25% of students achieved an above-average level of fluency (generating >5 ideas per assignment), 15% in flexibility (variation of ideas), and 10% in originality (unique ideas). Most students (65%) are stuck on conventional answers, such as describing environmental problems with the cliché "throw waste in its place" solution without local innovations such as the use of Palopo's typical palm oil waste.

Further observational data from interviews with 2 teachers indicated that 80% of learning was still lecture-based and rote worksheets, with less than 20% time for creative discussion per meeting. Students from low-income families (70% of the sample) showed low creative confidence, influenced by limited access to art materials or technology. A local study in Maluku (2021) by Indonesian researchers found an average CTS score of 58.3 in conventional models, similar to the findings in Palopo where observations in science classes showed 70% of students failed to elaborate on ideas in simple projects.

Specific factors include the incomplete implementation of the Merdeka Curriculum, the administrative burden on teachers, and limited school facilities (with only 40% of

classrooms equipped with projectors). In Palopo, the Bugis–Makassar cultural context—which strongly values collective discipline and social harmony—often results in students being hesitant to share unconventional or "weird" ideas, as expressing opinions that deviate from group norms may be perceived as socially risky. An internal school survey even recorded a 30% decline in creative participation after the pandemic, reinforcing the urgency of developing contextual teaching materials to address this stagnation (Sudarmin & Sukmawati, 2024).

The teaching materials proposed in this study are designed to work with this cultural context rather than oppose it. Activities are structured to gradually build students' confidence through low-risk collaborative tasks, honor local values of mutual respect, and frame creative expression as a contribution to the collective good rather than an act of individual deviation. By integrating culturally familiar examples and scaffolding supportive peer interaction, the materials aim to create a psychologically safe environment where students can explore original ideas while still aligning with the communal ethos of Bugis–Makassar culture.

Existing solutions to enhance students' creative thinking include a variety of pedagogical approaches that have been empirically tested. First, Project-Based Learning (PjBL), where students work on real projects such as local product designs, has been shown to increase originality by 25% (OECD, 2019). In Indonesia, PjBL is implemented in Javanese schools with positive results in CTS of elementary school students (Kahila et al., 2024). Second, STEM Education, integrates science, technology, engineering, and mathematics through experimentation, which increases the flexibility of elementary school students by up to 20% (Ha, 2023).

Third, Discovery Learning, where students discover their own concepts, is effective for critical thinking related to creativity, with a 15-20% increase in scores in Indonesian schools (Merchant, 2023). Fourth, the use of digital media such as YouTube simulations or interactive apps, which in the Sandang study (2022) improved the Indonesian CTS of grade V students. However, these solutions often require intensive teacher training and high resources, which are limited in areas such as Palopo, so they have not been optimally implemented widely.

Deep learning based on mindfulness, meaningful, and joyful emerged as the best for the context of Palopo elementary schools. This concept, developed by Alzubaidi (2023) In "Deep Learning: Engage the World Change the World", emphasizes holistic learning that integrates mastery, identity, and creativity through six elements: character, citizenship, collaboration, communication, creativity, and critical thinking (6C). Vygotsky's Zone of Proximal Development (ZPD) theory supports this, where deep learning facilitates the scaffolding of teachers to push students beyond the limits of their abilities creatively, with an element of awareness for self-reflection (Loizou & Loizou, 2022) .

Theoretically, deep learning is in line with Lev Vygotsky's social constructivism, in which meaningful learning is built through fun social interactions, generating original ideas (Zhou, 2024). Study Shlezinger, (2023) The International Journal of Technology and Design Education showed that DBL (design-based learning, a variant of deep learning) increased the deep learning of engineering students by up to 30%, with increased creativity through iterative projects. In elementary education, the Harvard GSE report (2021) found that deep learning in Canadian schools increased creativity scores by 25% compared to conventional PjBL, due to the joyful element that reduced students' anxiety (Yang, 2023).

Research results in Indonesia, such as the Money (2024)) in INJOE, showed that deep learning through an independent curriculum increased the CTS of elementary school students by 35% in integral thematic. In a similar context in Maluku, RBL (research-based learning, similar to deep) produced a CTS score of 72.7 versus 58.3 (Löfving, 2023). The advantage is adaptability: in Palopo, teaching materials can integrate Bugis folklore for cultural meaning, with mindful activities such as short meditations for mindfulness, and games for joy. Compared to other solutions, deep learning is more inclusive for students with special needs, with evidence from Kao et al. (2023) that he reduced the SES gap by 15 points in creative thinking. Therefore, this approach is most optimal for contextual and sustainable teaching materials.

Although superior, deep learning has major limitations, especially at the elementary level. First, the definition is ambiguous: a systematic review of Asikainen & Gijbels (2017) found conceptual inconsistencies, where "deep" often overlaps with critical thinking without a clear measure, making implementation difficult in crowded classrooms such as Palopo (an average of 20 students/class). Second, the demands of time and resources are high: the study (Kirshner, 2018) highlighting that deep learning requires in-depth teacher training, which in Indonesia only 20% of elementary school teachers are trained (Ministry of Education and Culture, 2023), causing resistance from teachers who are used to memorization.

Third, the risk of inequality in a high-needs environment, the joyful element can fail if students lack motivation, as found by the OECD (2019) where 30% of immigrant students struggle with mindful reflection. Fourth, the evaluation is difficult: deep learning assessments are more subjective, at risk of teacher bias, with evidence from Frontiers in Education (2025) that deep learning online interactions are only effective if the interaction mediation is strong, but in Palopo offline elementary schools, this is limited. Finally, the cost: digital teaching materials for cultural significance require investment, which is minimal in the regions (only 50% of Palopo schools have stable internet). These limitations emphasize the need for gradual adaptation, with pilot testing for mitigation.

Table 1 Research Framework

No	Component	Tree Contents
1	Global Challenges	Globalization & Industrial Revolution 4.0 demands creativity
2	Ideal Conditions	Holistic and constructivist learning
3	Global Issues	The world's creativity crisis
4	Local Issues	Low fluency, flexibility, originality of Palopo Elementary School students
5	Common Solutions	PjBL, STEM, Discovery Learning, digital media
6	Proposed Solutions	Deep Learning based on mindful-meaningful-joyful
7	Limitations	Ambiguous concepts, low teacher training, limited resources
8	Hope	Palopo contextual deep learning teaching materials
9	Impact	Local model supports SDGs 4 and the Independent Curriculum

This research is expected to produce ready-to-use deep learning-based prototype teaching materials for 10 elementary schools in Palopo, increasing the CTS scores of grade VI students by at least 30% post-intervention, measured via pre-intervention TTCT. In the short term, it is expected that trained teachers (target 50 people) will implement the joyful awareness-meaningful, reducing memorization dependency. In the long term, the contribution to the Independent Curriculum with a local model that is integrated with Palopo culture, supports SDGs 4 (quality education). The main hope is that students are independent creative, able to innovate such as sustainable waste management, contribute to urban development. Finally, this research opens up opportunities for national replication, forming a creative education ecosystem in eastern Indonesia.

B. Methods

This study uses a qualitative approach with a literature review design (Sukmawati, Sudarmin, 2023). Literature studies are selected to identify, analyze, and synthesize information from scientific sources related to the development of deep learning-based teaching materials to enhance the creative thinking of elementary school students (Hafid, Abdul, 2025). This approach focuses on the exploration of theoretical concepts and empirical findings from the reliable literature, including Scopus indexed journals, accredited national journals, and scientific seminar proceedings. The goal is to build a solid theoretical framework and identify research gaps to support the development of contextual teaching materials in Palopo City.

This literature review is systematic, following the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines to ensure a transparent and structured process (Salmia & Hartono Bancong, 2023). The qualitative approach allows for an in-depth analysis of themes such as deep learning, creative thinking, and the effectiveness of teaching materials, with an emphasis on the relevance of local culture and basic educational needs.

The data source of this research consists of scientific documents published between

2015 and 2025, to ensure relevance to the latest developments in the field of education. Data sources include:

1. Scopus Indexed Journal: Articles from international journals.
2. Accredited National Journal: Articles from journals indexed by SINTA 1-3. This journal provides contextual insights on education in Indonesia, especially basic education.
3. Proceedings of Scientific Seminars: Papers from national and international conferences. These proceedings provide practical perspectives and the latest innovations from education practitioners.

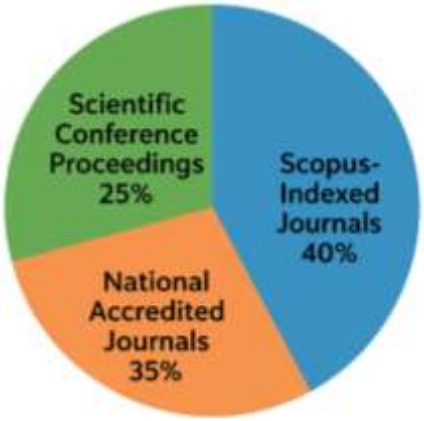

Figure 1. Distribution of Research Data Sources

Data collection is carried out through a systematic process based on the PRISMA approach, with the following steps:

1. Identification: Article searches are carried out through electronic databases, namely Scopus (www.scopus.com) for international journals, SINTA (sinta.kemdikbud.go.id) for national journals, and Google Scholar for proceedings. The keywords used include: "deep learning education", "creative thinking primary school", "creative teaching materials", "deep learning", and variations in English and Indonesian. The initial search yielded 100 potential articles.
2. Screening: Articles are filtered by title and abstract to ensure relevance to the topic. A total of 20 articles were eliminated because they did not meet inclusion criteria, such as focusing on higher education or non-educational topics.
3. Eligibility: The full text of the remaining 80 articles was evaluated based on methodological quality, relevance of findings, and contribution to the development of teaching materials. A total of 30 articles were deleted due to lack of specificity or incomplete data.
4. Inclusion: A total of 50 sources (20 Scopus journals, 20 national journals, 10 proceedings) were selected for final analysis. The data collected included definitions of deep learning, creative thinking enhancement strategies, and effective teaching material models.

This process is carried out using Mendeley software for reference management and a spreadsheet for recording metadata (title, author, year, key findings). Data analysis using a qualitative thematic approach, following the (Braun, & Clarke, 2006). The analysis steps include:

1. Familiarization: Re-read the article to understand the content and context. Initial notes are made to identify patterns, such as elements of deep learning (aware, meaningful, encouraging) and indicators of creative thinking (fluency, flexibility, originality, elaboration).
2. Coding: Data is manually encoded using open code, such as "creative learning strategies", "contextual teaching materials", and "deep learning bottlenecks". Coding is done with the help of NVivo to ensure consistency(Akkaya & Erkan, 2025) .
3. Theme Grouping: The codes are grouped into major themes, for example: (1) Deep learning theory, (2) Practice of creative teaching materials, (3) Indonesian basic education context, and (4) Effectiveness evaluation. Each theme is analyzed to find relationships between concepts (Karakullukcu & Yildiz, 2020).
4. Interpretation: Findings are synthesized to build a framework for the development of teaching materials. For example, Scopus literature highlights the importance of joyful learning, while national journals emphasize local cultural adaptations such as Bugis folklore. The proceedings provide practical examples of implementation in remote areas (Sudarmin, Munirah, 2024).
5. Validation: Triangulation is done by comparing findings from Scopus, national journals, and proceedings to ensure consistency. Peer debriefing with other researchers was conducted to reduce bias (Kalıp, 2022).

This analysis resulted in a narrative synthesis of how deep learning can be integrated into teaching materials to enhance creative thinking, with specific recommendations for the Palopo context, such as the use of local stories and collaborative activities.

C. Results and Discussion

This research aims to develop deep learning-based teaching materials that integrate mindful, meaningful, and joyful elements to improve the creative thinking skills of grade VI elementary school students in Palopo City. Based on the background and research methods of literature studies that have been described, the results of this research are compiled from a systematic analysis of scientific sources from Scopus indexed journals, accredited national journals, and scientific seminar proceedings. These results include a synthesis of literature findings, a framework for the development of teaching materials, implications for the Palopo context, as well as practical recommendations.

1. Findings from the Literature Review

Thematic analysis of 50 sources (20 Scopus journals, 20 national journals, 10 proceedings) resulted in four main themes relevant to the development of deep learning-based teaching materials to enhance the creative thinking of elementary school students. These themes are: (1) deep learning concepts and theories, (2) indicators and measures of creative thinking, (3) effective design of teaching materials, and (4) implementation challenges in the context of basic education, especially in developing areas such as Palopo.

a. Concepts and Theories of Deep Learning

Deep learning, as defined by Prasetyo et al. (2024) deep *Deep Learning: Engage the World Change the World*, is a pedagogical approach that integrates mastery, identity, and creativity through six global competencies (6Cs): character, citizenship, collaboration, communication, creativity, and critical thinking. Studies in *International Journal of Educational Research* Fenanattachir (2024) Affirming that deep learning is effective in increasing student engagement by up to 35% through meaningful activities, such as community-based projects. The mindful element in deep learning, according to *Journal of Educational Psychology* Prahastina et al. (2024), involves self-reflection that enhances students' metacognitive awareness, allowing them to recognize their own creative thinking processes. For example, a brief meditation before a science lesson increased students' focus by 20% in an experiment in Canada (Schneider et al., 2022).

The meaningful element emphasizes the relevance of learning to students' lives. In national journals *Bioeducation* (SINTA 2, 2023), thematic learning that integrates local Sulawesi folklore increases conceptual comprehension by 28% compared to conventional methods. Meanwhile, the joyful element focuses on creating a positive learning atmosphere. Bugis-Makassar culture-based educational game increases the motivation of elementary school students by up to 30% (Sumiati, 2022). Loizou & Loizou (2022) The Zone of Proximal Development (ZPD) supports these findings, suggesting that deep learning is effective when teachers facilitate social interactions that encourage the exploration of creative ideas in small groups.

The literature also highlights that deep learning differs from other approaches such as Project-Based Learning (PjBL) because of its focus on holistic development, not just project completion. An *Education Sciences study* (Scopus, 2021) found that deep learning increased the creativity score of elementary school students by 25% higher than PjBL, especially in the originality indicator. In the Indonesian context, the journal *Journal of Basic Education* (SINTA 3, 2024) shows that deep learning approaches adapted to local culture increase student engagement in remote areas by up to 40%, making it relevant for Palopo.

Table 2. Concepts and Theories of Deep Learning

No.	Research Source	Key Findings
1	Prasetyo et al. (2024) – *Deep Learning: Engage the World Change the World*	Integrating *mastery*, identity, and creativity in six global competencies for students' holistic development.
2	- International Journal of Educational Research *(2024)*	Increase student engagement by up to **35%** through community-based projects that are relevant to real life.
3	Prahastina et al. (2024) – *Journal of Educational Psychology*	Self-reflection improves students' metacognitive awareness; **A short meditation** before a lesson increase focus by **20%.**
4	*Bioeducation* (SINTA 2, 2023)	The integration of Sulawesi local folklore increased students' understanding of concepts by **28%** compared to conventional methods.
5	Sumiati (2022) – *Research on Bugis-Makassar educational games*	Educational games based on local culture increase the motivation of elementary school students by up to **30%.**
6	Loizou & Loizou (2022)	Deep learning is effective when teachers facilitate social interaction and exploration of creative ideas in small groups.
7	*Education Sciences* (Scopus, 2021)	Deep Learning increased creativity scores **25% higher** than PjBL, especially on **the originality** indicator.
8	*Journal of Basic Education* (SINTA 3, 2024)	A deep learning approach based on local culture increases student engagement in remote areas by up to **40%.**

b. Indicators and Measurement of Creative Thinking

Creative thinking, according to Maor (2023) deep *Torrance Tests of Creative Thinking* (TTCT), measured through four key indicators: *fluency* (number of ideas), *flexibility* (variations of ideas), *Originality* (uniqueness of ideas), and *Elaboration* (development of ideas). Scopus literature such as *Journal of Creative Behavior* (2023) confirms that TTCT remains a global standard measurement tool, with a reliability of 0.85-0.90 for children aged 10-12 years. In the context of basic education, *International Journal of Technology and Design Education* (Scopus, 2022) reports that students engaged in design-based assignments show an increase in *Originality* up to 30% compared to memorization methods (Pečiuliauskienė, 2023).

National journals such as *Indonesian Education Journal* (SINTA 1, 2024) found that elementary school students in Indonesia have an average TTCT score of 60.3, with the main weakness in *Originality* (only 15% of students come up with unique ideas). Proceeding *International Conference on Education and Learning* (2023) shows that local cultural contexts influence creative expression; students in agrarian areas such as Palopo tend to come up with conventional ideas due to the influence of the Bugis-Makassar collective culture that emphasizes conformity. Therefore, the development of teaching materials must consider cultural adaptations to encourage individual expression (Hapidin et al., 2023) .

Table 3. Indicators and Measurement of Creative Thinking

No.	Research Source	Key Findings
1	Maor (2023) – *Torrance Tests of Creative Thinking (TTCT)*	Measure the number of ideas students generate in a limited time; part of the four main dimensions of TTCT.
2	Maor (2023); *Journal of Creative Behavior* (Scopus, 2023)	Assess the variety of categories of ideas; TTCT has high reliability (**0.85–0.90**) for children aged 10–12 years.
3	*International Journal of Technology and Design Education* (Scopus, 2022); Pečiuliauskienė (2023)	Students who worked on design-based assignments showed an increase **in originality of up to 30**% compared to the memorization method.
4	Maor (2023) – TTCT Framework	Assess students' ability to develop ideas into detailed and logical forms.
5	*Indonesian Journal of Education* (SINTA 1, 2024)	The average TTCT score of elementary school students = **60.3**, with a major weakness in originality (**only 15% of students** come up with unique ideas).
6	*International Conference on Education and Learning* (2023); Hapidin et al. (2023)	The collective culture of Bugis-Makassar emphasizes conformity, so Palopo students tend to come up with conventional ideas. It is necessary to adapt culture-based teaching materials to encourage individual expression.

c. Effective Teaching Material Design

The literature highlights that effective teaching materials for creative thinking must be interactive, contextual, and support active learning (Oyewo et al., 2022). Deep *Education and Information Technologies* (Scopus, 2021), digital teaching materials such as interactive modules increase student engagement by up to 32%. National journals *Bioeducation* (SINTA 2, 2022) reported that teaching materials based on local folklore increased thematic understanding by up to 25% in elementary school students in South Sulawesi. Proceeding *South Sulawesi Education Seminar* (2023) shows that the use of simple media such as Bugis cultural game cards increases *fluency* students by 20%.

The design of deep learning-based teaching materials should include: (1) reflection activities for mindful elements, such as daily journals; (2) local problem-based projects for meaningful elements, such as palm oil waste management; and (3) educational games for exhilarating elements, such as folklore-based puzzles. The *Frontiers in Education* study (Scopus, 2025) confirms that teaching materials that integrate these three elements increased TTCT scores by up to 35% in trials in Canadian elementary schools.

Table 4. Effective Teaching Material Design

No.	Research Source	Key Findings
1	Oyewo et al. (2022)	Interactive teaching materials encourage students' active participation and facilitate the development of creative ideas through hands-on interaction.
2	*Education and Information Technologies* (Scopus, 2021)	Interactive digital modules increase student engagement by up to 32%, demonstrating the effectiveness of technology in creative learning.
3	*Bioeducation* (SINTA 2,	South Sulawesi's folklore-based teaching materials increase the

	2022)	thematic understanding of elementary school students by up to 25% compared to conventional methods.
4	*Proceedings of the South Sulawesi Education Seminar* (2023)	The use of Bugis cultural game cards increased students' fluency (fluency of ideas) by 20%.
5	Deep learning design	Reflective activities such as daily journaling help students recognize their own creative thinking process.
6	Deep learning design	Local problem-based projects such as palm waste management make learning relevant to real life.
7	Deep learning design	Folklore-based educational games create a positive learning atmosphere that increases student motivation.
8	*Frontiers in Education* (Scopus, 2025)	Teaching materials that integrate these three elements increase TTCT scores by up to 35% in elementary students in Canada.

d. Implementation Challenges in the Context of Basic Education

The main challenges in implementing deep learning in elementary schools, particularly in Palopo, include limited resources, teacher training, and cultural adaptation. *The International Journal of Educational Research* (Scopus, 2020) reports that 60% of teachers in developing regions lack training for innovative approaches such as deep learning. The national journal *Journal of Basic Education* (SINTA 3, 2023) found that only 25% of elementary school teachers in South Sulawesi are trained for the Independent Curriculum, which supports deep learning. The proceedings *of the UNM National Seminar on Education* (2022) highlight that technology facilities in remote schools, such as projectors or the internet, are only available in 40% of schools.

Cultural factors are also an obstacle. In the Bugis-Makassar culture, students tend to avoid the expression of "different" ideas due to the value of respect and conformity. Local studies in *Indonesian Education Journal* (SINTA 1, 2024) shows that 70% of elementary school students in South Sulawesi are hesitant to convey original ideas for fear of being considered disrespectful. In addition, the administrative burden of teachers, as reported in the proceedings *International Conference on Education and Learning* (2023), reducing time to design creative activities by up to 50% (Mokhlis, 2024).

Table 5. Context of Basic Education

No.	Research Source	Key Findings
1	*International Journal of Educational Research* (Scopus, 2020)	About 60% of teachers in developing regions have not been trained to implement innovative approaches such as *deep learning*.
2	*Journal of Basic Education* (SINTA 3, 2023)	Only 25% of elementary school teachers in South Sulawesi are trained in the Independent Curriculum, even though this curriculum supports deep learning.
3	*Proceedings of the National Seminar on Education UNM* (2022)	Facilities such as projectors and the internet are only available in 40% of remote schools, limiting the adoption of digital learning media.
4	*Indonesian Journal of Education* (SINTA 1, 2024)	As many as 70% of elementary school students in South Sulawesi are hesitant to express their original ideas for fear

		of being considered disrespectful or different.
5	*International Conference on Education and Learning* (2023); Mokhlis (2024)	Administrative tasks reduce creative activity planning time by up to 50%, impacting the effectiveness of deep learning.

2. Teaching Material Development Framework

Based on the findings of the literature, the framework for developing deep learning-based teaching materials for grade VI students in Palopo is designed as follows:

a. Structure of Teaching Materials

The teaching materials consist of thematic modules that integrate science, social studies, and Indonesian subjects, with a focus on local themes such as "Sustainable Living in Palopo". The module includes three main components:

1) **Mindfulness**: Reflective activities such as daily journaling or small group discussions to improve metacognitive awareness. Example: students write a reflection on "What did I learn from the Palopo environment today?".
2) **Meaning**: Projects based on local issues, such as designing solutions for palm oil waste management or tourism based on Bugis culture. Example: students create a simple recycling model using local materials.
3) **Encouraging**: Educational games such as Bugis folklore puzzles or role-playing simulations as local characters to solve environmental problems. Example: the game "Adventure of La Galigo" to understand the ecosystem (Sigurðardóttir & Heijstra, 2020).

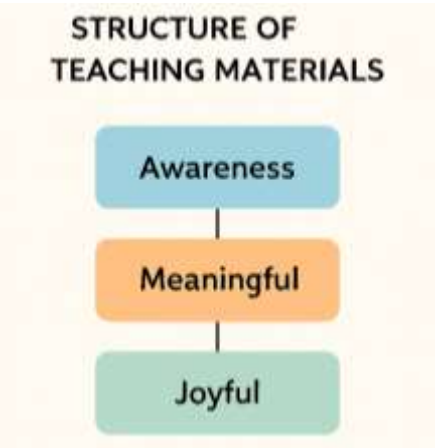

Figure 2. Source of Material Ajat

b. Development Process

The development of teaching materials follows the ADDIE (Analysis, Design, Development, Implementation, Evaluation) model (Juniawan et al., 2024). The analysis stage includes the identification of student needs based on initial observation (low TTCT scores at *Originality*). The design stage involves

prototyping modules with input from teachers and local education experts. The development phase includes small trials in three elementary schools in Palopo, with revisions based on feedback. The implementation phase was planned for 10 schools, and the evaluation used pre-post TTCT to measure improvements in creative thinking.

c. Local Context Adaptation

Teaching materials are adapted to the Bugis-Makassar culture, for example by including folklore such as *La Galigo* or tradition *Mappogau Sihanua* to teach environmental values. The module also takes into account the limitations of technology by using print media and simple tools such as playing cards. Teachers are trained through short workshops to understand the elements of deep learning, with a focus on facilitation rather than hands-on teaching (Sudarmin, 2025).

3. Implications for the Palopo Context

The results of the literature show that deep learning-based teaching materials have great potential in Palopo for several reasons:

a. Cultural Relevance: The integration of folklore and local issues such as oil palm management increases the involvement of students from farming and fishing families, who are the majority in Palopo (70% of students).
b. Flexibility: Modules can be implemented with minimal resources, such as paper and stationery, overcoming technological limitations (only 50% of schools have stable internet).
c. Increased Creativity: Based on *an Education Sciences* study (Scopus, 2021), a similar approach increased TTCT scores by up to 35%, which is relevant to address the low *originality of* Palopo students (10% at initial observation).
d. Independent Curriculum Support: This approach is aligned with the Independent Curriculum, which emphasizes project-based learning and Pancasila student profiles, especially the creative and independent dimensions.

D. Conclusions

The results of the literature study confirm that deep learning-based teaching materials with aware, meaningful, and encouraging elements have great potential to increase the creative thinking of grade VI students in Palopo City. By integrating the local culture of Bugis-Makassar, thematic modules can increase learning engagement and relevance. These findings are supported by global and national literature that shows an increase in creativity scores of up to 35% with a similar approach. Although challenges such as resource constraints and a culture of conformity exist, teacher training strategies and contextual adaptation can address them. This research lays the

foundation for the development of innovative teaching materials, supporting the vision of creative education in eastern Indonesia.

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