

“Perceptions and Experiences of Teachers and Students Using Alternative and Local Materials in Science Education of Laguna State Polytechnic University San Pablo City Campus, Laguna”

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Abstract

This study explores how teachers and students interact when using alternative and local materials in science education in Laguna State Polytechnic University – San Pablo City Campus. The study seeks to clarify the actual experiences, viewpoints, difficulties, and advantages faced by educators and students while incorporating alternative resources in science classes. Discoveries demonstrate a complex story, highlighting the interconnectedness of teaching methods, access to resources, cultural significance, and student involvement. Educators had different reasons for using alternative and local materials, such as encouraging curiosity and critical thinking, as well as supporting environmental sustainability and cultural understanding. Nevertheless, they also faced difficulties involving the access to resources, matching the curriculum, and receiving pedagogical assistance. Likewise, students displayed varied reactions to the utilization of different materials, with numerous showing increased curiosity, better comprehension, and a stronger bond to their environment. However, a few students encountered initial pushback or doubt, emphasizing the significance of clear communication and providing context. This research highlights the importance of recognizing and appreciating the real-life experiences of teachers and students in influencing science education practices. It offers valuable information for teachers, curriculum designers, and decision-makers to enhance the incorporation of alternative and local resources, promoting diverse, culturally relevant, and stimulating science education settings.

Keywords: alternative materials; local materials; perception and experience; professional development; science education; student engagement

INTRODUCTION

In the dynamic landscape of science education, the incorporation of alternative laboratory methods and local materials stands as a transformative approach. This shift not only reflects a departure from traditional teaching practices but also underscores the profound impact on the lived experiences of both teachers and students within the realm of science classrooms.

As educators navigate the complexities of instructing scientific principles, the utilization of alternative laboratory materials provides a unique lens through which teachers can immerse students in hands-on, culturally resonant learning. This departure from conventional resources not only challenges educators to explore innovative teaching methodologies but also compels them to adapt curriculum to local contexts, fostering a dynamic and interactive pedagogical environment.

Simultaneously, for students, this approach redefines their relationship with science. The integration of indigenous materials offers a bridge between scientific concepts and their lived experiences, forging a connection between the academic realm and their cultural heritage. This shift has the potential to kindle a profound sense of curiosity, critical thinking, and problem-solving skills as students engage with science in a manner that is not only academically rigorous but also personally relevant.

In essence, the incorporation of alternative laboratory and local materials in science classes represents a departure from conventional norms, offering a gateway to a more inclusive and culturally embedded scientific education. This introduction sets the stage for exploring the multifaceted impact on both teachers and students as they embark on a journey of discovery within the realm of science education. The integration of alternative laboratory and local materials in Science classes offers a unique opportunity for both teachers and students to engage in hands-on, culturally relevant learning experiences. Teachers, through this approach, can leverage local resources to contextualize scientific concepts, fostering a deeper understanding among students.

For teachers, incorporating alternative materials provides a chance to adapt curriculum to local contexts, making science more relatable and meaningful. This approach can enhance their pedagogical skills by encouraging creativity and resourcefulness in lesson planning, contributing to a dynamic and interactive classroom environment.

On the student side, using local materials promotes a sense of connection to their local community while learning scientific principles. This method encourages curiosity, critical thinking, and problem-solving skills as students navigate real-world applications of scientific concepts using materials familiar to them.

Traditional science teaching often relies on standardized laboratory equipment and materials, which may not always resonate with the diverse backgrounds and local contexts of students. Recognizing the need for a more inclusive and contextually relevant approach, educators have increasingly explored the integration of alternative laboratory methods and local materials in science instruction. This shift is motivated by a desire to bridge the gap between academic content and the lived experiences of students, creating a more engaging and meaningful learning environment.

Furthermore, the study recognizes the scarcity of research in this specific area, highlighting the importance of investigating the actual experiences of teachers and students as they navigate this innovative pedagogical approach. By understanding these lived experiences, the study aims to contribute valuable insights that can inform and enhance science education practices, fostering a more inclusive and effective learning environment.

Overall, the use of alternative laboratory and local materials in Science classes not only enriches the educational experience by making it more inclusive but also empowers both teachers and students to explore science through the lens of their lived experiences.

THEORETICAL UNDERPINNINGS

The study exploring the lived experience of teachers and students in the use of alternative and indigenous materials in Science classes could draw from phenomenology and cultural-historical activity theory. Phenomenology allows an in-depth exploration of individuals' subjective experiences, capturing the essence of their encounters with alternative materials. Cultural-historical activity theory provides a lens to examine the socio-cultural context influencing teaching and learning practices, considering how indigenous materials intersect with the cultural backgrounds of both teachers and students. Together, these frameworks can illuminate the complexities and nuances inherent in this educational context.

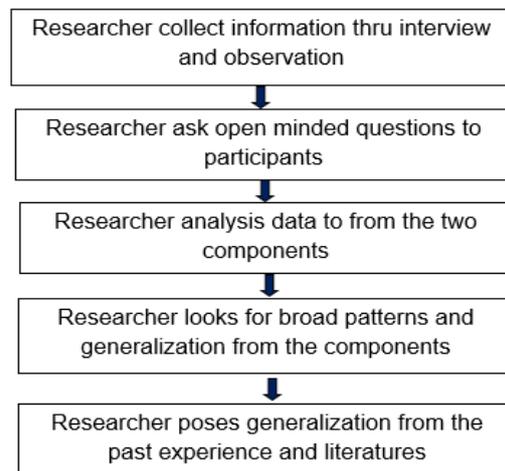


Figure 1. *Research Generalization Theory Model*

CENTRAL PROBLEM AND COROLLARY QUESTIONS

Specifically, the goal of this study is to answer the following questions:

1. What is the essence of teachers' and students' perception and experience on understanding scientific concepts and their overall engagement and its integration to alternative laboratory and indigenous materials in Science classes?
2. How do teachers and students describe their most significant experience with regards to the utilization of alternative laboratory and indigenous materials in teaching and learning of Science?
3. What interpretation may be formulated based on the significant experiences of teachers and students in terms of cultural backgrounds, integration of indigenous materials, pedagogical strategies, challenges and opportunities, and community involvement?
4. What themes emerged and potential implication on the formulated meanings from the teachers' and students' perceptions of their learning experiences, curriculum development and educational policy?

SCOPE AND LIMITATIONS OF THE STUDY

The focus of this study is on the collection of insights from the perception and experiences of teachers and students in the use of alternative laboratory and indigenous materials in Science classes of Laguna State Polytechnic University San Pablo City Campus.

The co-researchers of the study will include Bachelor of Science in Biology teachers and students, who have previous experience on the use of alternative laboratory and indigenous materials. Furthermore, the connection or relationship which has ended in experienced students and teachers.

Each participant will be interviewed about their experiences regarding the matter. Data collection will begin once the proposed study has been approved. The collection period may last between 2 to 3 months, depending on the availability of participants.

SIGNIFICANCE OF THE STUDY

The study's significance lies in its potential to inform educational practices, enhance the quality of science education, and contribute to the broader goal of creating culturally inclusive and effective learning environments for both teachers and students.

Community Collaboration. Exploring the involvement of local communities in the selection and integration of indigenous materials highlights the potential for community collaboration in education. This can strengthen ties between schools and communities, fostering a more inclusive and community-centered educational environment.

Cultural Relevance in Education. Examining how alternative and indigenous materials are integrated allows for a better understanding of how educational practices align with the cultural backgrounds of both teachers and students. This promotes culturally relevant teaching approaches.

Enhanced Teaching Strategies. Identify effective teaching strategies employed by teachers when incorporating these materials. This insight can contribute to the development of best practices for utilizing alternative resources in science education.

Equity in Education. Analyzing challenges related to resource accessibility sheds light on potential disparities in accessing alternative and indigenous materials. This information is crucial for addressing equity issues in education and ensuring that all students have equal opportunities to benefit from diverse learning resources.

Improved Learning Outcomes. Understanding the correlation between the use of alternative materials and student learning outcomes helps in evaluating the effectiveness of such methods. This information is crucial for curriculum development and improvement.

Socio-Cultural Context Considerations. Recognizing the influence of the broader socio-cultural context on teaching and learning experiences provides a comprehensive perspective. This awareness is essential for educators, policymakers, and curriculum developers to create inclusive and culturally responsive educational practices.

Student Engagement and Motivation. Investigating the impact on student engagement and motivation can reveal the effectiveness of using alternative and indigenous materials in Science classes. This knowledge can inform educators on how to create more stimulating and captivating learning experiences.

Teacher Professional Development. Identifying the impact of professional development on teachers' confidence and competence in using alternative materials can guide future training programs. This can lead to more targeted and effective professional development initiatives for educators.

METHODOLOGY

The procedures will be presented in the following sections: research design, selection of co-participants, generation of data, interview schedule, ethical consideration, data transcription and qualitative data analysis.

The present study will adopt a qualitative, phenomenological research design. A qualitative method of research is known as “the study of the nature of phenomena”, where we learn more about the quality of phenomena, their manifestations, how people perceive them, and how they appear to us (Busetto et al., 2022).

According to Aspers & Corte (2019), a qualitative method of research entails of studying various issues through methods such as interviews or in-depth analysis while concentrating on meanings and motivations, usually found within phenomena, experiences, and understandings of the world. Qualitative research allows for “inquiry from the inside” which allows a researcher to portray a concept as a whole and find meaning through idiosyncrasies by using an inductive method of collection where the data speaks for itself (Ospina, 2004)

The co-researchers of the present study will involve Bachelor of Science in Biology teachers and students of Laguna State Polytechnic University San Pablo City Campus.

ETHICAL CONSIDERATION

The present study will explore the experiences of teachers and students in the use of alternative laboratory and indigenous materials in Science classes. The co-researchers will be asked to participate in an interview where their lived experiences of teachers and students in the use of alternative laboratory and indigenous materials in Science classes.

Before the interview takes place, a request for the co-researchers' permission will be forwarded, along with the informed consent form. The nature of the study will be fully explained to the co-researchers during the orientation.

The co-researchers' participation in the study is entirely voluntary and may withdraw at any time he or she wishes. Furthermore, the co-researchers will not receive any compensation for participating in the study.

The interviews will be conducted in a privately in the researcher's residence, and the interview will be recorded. During the transcribing of interviews, all personal data and identifying information will be treated with utmost confidentiality. However, the information gathered from the study may be only used for research presentations and publications.

FINDINGS AND DISCUSSION

The result and discussion of the data gathered and aim to unravel the perception and experience of teachers and students in the use of alternative and local materials in science classes based on the themes asked to the participants.

TEACHER

Theme 1. *Cultural Background*

How does your cultural background influence your teaching approach in Science classes?

The cultural background of teachers significantly shapes their approaches to incorporating alternative and local materials in science classes. By recognizing and valuing teachers' cultural perspectives and experiences, educational institutions can support them in creating enriching and culturally responsive science education experiences for all students. All the participants in this study emphasizes that "It affects my teaching strategies inside the classroom on how to help students understand the lesson" and "Easier communication"

Theme 2. *Integration of Indigenous Materials*

a. To what extent do you incorporate alternative and local materials in your Science lessons?

The integration of Indigenous materials into science classes transforms the lived experience of teachers by fostering cultural relevance, pedagogical innovation, cultural competence, community collaboration, and environmental stewardship. By embracing local perspectives and knowledge systems, educators can create inclusive and culturally responsive learning environments that empower students to connect with science in meaningful and holistic ways. Participants of this theme answered that "Haven't use

local materials yet, but can make use of them if no materials needed won't be available in the lab." Other participants stated that "Being a resourceful teacher, I use it as alternative materials for our experiment." "Native local materials as long as useful for the experiment."

Theme 3. *Pedagogical Strategies*

- a. Describe the teaching strategies you employ when using alternative materials. How do you adapt your pedagogical approach to align with the cultural context of your students?

"Through demonstration, maybe." "Interactive teaching strategies to help my students explore the lesson." "Make use of materials familiar to them." "I'm always assuring the learning outcomes of the students every lesson I teach based on cultural context. yes" Integrating different pedagogical strategies into science classes transforms teachers' lived experiences by nurturing creativity, relevance, cultural sensitivity, and community engagement (Marosi, N, et al, 2021). By embracing alternative and local materials and the pedagogical approaches that accompany them, teachers create dynamic and enriching learning environments that empower students to explore, question, and connect with the world around them.

Theme 4. *Professional Development*

- a. Have you received any training or professional development related to integrating alternative and indigenous materials? How has professional development influenced your confidence and competence in using these materials?

"Even if there was no training yet, I may be competent enough to make use of those materials, since I have knowledge on concepts/principles to be discussed." "I developed my confidence being resourceful in every way." participants answered. Thus, professional development plays a vital role in enhancing the lived experience of teachers in the use of alternative and local materials in science classes. By providing teachers with the knowledge, skills, and support they need to effectively integrate these materials, professional development empowers teachers to create culturally responsive, engaging, and meaningful learning experiences for their students.

Theme 5. *Challenges and Opportunities*

- a. Identify challenges faced when incorporating alternative and local materials. Discuss any positive outcomes or opportunities you have observed in relation to student engagement and learning.

While teachers may face challenges in integrating alternative and local materials into science classes, there are significant opportunities for enhancing cultural relevance, community collaboration, environmental awareness, and cultural competence. By addressing these challenges and leveraging these opportunities, teachers can create enriching and meaningful learning experiences that empower students to connect with science in diverse and culturally responsive ways. Co-researchers answered "Acceptability." "The lack of availability of indigenous materials inside the school." "In case local materials are to be used, I think students would have the same learnings, though some may be a bit disappointed because they may be expecting much from a university." "They engaged more in our lesson."

Theme 6. *Community Involvement*

- a. How do you involve local communities in the selection and integration of local materials? What role do community collaborations play in enhancing the authenticity of your teaching practices?

Co-researchers stated that “Local community may be asked on their experience with the use of the material in their everyday lives.” “If the lesson is relevant to the community.” “Their experiences would make a good contribution in my teaching practices.” “If the community can be involved in the teaching practices to enhance the learning.” Therefore, community involvement plays a pivotal role in shaping the lived experience of teachers in the use of alternative and local materials in science classes. By engaging with local communities, teachers enrich their science instruction, promote cultural relevance and authenticity, foster environmental stewardship, and strengthen partnerships that benefit students and the community as a whole.

STUDENTS

Theme 1. *Learning Experiences*

- a. Share your experiences with Science classes. How do you feel about the use of alternative and local materials in your Science lessons?

The use of alternative and local materials in science classes enriches students' learning experiences by promoting cultural relevance, hands-on exploration, environmental awareness, community engagement, and critical inquiry. By incorporating materials that reflect students' cultural backgrounds and local environment, educators create inclusive and meaningful learning environments that empower students to connect with science in authentic and transformative ways. Participants responded “To be honest, it is difficult subject for me but at the same time, enjoyable (especially with group activities).” “I love science ever since in grade school, it so much fun and fascinating. My idea of science is much more closed to the everyday world, that is, I see science as something developed for the real everyday world. As a student I believe they I could be more interested in science if they could see and relate science in this way.” “My experience in science classes were fun and exciting.” “Interesting topics.” “Science classes teach me more than just facts, they make me a better problem solver and a critical thinker. I learn to ask questions, test ideas, and come up with our own explanations. Plus, understanding science helps me make sense of the world around us, from the best way to bake a cake to the weird weather patterns, everything under science in a fun and more interesting way to explore more. “

Furthermore, participants reacted about how they feel about using alternative and local materials used in Science lesson “If it is applicable and can be used to understand the lesson more, then I would like to use it, especially if the materials can be found locally. It is better if it is something that is cheap or has no need to be bought.” “I am not so much familiar in alternative and local materials for Science lessons but I think it is more using of local materials and resources that are common in Philippines.” “I feel like it is important because local materials are easily found just outside our homes and at school and is cheaper than buying materials that are found in shops.” “Happy because there are other ways to learn that could be exciting.” “Based on my experience, finding alternative way to find an apparatus during pandemic make me find myself to me a resourcefulness. Alternative and local materials in science lessons boost engagement by sparking curiosity

and connecting science to me as a students' cultures and environments. It promotes sustainability and demonstrate real-world applications of science concepts, by the use of alternative and indigenous materials in science it boosts my engagement to spark my curiosity.”

Theme 2. *Engagement and Motivation*

- a. Reflect on your level of engagement and motivation when alternative materials are used.

The integration of alternative and local materials in science classes enhances the engagement and motivation of students by providing culturally relevant, hands-on, and authentic learning experiences. By tapping into students' interests, identities, and communities, educators create learning environments that inspire curiosity, foster intrinsic motivation, and empower students to become active participants in their own learning journey. Participants stated that “It should be enjoyable, and I think I can even share the lessons and activities I learned with others. If it is exciting, then I would really want to participate more to the lesson.” “I think it is more valuable as Filipino which we use a local material and can be promoted.” “I am more engaged when materials are used in teaching.” “I become more curious.” “In term of level of engagement by the use of alternative materials in science ignite curiosity and make learning relevant to me as a student, and keep my curiosity and boosting engagement and motivation by the used of these alternative materials in experiment in the comfort of our house.”

Provide examples of activities or materials that particularly captured your interest. Participants emphasis differently in using alternative and local materials. "The egg drop challenge and using things you can only find inside your classroom or your surroundings. We also compete with other groups to see who's eggs last longer." “Another one is hiding a treasure and making a treasure map you will give to the other group. (The treasure is theirs).” “I think the research that particularly utilize local materials in specific area such as in San Pablo that rich in Coconut Trees.” “Hands on demonstrations.” “I used plastic container as alternative to Petri dish.”

Theme 3. *Understanding of Scientific Concepts*

- a. How has the use of alternative and indigenous materials contributed to your understanding of scientific concepts?

Co-researcher elaborated that “Science is a difficult subject, especially for people who don't have any interest in it, so for those students to understand scientific concepts, teachers have important strategies they use to do and that is to make the lesson more exciting, competitive, and fun. As alternative and local materials can be found easily and locally at the same time, cheaply or at no cost at all, they can also easily do more activities and experiments related to them. For me, it really made me participate more, become more familiar with, and understand the lesson more as it became part of an exciting memory that I can look up to.” “This time the science is not just discover the unique indigenous materials in specific area but also endorse and help the economy.” “I rarely encountered use of local materials but I prefer learning with these because it makes learning easier and fun.” “Not that intimidated by hard concepts.” “Alternative and local materials offer unique properties, inspire tools, hold traditional knowledge, and provide new perspectives, all of which contribute to a richer understanding of science.”

The use of alternative and local materials in science classes enhances students' understanding of scientific concepts by providing concrete experiences, contextualized learning opportunities, interdisciplinary connections, critical thinking skills, and exposure to diverse cultural perspectives. By incorporating materials that resonate with students' interests, identities, and communities, educators create enriching learning environments that promote deep learning and meaningful engagement with science.

Participants also share specific instances where these materials facilitated your learning. "There are materials or science concepts that we can use in our daily lives or things we have an interest in; this facilitates my learning. For example, a scientific concept and local materials that will help me survive in the wilderness gained my attention and focus. Or those that I think I can use as a bonding activity for my families or friends." "Localized instructional materials need local materials such as plants and other supplementary materials. Thus, exposing learners to more suitable environment by providing them authentic or real materials whereas plants and animals are available and easily found in the surroundings. Likewise, the use of microscopy for viewing small live specimen samples are also used for learning process." "In our research we used materials and ingredients found near our homes and it helped us understand the importance and even the advantages of using such materials." "By finding other ways of teaching or learning, we may learn to appreciate concepts that we thought are impossible to learn." "I think there is no specific, in terms of learning, because everything under this makes it more learning on every scenario."

Theme 4. *Community Influence*

- a. Do you notice connections between the local materials used and your local community? How does community involvement impact your perception of Science education?

The influence of the community on students' lived experience in the use of alternative and local materials in science classes is transformative. By engaging with their local environment, culture, and community, students develop a deeper understanding of scientific concepts, a stronger connection to their cultural identity, and a sense of responsibility towards environmental stewardship and community engagement. Wherein all of the participants believed and answered "Yes." "I think yes." "Yes, the use of materials that are recycled and found near our homes are being used both at school and at our community." "Some." "For me, in some point yes, there is a connection between the use of alternative used of apparatus."

In further information's shared by the co-researcher "Just like how the support of the parents motivates a child, with the involvement of more people and even my community, it motivates me to learn more and even improve my overall quality of education and perception of science." "It helps encourages creativity and reduction, recycling and reuse of litter that are environmentally friendly." "Community involvement helps us to feel connected with others through shared interests and ideals which in turn makes learning and creating solutions to different problems more fun and exciting." "It can become more meaningful because practical applications could be introduced to us." "As a student and educator as well, the impact of science education in our community is not common for everyone."

Theme 5. *Resource Accessibility*

- a. Are there challenges related to the availability of alternative and local materials?

Resource accessibility significantly impacts the lived experience of students in the use of alternative and local materials in science classes. Here's how the participants response “Yes. Some local materials can also cost you if you don't have it. -(Financially).” “I think it depends on availability of local materials, there are some seasonal but overall, I would say that it is economic cost and environmentally friendly.” “There are plenty of indigenous materials that are easily accessible at poor communities. I don't think that it is much of a challenge.” “Yes, Yes, because not all are suitable for alternative tools because there is such more specific function for used. “

Ensuring equitable access to alternative and local materials is essential for promoting inclusive, culturally responsive, and engaging science education experiences for all students. By addressing barriers to resource accessibility and leveraging community partnerships, educators can provide students with meaningful opportunities for hands-on learning, cultural connection, and scientific exploration.

Participants also response on how challenges affect in learning experience? “Not that tough as I can still have sufficient to bear those resources not sustainable locally.” “As a student in rural area, it seems to be a solution not a challenge.” “Challenges are fun and it helps me learn and have an objective or goal to reach which in turn improves my mental ability.” “It could hinder them.” “In terms of learning, it's for me to acquire new idea by do researching. So that I could have prior knowledge.”

Theme 6. *Socio-Cultural Context*

- a. In what ways does the socio-cultural context influence your experiences in Science classes?

The socio-cultural context profoundly influences the perception and experience of students in the use of alternative and local materials in science classes. Here's how the co-researchers' responses “It can interfere and influence me in learning especially as some science concepts are against some Filipino cultures, beliefs and practices. Some can't accept it easily.” “As I experience, need an adjustment and process to learn.” “It is fun to be with people with different beliefs and norms. I can learn a lot from them as well as I can share my own experiences.” “Science concepts are better understood when put in the context of the real world.” “Socio-cultural context plays a big role in shaping our experiences in science classes. Especially as an educator in teaching science subjects.”

Understanding the socio-cultural context is essential for creating meaningful and inclusive learning experiences with alternative and local materials in science classes. By acknowledging students' cultural backgrounds, community connections, linguistic diversity, and perspectives on science, educators can design learning experiences that honor students' identities, promote cultural relevance, and foster deeper engagement in science education.

Participants of the study share any cultural elements in the curriculum that find particularly meaningful. “Just from the title itself, I find it meaningful that just to increase the overall quality and perception of science education, educators use alternative and indigenous materials. It is really a great help to the students and even to the society as they can use what they learned to help or influence the community for a better. It's also not against Filipino cultures.” “There are no specific circumstances.” “I can't think of any socio-cultural elements that I encountered in our science subjects.” “Concepts seen in the real world.” “Real-world applications that connect scientific concepts to educational procedures, customs, or environmental issues make science more accessible and interesting. specially on today's generation we must be more aware of how science provide facts and more knowledge.”

In general, the use of alternative and local materials in science classes enriches the lived experience of both teachers and students by promoting cultural relevance, community collaboration, equity, cultural sensitivity, and authentic learning experiences. By integrating alternative and local materials into science instruction, educators create inclusive and meaningful learning environments that empower students to connect with science in diverse and transformative ways.

CONCLUSION

In conclusion, the exploration of the perception and experiences of teachers and students in the utilization of alternative and local materials within science classes reveals a nuanced landscape shaped by various factors including pedagogical practices, resource accessibility, community relevance, and student engagement.

Teachers play a crucial role in this narrative, with a variety of reasons driving them to use different materials, from new teaching methods to conserving local resources. Their experiences highlight the significance of continuous professional growth, support from institutions, and working together within educational community to address difficulties like limited resources and aligning curriculums.

However, students show a range of responses towards the incorporation of alternative materials, which is influenced by their unique backgrounds, interests, and learning preferences. Although a majority of students show more involvement, better comprehension, and greater curiosity as a result of these methods, a few students may initially push back or doubt them. Therefore, promoting open communication, offering relevant background information, and empowering student autonomy are vital components in enabling successful integration.

Educators can empower students to explore, question, and connect with the world around them by utilizing a variety of lived experiences and tapping into the possibilities of alternative and local materials, leading to more inclusive and culturally responsive learning environments. This highlights the importance of continuous research, collaboration and creativity for further science education towards equity and environmental sustainability.

RECOMMENDATIONS

Based on the findings and conclusions drawn from the exploration of the perception and experiences of teachers and students in the use of alternative and local materials in science classes.

1. Educational institutions need to focus on creating and executing professional development programs that help teachers incorporate alternative and local materials into science curriculum by providing them with essential knowledge, skills, and resources. These programs need to focus on teaching methods, understanding different cultures, and promoting sustainable practices.

2. Curriculum developers and educators should work together to modify current science curriculum to include alternative and local materials more effectively. This could include recognizing appropriate local resources, creating inquiry-based tasks, and connecting curriculum standards with cultural backgrounds and community requirements. Steps need to be taken to enhance the accessibility and availability of different and nearby resources for teachers, especially those working in low-income areas. This could involve forming alliances with community groups, offering financial assistance, and creating connections for sharing and exchanging resources.

3. Schools need to collaborate with local communities, Indigenous knowledge holders, and cultural institutions to develop science education experiences that are culturally appropriate and inclusive. This could entail bringing in guest speakers, planning field trips, and integrating community-based projects into the curriculum.

4. Educators must motivate students to engage actively in their learning by promoting inquiry, exploration, and critical reflection. Offering chances for students to lead investigations, engage in project-based learning, and collaborate with peers can improve student engagement and encourage ownership of their learning.

5. More study is required to investigate how incorporating different and nearby resources affects students' academic achievements, attitudes towards science, and commitment to protecting the environment in the long run. Frameworks for evaluation need to be created to evaluate how well these approaches work and can be maintained in various educational settings.

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