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Enhancing learners' proficiency in science through contextualized activity sheets in the local dialect: A hands-on approach

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ABSTRACT

This study examined the effectiveness of hands-on learning through contextualized activity sheets on Grade 3 learners' performance in science at Hipona Elementary School, Pontevedra, Capiz. A one-group pretest–posttest design was employed with learners, while interviews and classroom observations were conducted with teachers for the qualitative aspect. Researcher-made pretests and posttests in Hiligaynon and teacher interview guides were used as instruments. Data were analyzed using frequency, percentage, mean, paired sample t-test, and thematic analysis. Results revealed a significant improvement in learners' science proficiency after exposure to the intervention. Teachers emphasized that the use of the local dialect enhanced real-world application, critical thinking, motivation, engagement, diverse learning styles, and collaborative learning. The findings indicate that the intervention was effective in improving science performance, suggesting the need for varied and engaging science activities, the provision of instructional materials such as activity sheets and workbooks, and stronger collaboration between teachers and parents to further support learners' academic growth.

1. Introduction

Currently, contextualization is the current trend in the education system. Many teachers in elementary school adopted the suggested activities from the Department of Education. Training and workshops were facilitated to enhance the skills and knowledge of elementary teachers on the use of contextualized activity sheets (Pombo and Marques, 2021). From suggested activities coming from the national government, this concept was embraced by elementary teachers. Nonetheless, some created their own based on the needs of the learners. Science involves cultivating self-awareness and expanding one's understanding of the natural world, engaging in scientific practices, and developing new insights within a community through argumentation. To efficiently teach, educators, as instructional designers, must have a profound understanding of their learners. This includes understanding how learners absorb knowledge and identifying the occurrences that promote engagement and theoretical learning. Additionally, teachers should be attuned to the unique characteristics of their students and the specific needs of different groups within their classrooms (Darling-Hammond et al., 2020).

Teaching science requires meticulous approaches that embrace inquiry-based learning. Teachers must always ignite interest and essential science skills among learners via practical skills. Science is always intertwined between teachers' knowledge and ability and learners' way of understanding what science is all about (Twizeyimana et al., 2024). Learning Science is always connected to one of the difficult subjects. Thus, teachers should continually explore ways to make science engaging and enjoyable.

In the Philippines, hands-on activities are widely used as teaching strategies. This study adopted hands-on learning as the main instructional approach. Hands-on learning refers to "learning by doing" and is closely related to experiential learning, where learners actively participate in tasks to gain knowledge. This approach is believed to improve students' academic performance and deepen their understanding of scientific concepts by allowing them to manipulate objects, making abstract ideas more concrete and easier to grasp. It also enables students to explore real-life examples and observe

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the effects of changes in different variables. As a learner-centered method, it allows students to see, touch, and manipulate objects while learning. This is particularly effective in mathematics, which involves active demonstration, and in science, which emphasizes the principle of "do it yourself" (Ekwueme et al., 2015).

There were published papers, such as looking into the possibility of utilizing Sampunong Bolo Wildlife Sanctuary in the Municipality of Sara, Iloilo, Philippines, in teaching biodiversity in all grade levels, according to science teachers. They even created possible materials as tools in teaching science, Biology to be exact. Utilization of local biodiversity also educates stakeholders on the importance of our ecosystem (Tupas, 2019). Another study on local marine biodiversity also has potential as a material in teaching science at elementary levels. Science textbooks are general, instead of incorporating local resources to enhance comprehension among learners (Tupas and Matsuura, 2020). In addition, another study about local marine resources in the context of a museum is another innovative approach to using contextualization (Tupas et al., 2023). As a result, using contextualization or localization is very dependent on the interest of teachers to help learners improve their performance in science. All possibilities as materials, tools, or instruments for teaching and learning surround the world. Thus, this study was formulated to answer the call of the Department of Education for the concept of contextualization using the mother tongue.

This study aims to determine the effect of contextualized activity sheets on learning science in elementary grades in the Philippines.

Specifically, this study answers the following questions:

- What are the pretest results before the intervention of contextualized activity sheets using the mother tongue on learners' proficiency in science?
- What are the posttest results after the intervention of contextualized activity sheets using the mother tongue on learners' proficiency in science?
- Is there a significant difference between the pretest and posttest results of the contextualized activity sheets using the mother tongue on learners' proficiency in science?

2. Conceptual framework

Fig. 1 shows the conceptual framework of the study. This study is grounded in Constructivist Theory, which emphasizes active learning through experience, interaction, and problem-solving. Drawing on Piaget's experiential approach and Vygotsky's sociocultural perspective, the intervention leverages contextualized activity sheets and hands-on strategies to help learners actively construct knowledge through meaningful, real-world applications. Scaffolding techniques provide structured support, gradually enabling students to take ownership of their learning. Within this framework, teachers serve as facilitators who encourage exploration and inquiry, fostering deeper conceptual understanding and critical thinking. The effectiveness of this constructivist-based approach is evaluated through pretest and posttest comparisons, highlighting the positive impact of contextualized instruction on students' proficiency (Chand, 2023).

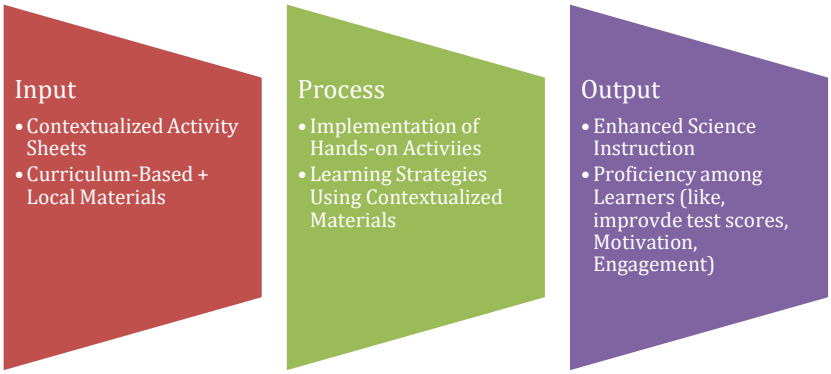

Fig. 1: The conceptual framework of the research study

2.1. Developing elementary education in the Philippines: Beyond the basics

Elementary learners in the Philippines face numerous challenges, particularly in foundational skills such as reading, writing, and mathematics, which often lead to low academic performance. A study by Piamonte and Ventura-Escote (2023) highlighted several post-pandemic factors affecting learning, including teacher delivery, parental involvement, and learner engagement. While these areas showed strong influence, the study emphasized the importance of encouraging learners to ask questions and actively participate in class, as well as the need for consistent parental support.

Family background also plays a significant role in learners' academic outcomes. Duque et al. (2022) found that many pupils come from nuclear households where multiple generations or extended family members live together. In many cases, parents, particularly mothers, are middle-aged, and heads of households often have not attained higher

education. These conditions contribute to economic hardship, limiting educational opportunities. The study suggests that greater support is needed to help learners pursue higher education, as earning a degree can potentially lift families out of poverty.

Despite their interest in continuing their studies, many students are forced to work or skip classes to meet their families' basic needs, often experiencing hunger. These socioeconomic challenges significantly contribute to poor academic performance and hinder long-term educational success.

2.2. Tailored activity sheet for enhanced contextual learning

The Contextualized Activity Sheet integrates real-world scenarios into the curriculum to enhance student understanding and engagement. Ta-oy (2021) reported improvements in kindergarten learners through contextualized learning, though emphasized the need for supportive policies and further interventions. At higher grade levels, similar gains were noted—Gaña (2022) found significant posttest improvements in science through contextualized activities. In the Philippines, one such innovation is the Learning Activity Sheet (LAS), a simplified, contextualized tool aligned with learners' environments. Given these benefits, the Department of Education (DepEd) encourages teachers to use or develop contextualized instructional materials. Inspired by these findings, the researcher applied this approach in a local elementary school on Panay Island.

Teachers play a crucial role in delivering contextualized learning. While many possess the creativity and cultural awareness needed, Gerodias (2023) stressed the importance of advanced professional development to deepen their expertise in crafting authentic learning experiences. However, Laguerta and Gamba (2024) found that stronger administrative and instructional support is essential. School leaders are urged to provide opportunities for teachers to attend training, workshops, and collaborative planning sessions. These efforts should culminate in the development of program designs and action plans that can be implemented widely and guide future research and practice.

2.3. Enhancing learner proficiency

There are multiple ways to enhance learners' proficiency in the classroom, and teachers play a central role in this process. To remain effective, educators must continually adopt innovative and creative teaching strategies. Professional development, such as in-service training, is essential for equipping teachers with updated pedagogical tools and knowledge (Abenir and Abenir, 2023). In response to consistently low performance in both national and international assessments, the Department of Education has been actively pursuing solutions. Without coordinated efforts from both education authorities and schools, the system risks falling further behind on the global stage.

As primary facilitators of learning, teachers have firsthand knowledge of students' needs, learning gaps, and challenges. Their involvement is critical in driving meaningful improvements in academic outcomes.

Several subject-specific strategies have proven effective in improving proficiency. In English instruction, Zhong and Wakat (2023) found that corpus-integrated lessons significantly enhanced learning outcomes, particularly among Chinese students. However, this approach requires collaboration among applied linguists, educational psychologists, textbook writers, and teachers, highlighting the need to include corpus literacy in teacher education programs. Similarly, Bhandari (2022) demonstrated that students engaged in collaborative writing produced higher-quality texts than those working individually, emphasizing the value of cooperative learning.

In science, student-centered approaches that integrate hands-on and minds-on activities have been shown to develop science process skills. Additionally, the integration of technology supports deeper engagement and understanding of scientific concepts (Gizaw and Sota, 2023).

Improving proficiency in key subjects such as reading, writing, mathematics, and science not only boosts academic performance but also enhances learners' critical thinking, problem-solving, and analytical skills. As proficiency increases, students gain confidence, motivation, and a greater capacity for lifelong learning. Furthermore, it empowers them to pursue higher education and future career opportunities, regardless of socioeconomic background. Proficiency development also supports emotional well-being and social growth, helping students navigate group dynamics and peer interactions effectively.

2.4. Engaging hands-on activities for elementary learners

Hands-on activities promote active learning by engaging students directly in the learning process. These activities support the development of both mental and physical skills through tasks such as solving puzzles, building models, drawing, mixing colors, or storytelling. A wide variety of hands-on activities are available online and can be adapted to suit learners' interests and proficiency levels.

Research by Yilmaz et al. (2024) found that hands-on science activities significantly increased children's motivation to engage in science. Notably, motivation levels improved consistently across genders, indicating the universal effectiveness of interactive learning experiences.

Similarly, Okeofu (2022) revealed that learners taught Cultural and Creative Arts through hands-on and mind-on activities achieved better results than those taught using traditional methods. This approach proved equally effective for both boys and

girls. The study recommends that both in-service and pre-service teachers be trained in the design and application of hands-on/mind-on strategies to better support student learning, particularly in subjects often overlooked in educational research.

In the present study, hands-on activities were drawn from the Department of Education's suggested curriculum and supplemented with online resources. These materials were adapted to incorporate local dialects as the medium of instruction, aligning with the goal of contextualized, learner-centered education.

2.5. Mother tongue-based

Recent debates among education experts in the Philippines have centered on the use of English as the medium of instruction in the science curriculum. Many attribute students' low achievement test scores to language barriers that hinder comprehension. Consequently, there is a growing advocacy for integrating local languages into science instruction to enhance understanding. Research supports this approach, showing that the use of local languages significantly improves the effectiveness of science teaching and learning (Zehlia, 2017).

3. Methodology

3.1. Research design

This study employed a one-group pretest-posttest research design using contextualized activity sheets in "Hiligaynon" to enhance the proficiency of science learners in the Province of Capiz, Philippines, during the school year 2023-2024. This contextualized activity sheet is from the suggestions of the DepEd and was improvised by the science teachers to see its effectiveness in teaching and learning science. There were a lot of studies conducted related to innovation, but none in the Province of Capiz; therefore, the researcher was motivated to engage in this research study. Also, one of the reasons for the research is that many of her students have very alarming performance in science. While purposive sampling enabled the researcher to target learners suited to the intervention, it also introduced sampling bias, as the sample may not be representative of the broader student population. This limits the generalizability of the findings beyond the immediate study context. Factors such as school location, teacher competency, and student demographics may have influenced the results and should be considered when interpreting the outcomes. In addition, to make the paper more relevant, qualitative parts were included using interviews and observation.

3.2. Research instrument

The research instrument was fifteen multiple-choice questions in English and translated into "Hiligaynon," taken from the less mastered areas in science. This instrument was gauged by 5 experts in science and was conducted to the same grade level, but from different schools located in the municipality, for validation. From the suggestions of the experts and results from validation, the instruments were improved.

The research utilized a researcher-made pretest and posttest to evaluate science proficiency. While the instrument was reviewed by content experts and pilot-tested with a small group of students for clarity and reliability, it may still be subject to instrument validity limitations. Specifically, there may be concerns related to content coverage, question difficulty, or alignment with national standards. Additionally, since the test was not standardized, direct comparison with other educational contexts is constrained.

To support the accuracy of findings, classroom observations and learner feedback were also gathered to triangulate data. However, subjective interpretation during observation may present a limitation, despite efforts to maintain consistency through a structured observation tool.

3.3. Respondents of the study

This study was conducted on sixty grade 3 learners who were enrolled in Hipona Elementary School, Hipona, Pontevedra, Capiz, Philippines, during the School Year (SY) 2023 - 2024. These respondents were selected because of the performance of the learners in science, and most of them have low grades.

In addition, three Grade 3 teachers from the same school were asked to participate in the study. They were asked to immerse themselves in the implementation of the program to gain a deeper understanding of how local dialects can be effectively used as a medium of instruction in the Science curriculum. These teachers contributed to the qualitative component of the research by providing insights based on their observations and experiences during the program implementation.

3.4. Procedures

The task of describing the parts and functions of the human body's sense organs (S3LT-IIa-b-1) emerged as one of the least mastered learning competencies, as evidenced by a pretest conducted in October 2023, where students achieved a mean percentage score (MPS) of only 35%. This situation is concerning, prompting the researcher to seek effective strategies to enhance students' proficiency in science.

The challenges of traditional education have been exacerbated by the ongoing pandemic, which has transitioned learning into modular and online formats. This shift has made collaborative and interactive teaching approaches more difficult to implement.

With current guidelines encouraging students to remain safely at home, it is essential for instructional methods to adapt to their needs. To support experiential learning, learners were provided with activities and experiments that could be conducted at home. Therefore, this study aims to facilitate these experiments under the supervision of parents, utilizing the researcher's contextualized science activity sheet. This approach significantly aided learners in gaining a better understanding of the various parts and functions of the human body's sense organs.

The medium of instruction in this "Hiligaynon." Science is usually taught in English, and all materials like books, activity sheets, and examinations are in English. However, not all learners use English in their daily communication. They only used the language during school days. One common problem is the learners' comprehension; many of them are scared to use English in class.

In this study, the researcher obtained approval from the District Supervisor to conduct research with grade three learners. Additionally, a letter was sent to the parents of the learners to inform them that their children would be participating in the study. The responses collected from the participants were handled with the highest level of confidentiality, prioritizing compliance with the Data Privacy Act and ensuring the trustworthiness of the research. The researcher also sought approval from the Education Program Supervisor (EPS) responsible for this subject area, the Senior Education Program Supervisor (SEPS) in charge of Research and Planning, and the Schools Division Superintendent.

Upon the approval of the concerned individual, she immediately gave the pretest to the selected respondents. Then, the researcher conducts a lesson on the less mastered lesson, introducing her innovations with the hands-on contextualized activity sheets for one month. After she finished the lesson, she immediately took the posttest.

These hands-on activities are taken from the suggested curriculum, textbooks, and the internet, which were relevant to the lesson selected for this research endeavor. The hands-on activities included card games (mixed 'n match), artwork, debates, sense organ exercises, a blindfolded obstacle course, and a taste-testing experiment. These activities were selected from the suggested curriculum, textbooks, and online resources to align with the lessons chosen for this research endeavor

3.5. Statistical analysis

The frequency count, percentages, and mean were used to determine the distribution of Grade 3 learners exposed to contextualized activity sheets. The mean was used to determine the level of achievement of the learners before and after they were exposed to contextualized activity sheets. At the same time, independent sample t-test was used to determine the difference between the pretest and the posttest of Grade 3 learners.

4. Results and discussion

4.1. Level of performance of learners in science during pretest and posttest

Table 1 shows the pretest-posttest results of the research study on contextualized activity sheets in local dialects on the different hands-on activities.

Table 1: Shows the level of learners' performance in science during pretest and posttest

	Mean	SD	Description
Pretest	2.38	.84556	Not proficient
Posttest	14.27	.73338	Highly proficient

1-4 (Not Proficient); 5-8 (Proficient); 9-12 (Very Proficient); 13-15 (Highly Proficient); SD: Standard deviation

The pretest results revealed a mean score of 2.38, which was interpreted as "Not Proficient." This indicated a limited grasp of scientific concepts and difficulties in independently applying their knowledge before utilizing the local dialect as the medium of instruction. However, following the implementation of contextualized activity sheets in the context of "Hiligaynon" featuring hands-on learning experiences, the posttest results demonstrate a remarkable development, with a mean score of 14.27, categorizing the learners as "Highly Proficient." This impressive increase suggests that the implementation of contextualized, experiential learning activities significantly enhanced students' understanding and application of scientific concepts. The results indicated that hands-on learning linking scientific principles to real-life experiences played a crucial role in fostering active engagement, deepening understanding, and boosting performance in science.

The relationship between innovation, language, and academic performance has garnered significant attention in educational research. As highlighted by Anwer (2019), the introduction of innovative teaching methods, tools, or technologies has been linked to substantial improvements in learner performance. This phenomenon can be attributed to various factors, such as increased engagement, personalized learning experiences, and enhanced access to resources. Innovations often provide diverse ways for learners to interact with content, catering to different learning styles and preferences, which can lead to a deeper understanding of materials and better retention of information.

Furthermore, the role of local languages in education cannot be overstated. According to Phiri et al. (2024), utilizing local languages in an academic setting contributes significantly to learners' performance. This assertion aligns with the notion that language is a crucial vehicle for understanding and expressing complex ideas. When learners are taught in a language in which they are fluent and culturally connected, they are likely to feel more confident and engaged in their studies. This approach not only supports cognitive development but also fosters a sense of identity and belonging, which is essential for motivation and academic

success. Moreover, research has shown that when learners understand the language of instruction, their ability to participate actively in the learning process increases. They are more inclined to ask questions, engage in discussions, and articulate their thoughts clearly. This active participation is fundamental for critical thinking and collaborative learning experiences, both of which are integral to the modern educational landscape.

Additionally, incorporating local languages into education systems creates an inclusive environment that respects and values learners' cultural backgrounds. This respect can lead to decreased dropout rates and increased persistence in academics, as learners feel that their heritage is appreciated and acknowledged. Consequently, this sense of belonging and recognition promotes a positive self-concept and enhances overall educational outcomes.

The integration of innovative teaching approaches and the use of local languages are both pivotal in enhancing learners' academic performance. The benefits of innovations are evident in improved engagement and access to resources, while the role of local languages facilitates understanding, engagement, and a stronger connection to cultural identity. Recognizing and implementing these elements within educational systems can lead to more inclusive, effective, and responsive teaching practices, ultimately fostering an environment where all learners can thrive.

4.2. Comparison of pretest-posttest results

Table 2 represents the significant difference between the pretest and posttest on the contextualized activities sheets in local dialects using hands-on activities.

Table 2: Differences between pretest and posttest results

	Paired Difference					t	df	Sig. (2-tailed)
	Mean	SD	Standard error mean	95% confidence interval of the difference				
				Lower	Upper			
Pair 1 pretest-posttest	-11.88	1.09	1.40	-12.16	-11.60	-84.40	59	.000

The statistical analysis yielded a significant value of p = .000 (2-tailed), indicating a highly significant difference in learners' Science proficiency before and after the intervention. This result strongly suggests that the observed improvement was not due to random variation but can be attributed to the intervention itself. Specifically, the use of contextualized activity sheets incorporating hands-on learning strategies significantly enhanced students' understanding and application of scientific concepts. These findings underscore the effectiveness of localized, experiential learning approaches in making science more engaging, relevant, and meaningful to learners, particularly in diverse educational contexts.

The results of the study highlight the significant impact of using contextualized activity sheets in the local language, alongside hands-on activities, on enhancing learners' scientific process skills. The findings indicate that implementing lessons through the Problem-Based Learning (PBL) Method, in conjunction with a Combined Method, effectively bolsters learners' engagement and comprehension. By integrating culturally relevant materials and facilitating experiential learning, learners can relate the content to their own experiences and actively participate in the learning process. This approach fosters critical thinking, problem-solving, and collaboration—key components of scientific process skills. Furthermore, using the local language in the activity sheets minimizes barriers to understanding, allowing learners to grasp complex concepts more readily. When learners can interact with the material in a familiar linguistic context, they are more likely to be motivated and invest effort in the learning activities (Kurt and Sezek, 2021). In summary, the findings underscore the importance of using contextualized resources and hands-on methods in education. The combined approach of PBL and practical activities not only enhances scientific skills but also promotes a deeper connection to the content, ultimately leading to a more effective learning experience for learners.

The result showed a significant difference between the pretest and posttest performance of learners who used contextualized learning activity sheets. Therefore, the Contextualized Learning Activity Sheets were effective.

4.3. Responses of grade 3 teachers on why local dialects are vital in the science curriculum

Based on the responses of the Grade 3 teachers, five themes were identified that highlight the importance of using contextualized activity sheets in the local dialect as part of the Science curriculum (Table 3). Overall, the use of contextualized activity sheets in the local dialect, combined with hands-on activities, offers numerous educational benefits. By emphasizing real-world applications, fostering critical thinking, enhancing student engagement, supporting diverse learning styles, and promoting collaborative learning, these methods contribute significantly to a more effective and meaningful educational experience. As educators continue to explore ways to improve instructional strategies, the findings of this study underscore the value of practical, interactive, and contextually relevant learning opportunities in the classroom.

The use of contextualized activity sheets in local languages, coupled with hands-on activities, represents a significant advancement in creating effective learning environments. A recent study by Gebre and Polman (2020) offered valuable insights into active contextualization, outlining key elements that can enhance educational practices.

Table 3: Different themes for the importance of local dialects in grade 3

Themes	Reasons
Significance of real-world application	Connect scientific concepts to real-world scenarios. Enhance understanding and retention of the materials. Science can be applied to everyday life.
Enrichment of critical thinking skills	Encourage students to analyze, evaluate, and apply information. Engage in context-rich events. Learn to think critically.
Promoting engagement and motivation	Increase learners' interest and motivation. Engage deeply with the instruments. Participate in classroom activities and discussions.
Support for diverse learning styles	Can cater to different types of learners. Engage in different formats such as visual, auditory, and kinesthetic elements. Help reach range learners. Make learning more accessible and effective.
Assistance in collaborative learning	Encourage collaboration among learners. Promote teamwork and communication skills. Learn from each other. Develop social skills and a sense of community within the classroom.

Active contextualization refers to the process of situating learning experiences within the learners' own cultural and linguistic contexts. By developing activity sheets that are tailored to the local language, educators can make content more relatable and accessible. This fosters a deeper understanding of the material, as learners can draw on their own experiences and knowledge while engaging with the content. Incorporating hands-on activities alongside these contextualized worksheets further amplifies the learning experience. These activities allow learners to apply theoretical concepts in practical, real-world situations, reinforcing their understanding and retention of information. For example, local studies, community projects, or culturally relevant problem-solving tasks not only engage students but also encourage collaboration, critical thinking, and creativity.

Moreover, utilizing local languages in educational materials can boost students' confidence and motivation. It validates their linguistic identity and helps bridge the gap between home and school language practices. This approach aligns with the principles of culturally responsive pedagogy, which seeks to honor and empower students' backgrounds.

In summary, the integration of contextualized activity sheets and hands-on activities in local languages is a powerful strategy for enhancing learning. By building on the findings from Gebre and Polman (2020), educators can foster more meaningful learning experiences that resonate with learners' lives and communities. Emphasizing active contextualization not only enriches the educational landscape but also prepares learners to navigate and contribute to an increasingly diverse world.

5. Conclusion

In conclusion, the results of the study display a substantial enhancement in learners' proficiency in science following their encounter with hands-on learning through contextualized activity sheets using local dialect. The significant difference observed between pretest and posttest scores indicates that the implemented intervention was both effective and efficient in enhancing learners' understanding of scientific concepts. These findings underscore the importance of providing diverse and engaging science activities to maintain learners' motivation and strengthen study habits. Additionally, it is crucial to supply appropriate instructional materials, such as activity sheets and workbooks, to further develop learners' proficiency in science. Moreover, fostering a collaborative relationship between parents and teachers is essential to support and facilitate students' learning experiences. Moving forward, integrating these strategies will be vital to sustaining and improving science education outcomes. The findings from the teachers' responses highlight the multifaceted value of local dialects in educational settings. The use of local dialects not only enhances real-world applications by making learning more relevant to learners' lives but also fosters critical thinking skills and encourages greater engagement and motivation among learners. Additionally, the incorporation of local dialects supports diverse learning styles, caters to the unique needs of all learners, and promotes collaborative learning experiences. Overall, integrating local dialects into the curriculum can significantly enrich the educational landscape, making it more inclusive and effective for a diverse learner population.

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Compliance with ethical standards

Ethical considerations

The identities of all respondents were kept strictly confidential to protect their privacy.

Informed consent was obtained from parents or guardians through the distribution of consent forms, clearly explaining the purpose of the study and the involvement of their children. Participation was voluntary, and respondents were assured that they could withdraw from the study at any time without any negative consequences.

Conflict of interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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