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The Effectiveness of Educational Tools Grounded in Local Knowledge in Enhancing High School Students' Creative Thinking Skills in the Context of Sound Waves

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ABSTRACT

The objective of this study was to describe the effectiveness of learning tools based on local wisdom in enhancing creative thinking skills in the context of sound waves. The research was conducted at SMA N 1 North Gorontalo, specifically targeting eleventh-grade students. The study employed a Research and Development (R&D) approach, utilizing the ADDIE learning design model, which encompasses the stages of Analysis, Design, Development, Implementation, and Evaluation. However, it is important to note that this study focuses solely on describing the effectiveness of the learning materials, without delving into other aspects. The effectiveness of the learning tools was assessed during the implementation stage. The findings of the study indicated that student engagement during the two sessions was rated as very good. The assessment of attitudes in both sessions resulted in a percentage of 87.89% and 89.85% respectively, falling within the very good category. Similarly, the assessment of skills exhibited percentages of 85.70% and 89.85% respectively, also within the very good range. Furthermore, the test conducted to evaluate students' creative thinking abilities revealed that the majority of students demonstrated creativity in utilizing traditional polopalo musical instruments. These findings suggest that learning tools based on local wisdom have the potential to enhance students' creative thinking skills.

INTRODUCTION

The significance of the role of education is clearly evident in the education system, as stated in the Republic of Indonesia Law No. 20 of 2003 regarding the National Education System. According to Article 1, Paragraph 1 of the law, education is recognized as a deliberate and systematic endeavor to establish a conducive learning environment and learning process that enables students to actively develop their potentials, including religious and spiritual strength, self-control, personality,

intelligence, noble character, and skills that are essential for themselves, society, nation, and country [1].

Education plays a vital role in enabling students to enhance their fundamental capacities, encompassing physical, intellectual, emotional, mental, social, and ethical dimensions. It is essential for every student to acquire education to foster the development of high-quality individuals. Essentially, education involves an interactive process between educators and students, working towards specific educational objectives within a dedicated learning environment. Its primary function is to facilitate students' self-development, encompassing the growth of their potentials, skills, and personal qualities in a positive direction that benefits both themselves and their surroundings.

The capacity to think creatively is a significant skill encompassed within life skills, which is one of the key objectives of national education, as explicitly outlined in the Republic of Indonesia Law No. 20 of 2003 concerning the National Education System. The law emphasizes that education aims to nurture students' potentials, guiding them to become individuals who possess faith and reverence for the Almighty, exhibit noble character, maintain good health, acquire knowledge, demonstrate competence, creativity, independence, and ultimately become democratic and responsible citizens (Article 3) [1]. Thinking is a cognitive process that engages the functioning of the brain. It is closely intertwined with mental activity. Thinking entails the exploration of concepts and perspectives in order to generate novel ideas that go beyond existing ones [2].

The significance of creative thinking lies in its ability to equip students with diverse approaches to solving a wide range of problems, employing varying perceptions and concepts. This capacity enables students to explore innovative and unconventional solutions, fostering adaptability and resourcefulness in addressing challenges [3]. The significance of nurturing creative thinking stems from four key reasons. Firstly, creative individuals possess the capacity to envision multiple possibilities for problem-solving, showing their ingenuity. Both engaging in creative pursuits not only offer practical benefits but also bring personal fulfillment and satisfaction. Thirdly, it is through creative abilities that human beings are able to enhance the quality of life, introducing innovative solutions and advancements. Lastly, fostering creative thinking empowers individuals to adapt to changing circumstances and find unique approaches to various challenges, ultimately promoting personal and social growth [4].

The development of creative thinking and curiosity is crucial to align with the requirements of the 2013 Curriculum. This requires the attention and creativity of teachers in designing learning models that engage and empower students to think creatively. One such model that can be utilized is the Guided Inquiry learning model. Guided Inquiry is a framework that fosters students' effective information access and implementation of critical thinking. By adopting this model, students are positioned as active participants in problem solving and knowledge discovery, promoting scientific thinking. Moreover, Guided Inquiry learning nurtures students' intrinsic motivation and eagerness to learn. Consequently, utilizing this model facilitates a deeper understanding of local wisdom within the Gorontalo community, enabling students to appreciate their cultural heritage on a profound level.

Local wisdom encompasses the cultural identity and distinctive traits of a nation, which enables it to assimilate and assimilate external cultures from other nations, incorporating them into its own character and capabilities. It serves as a reservoir of cultural knowledge and values that shape the unique attributes of a community or society. Local wisdom plays a crucial role in preserving and transmitting traditions, customs, beliefs, and practices from one generation to another, fostering a sense of pride and unity among its people. It serves as a foundation for social cohesion, resilience and adaptability, allowing a nation to embrace diversity while retaining its core essence. Through local wisdom, a nation can embrace its cultural heritage while actively engaging with the global community, contributing to the enrichment and evolution of its own identity [5]. According to Paulo Freire, local wisdom refers to the way individuals adapt and respond to changes in their physical and cultural environment [6]. Local wisdom education, as advocated by Freire, focuses on teaching students to stay

connected to the specific and tangible situations they encounter in their daily lives. This approach emphasizes the importance of understanding and valuing the local context, culture, and experiences of individuals. By grounding education in the realities of students' lives, local wisdom education seeks to promote critical thinking, empowerment, and social transformation within the local community [7]. Freire emphasized that when students are confronted with real-life problems and situations, they are progressively encouraged to respond with a critical mindset. By engaging with concrete challenges, students are prompted to analyze, ask questions, and evaluate the world around them. This process of critical inquiry enables them to develop a deeper understanding, uncover underlying issues, and seek innovative solutions. Through active participation in problem solving, students are empowered to become agents of change and active contributors to their communities. Freire's approach highlights the transformative potential of education when it engages students in critical reflection and action within their lived experiences.

Incorporating local wisdom into various subjects can be effectively designed, including the subject of physics. Local wisdom can be identified and validated through factual evidence or observable phenomena that are relevant in a specific cultural context. By integrating local wisdom into the teaching of physics, students can gain a deeper appreciation for the practical application and relevance of scientific principles within their own cultural environment. This approach allows students to bridge the gap between abstract scientific concepts and their everyday experiences, fostering a stronger connection and understanding of the subject matter. By recognizing and exploring the local wisdom embedded in their community, students can develop a more holistic and culturally grounded perspective in their study of physics [8]. Polopalo is a traditional musical instrument that is synonymous with the Gorontalo Peninsula in Gorontalo Province. It belongs to the idiophone family of musical instruments, which means its sound is produced directly from the instrument itself. When the polopalo is struck or hit, the entire body of the instrument vibrates, resulting in the production of sound. This unique characteristic distinguishes the polopalo and contributes to its distinct and resonant tones. As an important part of the local musical heritage, the polopalo embodies the rich cultural traditions of the Gorontalo community and holds significance in their artistic expressions and celebrations.

Physics is a subject that has strong connections to everyday life, necessitating students to link the physical phenomena they encounter in their daily experiences with the physics concepts taught in school. It is crucial for students to develop a deep understanding of the subject matter, enabling them to effectively solve problems related to physical phenomena both within the classroom and in real-life scenarios. To facilitate this, teachers should employ instructional methods that empower students to independently develop their knowledge and skills. By fostering a sense of ownership and active engagement in the learning process, students can enhance their problem-solving abilities and apply physics principles to practical situations. This approach encourages students to become self-directed learners, capable of applying their knowledge and understanding to real-world contexts [9].

Physics plays a significant role in various disciplines, making it crucial to integrate creative thinking skills within the physics curriculum, especially in secondary schools. In today's rapidly evolving world, the progress and advancement of civilization rely not solely on natural resources, but also on individuals who possess the ability to think creatively. Unfortunately, the development of creative thinking skills is often overlooked in formal education, and many teachers fail to address this important aspect in schools. The neglect of creativity in formal education is a missed opportunity, as it holds great significance in unlocking the full potential of students. Creative thinking skills contribute to innovation, problem-solving, and critical analysis, which are essential for personal growth and success in various fields. By nurturing creativity within the context of physics education, students can develop a broader perspective, engage in imaginative problem-solving, and explore innovative approaches to scientific concepts. It is imperative for educators and educational institutions to prioritize the development of creativity alongside subject knowledge. By incorporating creative thinking skills into the physics curriculum, students can cultivate their creative potential, which will benefit them not only in physics but also in other areas of their lives. It is further emphasized that creative thinking is not sufficiently stimulated, leading to a lack of practice in thinking from multiple

perspectives among children [3]. Consequently, creativity and creative thinking should be nurtured, developed, and enhanced from early childhood education to tertiary institutions. This calls for educational approaches that effectively promote the development of creative thinking skills. However, the current situation reveals that many schools have not fully utilized the potential of integrating local wisdom-based learning to enhance creative thinking skills, particularly in the field of physics.

According to Minister of Education and Culture Regulation No. 65 of 2013 on Process Standards for Elementary and Secondary Education, the development of learning tools is an integral part of the lesson planning process. Lesson plans are structured in the form of syllabi and lesson plans, which align with content standards [1]. According to Trianto [10], The effective management of the teaching and learning process requires various learning tools to support instruction. These tools can take the form of lesson plans, worksheets, evaluation sheets, learning media, and student textbooks. Lesson plans provide a detailed outline of the content, objectives, and activities for each lesson. They serve as a roadmap for teachers, guiding them in delivering the curriculum effectively. Worksheets are instructional materials that provide exercises or activities to reinforce concepts learned in class. They encourage student engagement and independent thinking. Evaluation sheets are used to assess student performance and understanding. They help teachers gauge the effectiveness of their instructions and identify areas for improvement. Learning media, such as visual aids, videos, or interactive tools, enhance the learning experience by presenting information in a dynamic and engaging manner. Student textbooks are valuable resources that provide structured content and information aligned with the curriculum. They serve as references for students, supporting their independent study and reinforcing classroom learning. These learning tools play a crucial role in facilitating effective teaching and learning experiences. They provide structure, resources, and assessment methods to ensure that students receive comprehensive and meaningful instruction. By utilizing a variety of learning tools, educators can create a dynamic and engaging learning environment that caters to the diverse needs of students. Based on this description, the purpose of this research is to describe the level of effectiveness of local wisdom-based learning tools to improve students' creative thinking skills on sound waves..

METHOD

This study adopts a Research and Development (R&D) approach, utilizing the ADDIE instructional design model, which encompasses the analysis, design, development, implementation, and evaluation stages. The focus of this research is to assess the effectiveness of learning tools based on local wisdom in enhancing creative thinking skills specifically related to sound wave material.

The effectiveness of these learning tools will be evaluated during the implementation stage. The evaluation will involve various assessment methods, including observation sheets for attitude assessment, skills assessment, and student activity. Additionally, a test on creative thinking skills will be conducted, consisting of essay questions that measure fluid thinking, flexible thinking, and organizational skills.

The implementation of this research will take place in the semester event, specifically at SMAN 1 North Gorontalo, with the participation of eleventh-grade students. By conducting this study, the aim is to gain insights into the effectiveness of learning tools rooted in local wisdom and their impact on improving students' creative thinking skills in the context of sound wave material.

Observations that are used to see the effectiveness of a learning device are from activities, attitudes and skills during the learning process. According to Adhi et al [11], student activity while participating in the learning process can be calculated by the following formula:

$$P_{\alpha} = \frac{A}{N} \times 100\% \quad (1)$$

Information :

P_{α} = Percentage of activeness towards learning

A= The number of scores that will be obtained by students

N= The total score

The average percentage of student activity can be calculated using the formula:

$$\% \text{ average} = \frac{\% \text{ meeting 1} + \% \text{ meeting 2}}{N} \tag{2}$$

Assessment of student activity is carried out by matching the results of the average total score obtained by showing in Table 1:

Table 1. Student Activity Criteria

Predicate Intervals	Predicate	Information
>91-100	A	Very good
>83-91	B	Good
>75-83	C	Enough
<75	D	Not enough

Table 2 is used to see students' creative thinking abilities in the written test:

Table 2. Interpretation Of The Level Of Creative Thinking

Score	KBK General Criteria	Value Percentage	Level
4	Fluency Flexibility Originality	81% - 100%	Level 3 very creative
3	Fluency and Flexibility Flexibility and Originality Fluency and Or Itionality	65% - 80%	Level 2 creative
2	Fluency Flexibility Originality	35% - 64%	Level 1 creative enough
1	Does not meet the creative thinking component	1% - 34%	Level 0 not creative
Maximum total score = 16			
Percentage of Value = Total Score Achieved / Maximum Total Score X 100 %			

Based on the results of student tests in the form of descriptions with a total of 4 questions, a total score for each student was obtained, then analyzed to determine the level of students' creative thinking. Thus, the final score for students' creative thinking skills using local wisdom-based learning tools will be obtained. Furthermore, the value obtained is interpreted based on the criteria for creative thinking ability. According to Arikunto [12], from the learning outcomes data obtained by students can be seen in Table 3:

Table 3. Criteria for Assessing Learning Outcomes on Attitudes and Skills

Percentage (%)	Criteria
86 – 100	Very good
76 – 85	Good
66 – 75	Enough
56 – 65	Not enough
0 – 55	Very less

RESULTS AND DISCUSSIONS

The effectiveness of learning tools is seen from student activities, attitude assessment, skills assessment, and tests of creative thinking abilities.

Student Activity

Student activity during the learning process serves as an important indicator of their motivation and eagerness to learn. The level of student activity provides insights into the effectiveness of the learning experience and the overall quality of education. When students are highly engaged and active in their learning, it indicates that the learning process is progressing well and yielding higher-quality outcomes. To assess student activity, observers closely monitor and record their behaviors and interactions during two meetings focused on the topic of Sound Waves. The student observation sheet consists of nine indicators that help evaluate and quantify their level of engagement. These indicators may include factors such as participation in discussions, attentiveness, collaboration with peers, asking questions, conducting experiments or practical activities, and overall enthusiasm towards the learning material. By systematically observing and analyzing student activity, educators and researchers gain valuable insights into the dynamics of the learning environment. This information can guide instructional strategies, identify areas for improvement, and create a more engaging and effective learning experience for students. Based on the results of observations made by observers, the presentation of student activities was obtained in Table 4:

Table 4. Percentage Of Student Activity

Respondents	Percentage Of Student Activity At		Average (%)	Criteria	Predicate
	Each Meeting (%)				
	I	II			
1	87.5	83.87	85.68	Good	B
2	84.375	87.5	85.93	Good	B
3	93.75	90.32	92.03	Very good	A
4	90.625	87.09	88.86	Good	B
5	96.875	93.54	95.21	Very good	A
6	90.625	90.32	90.47	Very good	A
7	93.75	87.09	90.42	Very good	A
8	93.75	93.54	93.649	Very good	A
9	96.875	96.77	96.82	Very good	A
10	84.375	90.54	87.34	Good	B
11	93.75	93.54	93.64	Very good	A
12	100	100	100	Very good	A
13	96.875	90.32	93.59	Very good	A
14	100	93.54	96.77	Very good	A
15	87.5	96.77	92.13	Very good	A
16	90.625	100	95.312	Very good	A
17	93.875	83.87	88.87	Good	B
18	96.875	87.09	91.98	Very good	A
19	100	90.32	95.161	Very good	A
20	100	87.09	93.548	Very good	A
21	81.25	83.87	82.56	Good	B
22	100	93.54	96.77	Very good	A
23	81.25	87.09	84.173	Good	B

After conducting observations on student activities with a total of 23 participants, it is evident that the average score for student activities falls within the very good category, with 15 students meeting this criterion. Additionally, 8 students achieved a score that qualifies them for the good category. These findings indicate that the learning tools implemented in the learning process have been proven to be effective and well-utilized. The high number of students who demonstrated very good activity levels

suggests that the learning tools have successfully engaged and motivated students in their learning journey. This observation further confirms that the implemented learning tools have positively contributed to the overall effectiveness of the learning process. The results of this analysis provide valuable insights for educators, indicating that the selected learning tools have had a positive impact on student engagement and learning outcomes. These findings can be used to inform future instructional decisions and reinforce the use of effective learning tools in order to optimize the learning experience for all students. This is in line with research conducted by Sudiarman et al [13] with the results of his research on the development of physics learning tools showing that student activity in following the learning process is included in the good category.

Assessment Of Attitudes And Skills

The effectiveness of learning is assessed by evaluating students' learning outcomes in terms of their attitudes and skill competencies. Referring to the table provided, the data indicates that the percentage of attitude assessment for meetings one and two is 87.89% and 89.85% respectively, falling within the very good category, so that the learning device meets the effective category.

Table 5. Percentage of Attitude Competency Assessment

Meeting	Average Percentage (%)	Criteria
First	87,89%	Very good
Second	89,85%	Very good

Table 6. Percentage of Skills Competency Assessment

Meeting	Average Percentage (%)	Criteria
First	85,70%	Very good
Second	89,85%	Very good

Based on Table 5. and Table 6. the percentage of skills assessment at meetings one and two is 85.70% and 89.85% with very good criteria, so that the learning device meets the effective category. This is in line with research conducted by Putri & Djamas [14], with the results of her research in the development of physics learning tools showing that the assessment of student skills meets the value of completeness and the assessment of students' attitudes is good. Research conducted by Lantowa et al [15] on the development of learning tools obtained the results of a good attitude assessment and an assessment of skills were also in the good category.

Creative Thinking Ability

The scores obtained from the creative thinking ability test can be seen in Table 7:

Table 7. Creative Thinking Ability Test Scores

Respondents	Creative Thinking Ability Test Scores				Total Score Reached
	1	2	3	4	
1	3	3	4	2	12
2	2	2	4	2	10
3	4	4	3	3	14
4	3	3	2	3	11
5	3	3	3	2	11
6	3	3	2	4	12
7	3	4	2	2	11
8	2	3	3	2	10
9	2	4	2	3	11
10	3	4	2	3	12
11	3	3	3	2	11
12	3	2	1	4	10
13	4	3	3	3	13
14	3	4	3	2	12

Respondents	Creative Thinking Ability Test Scores				Total Score Reached
	1	2	3	4	
15	4	3	4	4	15
16	2	4	2	3	11
17	2	1	2	2	7
18	3	4	3	2	12
19	3	3	2	3	11
20	2	1	2	3	8
21	3	2	3	3	11
22	3	4	4	4	15
23	4	3	4	3	14

As for the summary of the data, it can be seen in Table 8:

Table 8. Description of Physics Creative Thinking Level Data

Creative Thinking Level	Amount	Percentage (%)
Very creative	5	21.7%
Creative	13	56.52%
Creative Enough	5	21.73%

Referring to Table 8, the data reveals that out of the total respondents, only 5 students achieved a very high level of creative thinking, while 13 students demonstrated a high level of creative thinking, resulting in percentages of 21.7% and 56.52% respectively. These findings indicate that the creative thinking ability test employed in the study is suitable and effective for assessing students' creative thinking skills in the learning context. Furthermore, the learning outcomes of students, encompassing knowledge, attitudes, and skills developed through the utilization of local wisdom in using the traditional polopalo musical instruments, can be considered positive. The implementation of the polopalo traditional musical instrument in the Sound Wave material appears to have been effective in the classroom setting. These results suggest that the integration of local wisdom and the incorporation of the polopalo musical instrument have contributed to the enhancement of students' creative thinking skills. The successful implementation of this approach highlights the effectiveness of using cultural elements in education, supporting the development of students' knowledge, attitudes, and skills. This is in line with research conducted by Sarah [16], with the results of the research showing that there is an increase in students' creative thinking skills to carry out local potential-based physics learning.

CONCLUSION AND SUGGESTION

The research conducted on the effectiveness of learning tools based on local wisdom in enhancing creative thinking skills in the context of sound wave material has yielded positive results. The students' activities in two meetings demonstrated a high level of engagement and were rated as very good. Moreover, the test on creative thinking skills revealed that a majority of the students showcased creativity in utilizing the Polopalo Traditional Musical instrument.

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REFERENCES

- [1] Kemendikbud. (2013). *Permendikbud Republik Indonesia No. 65 Tahun 2013 Tentang Standar Proses Pendidikan Dasar dan Menengah*.
- [2] Tawil, M., & Haris, A. (2016). Analisis Keterampilan Berpikir Kreatif Fisika pada Peserta Didik Kelas XI IPA1 SMA Negeri 2 Bua Ponrang. *Jurnal Pendidikan Fisika*, 4(1): 127-144.
- [3] Awang, H., & Ramly, I. (2008). Creative thinking skill approach through problem-based learning: Pedagogy and practice in the engineering classroom. *International Journal of Educational and Pedagogical Sciences*, 2(4): 334-339.
- [4] Munandar, U. (2009). *Pengembangan Kreativitas Anak Berbakat*. Rineka Cipta.
- [5] Wibowo, A., & Gunawan. (2015). *Pendidikan karakter berbasis kearifan lokal di sekolah: konsep, strategi, dan implementasi*. Pustaka Pelajar.
- [6] Istiawati, N. F. (2016). Pendidikan karakter Berbasis Nilai-nilai Kearifan lokal Adat AMMATOA dalam menumbuhkan karakter konservasi. *Cendekia: Jurnal Pendidikan Dan Pembelajaran*, 10(1): 1-18.
- [7] Wagiran et al. (2010). *Pengembangan Model Pendidikan Kearifan Lokal di Wilayah Provinsi DIY dalam mendukung Perwujudan Visi Pembangunan DIY menuju Tahun 2025 (tahun kedua)*. Penelitian. Yogyakarta: Biro Administrasi Pembangunan.
- [8] Rusilowati, A., Supriyadi, S., & Widiatmoko, A. (2015). Pembelajaran Kebencanaan Alam Bervisi SETS Terintegrasi dalam Mata Pelajaran Fisika Berbasis Kearifan Lokal. *Jurnal Pendidikan Fisika Indonesia*, 11(1): 42-48.
- [9] Jumanta, H. (2014). *Model dan Metode Pembelajaran Kreatif dan Berkarakter*. Ghalia Indonesia.
- [10] Trianto. (2011). *Mendesain Model Pembelajaran Inovatif-Progresif. Ed ke 4*. Kencana.
- [11] Adhi, I. A. P., Marhaeni, A. N., & Atmadja, N. B. (2013). Pengaruh Pendekatan Kooperatif Tipe Jigsaw Dalam Pembelajaran Bahasa Inggris Terhadap Prestasi Belajar Menulis Ditinjau Dari Bakat Verbal Siswa SMP Negeri 2 Amlapura. *Jurnal Administrasi Pendidikan Indonesia*, 4(1).
- [12] Arikunto, S. (2010). *Metode Penelitian*. Rineka Cipta.
- [13] Sudiarman, S., Soegimin, W. W., & Susantini, E. (2015). Pengembangan perangkat pembelajaran fisika berbasis inkuiri terbimbing untuk melatih keterampilan proses sains dan meningkatkan hasil belajar pada topik suhu dan perubahannya. *JPPS (Jurnal penelitian pendidikan sains)*, 4(2): 658-671.
- [14] Putri, S. D., & Djamas, D. (2017). Pengembangan perangkat pembelajaran fisika berbasis keterampilan berpikir kritis dalam problem-based learning. *Jurnal Ilmiah Pendidikan Fisika Al-Biruni*, 6(1): 125-135.
- [15] Lantowa, H. D., Buhungo, T. J., Odja, A. H., & Arbie, A. (2022). Pengembangan Perangkat Pembelajaran Model Inkuiri Terbimbing Berbantuan Aplikasi Zoom Pada Materi Fluida Statis Terhadap Hasil Belajar. *ORBITA: Jurnal Kajian, Inovasi dan Aplikasi Pendidikan Fisika*, 8(1): 21-27.
- [16] Sarah, S. (2018). Peningkatan Keterampilan Berpikir Kreatif Melalui Pembelajaran Fisika Berbasis Potensi Lokal. *JIPFRI (Jurnal Inovasi Pendidikan Fisika dan Riset Ilmiah)*, 2(2): 84-94.