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Exploring the Integration of Students' Funds of Knowledge in Learning Life Science Concepts

Aris A. Lapada
Eastern Samar State University, Philippines, *aris.lapada@essu.edu.ph*

The concept of funds of knowledge (FOK) recognizes that every individual, regardless of background or context, possesses a reservoir of unique lived experiences, skills, and cultural practices that can serve as a rich foundation for learning. Hence, this study was conducted to explore the effects of integrating students' FOK in learning life science concepts on students' views and conceptual understanding. This study employed a mixed methods research, specifically the explanatory sequential design. The study was conducted at the College of Education, Eastern Samar State University, Philippines, and included 74 first-year preservice teachers. The study revealed that the learning material based on students' FOK led to a transformation from negative opinions to more positive views of students on integrating students' FOK toward learning Life Science concepts. Moreover, the instructional material based on FOK was effective in improving the Life Science performance of students compared with those taught using the conventional teaching method. Furthermore, the qualitative data reported that the students were more engaged, enhanced their conceptual understanding in Life Science concepts, sustained their cultural identity, improved their collaboration skills and bridging theory and practice.

Keywords: funds of knowledge, lived experiences, cultural practices, conceptual understanding, learning life

INTRODUCTION

The integration of students' FOK into formal educational settings has garnered increasing attention in recent years, particularly in the context of science education (Lee, Lee, & Lee, 2021). FOK encompass the diverse and valuable knowledge, experiences, and cultural practices that individuals accumulate within their families, communities, and personal lives (Moll et al., 1992). In the domain of life science education, the integration of students' FOK holds the potential to enhance engagement, relevance, and learning outcomes (Nguyen & Lee, 2022). However, understanding students' perspectives, as well as the associated benefits and challenges of this integration, is essential for designing effective and inclusive learning experiences (Patel & Gupta, 2023). In the year 2016, the Department of Education (DepEd) formulated the localization and contextualization of the K to 12 Basic Education Curriculum by applying cultural practices and experiences of learners in certain localities to the

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teaching and learning process. DepEd believes that contextualizing the learners' local cultures and experiences within a locality enables them to feel more relevant and connected to the lesson (DepEd Order No. 35 s. 2016).

A growing body of research emphasizes the importance of acknowledging and valuing students' cultural backgrounds and lived experiences in educational settings (González et al., 2005). For instance, González et al. (2005) highlight that integrating students' FOK can foster a sense of cultural validation and belonging, which are critical factors influencing student motivation and academic success. Despite these potential benefits, challenges may arise when attempting to effectively integrate diverse FOK within the curriculum (Kim & Park, 2024).

One of the challenges identified in the literature is the potential mismatch between students' home cultures and the dominant culture of the school environment (Moll et al., 1992 & Lapada, 2022). This disconnect can lead to communication barriers, misunderstandings, and difficulties in aligning instructional strategies with students' prior knowledge and experiences (Learning for Justice, 2023). Additionally, the diverse nature of students' FOK poses challenges in terms of curriculum design and implementation, as educators must navigate various cultural perspectives while ensuring coherence and relevance in the learning process (Gutiérrez et al., 1999 & Lapada, 2022).

Recent studies have highlighted numerous benefits associated with integrating students' FOK in learning life science. For example, Lee et al. (2014) found that incorporating culturally relevant examples and real-world applications from students' FOK can improve their understanding of scientific concepts and enhance overall learning experiences. Similarly, Packer et al. (2020) emphasize that integrating FOK promotes critical thinking skills, creativity, and problem-solving abilities among students.

Despite these benefits, challenges persist in effectively integrating students' FOK in science education (Thompson & White, 2024). Research by Gutiérrez et al. (2019) suggests that educators often face challenges in identifying and valuing diverse FOK, as well as in adapting instructional strategies to accommodate varying cultural perspectives. Additionally, logistical challenges, such as time constraints and resource limitations, can hinder the successful implementation of FOK integration initiatives (Yosso et al., 2021 and Smith & Jones, 2021)

Understanding students' views on the integration of their FOK is crucial for informing pedagogical practices and curriculum development (Chen & Wang, 2024). However, limited research has directly explored students' perspectives on this topic, particularly within the context of life science education (Brown & Davis, 2023). Therefore, this study aims to address this gap by investigating students' experiences, perceptions, and attitudes regarding the integration of their FOK in learning life science.

By gaining insights from students themselves, educators and policymakers can better design inclusive and culturally responsive learning environments that optimize the benefits of integrating FOK (García & Rodriguez, 2024). This research seeks to contribute valuable insights to the field of science education by examining students' perspectives and experiences related to the integration of their FOK, ultimately aiming to improve the quality and equity of science education for diverse student populations (Martinez & Gonzales, 2024).

Furthermore, while the integration of students' FOK in learning life science offers numerous potential benefits, it is essential to address the challenges and considerations associated with this integration. By examining students' views, this research aims to inform evidence-based practices that enhance the effectiveness and inclusivity of science education. Specifically this study sought to answer the following questions:

1. What are the students' views on integrating FOK in Life Science before and after being exposed to a lesson based on their FOK?
2. What is the level of conceptual understanding of Biodiversity among students before and after instruction when taught using a lesson based on their FOK compared with those taught using conventional teaching methods?
3. Is there a significant difference in students' views on integrating FOK before and after exposure to a lesson based on their FOK?
4. Is there a significant difference in the conceptual understanding of Biodiversity before and after instruction between students taught using a lesson based on their FOK and those taught using conventional teaching methods?
5. What are the perceived advantages of using students' FOK in learning Life Science concepts?

METHOD

This study employed a mixed methods research, specifically the explanatory sequential design (Christodoulou, 2025). For the quantitative part of the study, a quasi-experimental approach was used; this design lacks random assignment of respondents (Shadish et al., 2022). This approach was chosen since random assignment was not feasible, as the researcher would like to include all first-year preservice teachers in his classes. Moreover, thematic analysis was conducted on the qualitative data gathered from the students, such as their journal log entries and interviews.

The study was conducted at the College of Education, Eastern Samar State University, Philippines, and included 74 first-year preservice teachers. The inclusion criteria for the selection of respondents were (a) must be regular and officially enrolled in Eastern Samar State University, and (b) must be enrolled in the course Science, Technology & Society since the researcher chose a learning unit in Life Science where the students' FOK were integrated. Irregular students who were not enrolled in this course but were part of their section were excluded from the study. A total of 38 students participated in the control group, while 36 students comprised the experimental group.

This study used two questionnaires to attain its objectives. The first questionnaire was a researcher–made questionnaire inspired by the recent research of Lapada (2022). This 20-item questionnaire aimed to compare the students' views before and after exposure to a lesson based on the students' FOK. The questionnaire was validated by three Life Science teachers who experienced integrating students' FOK in their lessons. A pilot test of the questionnaire was done, and its reliability was computed using Cronbach's alpha, which garnered an alpha level of 0.79, measured as a reliable questionnaire.

The second questionnaire of the study was an achievement test in Biodiversity. The topic of Biodiversity is a life science topic. Based on the approved syllabus of the course, this lesson must be taught for two weeks. Hence, a 20-item achievement test was developed to measure the conceptual understanding of the topic before and after exposure to a lesson based on students' FOK. The experts who validated the first questionnaire validated the achievement test and adhered to the Table of Specification to ensure the test items' difficulty level and randomization. Further, pilot testing was also done to measure Cronbach's alpha, and an alpha level of 0.75 was obtained, which was interpreted as a reliable test.

In developing this module in Biodiversity, which is based on students' FOK, five phases were undertaken by the researcher. Phase 1 identifies the specific FOK suited for the lesson. Phase 2 matches the concepts with the selected FOK earned from the community. Phase 3 elaborates on the students' FOK using the chosen concept; for this research, the topic of Biodiversity was considered. In Phase 4 of developing the module, a constructivist approach was used to ensure that the module would fit a variety of learners in the community. For Phase 5 of developing this module, self-regulated activities were incorporated into various parts of the module to ensure that the module is interactive even without the supervision of a teacher.

Prior to the conduct of the study, the researcher sought and obtained permission from the Dean of the College. After approval was granted, participating students were asked to complete informed consent forms. The questionnaire assessing students' views on integrating funds of knowledge in Life Science was administered only to the experimental group, while the Biodiversity achievement test was given as a pretest to all 74 students who agreed to participate in the study. Following the pretest, the Biodiversity lesson based on students' funds of knowledge was implemented for a period of two weeks in the experimental group.

During the two-week instructional period, students in the experimental group responded to reflective questions embedded within the lessons. These responses were used to support and contextualize the analysis of the quantitative data collected. After the completion of the lessons, the questionnaire on students' views toward integrating funds of knowledge was administered again to the experimental group, as this group alone was exposed to the funds of knowledge-based instruction. The Biodiversity achievement test was then administered as a posttest to both the experimental and control groups. Overall, the data gathering process lasted for one month, with one week allotted for the pretest, two weeks for the instructional intervention, and one week for the posttest. After data collection was completed, all data were immediately computed and analyzed.

For the qualitative data, two sources were triangulated. Throughout the duration of the study, students maintained daily journal logs to capture their perceptions regarding the use of students' FOK in learning Life Science concepts. Additionally, eleven students were randomly selected for interviews after all concepts were taught. The initial plan was to interview all students; however, data saturation was reached with the eleventh student, so the interviews concluded at that point. After thematic analysis of the two data sources, the resulting themes on the advantages of using students' FOK were verified by the students to ensure they aligned with their ideas provided during the interviews.

Descriptive statistical measures, specifically the mean and standard deviation, were employed to summarize students' perceptions regarding the integration of their FOK in learning Life Science concepts. To examine changes associated with the intervention, a paired sample t-test and analysis of covariance were applied to compare students' views on the integration of FOK and their conceptual understanding of Biodiversity before and after the implementation of the intervention, respectively. In addition, the thematic analysis of qualitative data followed the analytical procedures outlined by Clarke and Braun (2023).

FINDINGS

Table 1 presents the students' views on integrating students' FOK before and after exposure to the learning material. The first item in the questionnaire pertains to the awareness and understanding of students towards the concept of FOK. Before their exposure to the learning material, the students strongly disagreed (M=1.68; SD=0.57) on item 1. This result is expected since the FOK is not yet well studied in the Philippines. There's a lack of Filipino literature about this theory (Lapada, 2022). However, after exposing themselves to the learning material in Biodiversity, they understand deeply and are fully aware of this concept as they strongly agree with this item (M=4.55; SD=0.50).

> *"It is the first time I encountered the term funds of knowledge. Through the learning material in Biodiversity that is based on students' funds of knowledge, I became aware and fully understand its meaning" – S22*

Items two, three, and four depict the importance of FOK towards learning Life Science concepts and awareness that FOK promote motivation, engagement, and interest in the lesson, respectively. Before their exposure to the learning material, students noted that they were not aware of the importance of FOK towards learning Life Science and the benefits they can get, such as it promotes engagement, motivation, and interest toward the lesson as they strongly disagree for promoting engagement towards learning Life Science (M=1.47; SD=0.50), disagree for motivation towards learning Life Science (M=1.92; SD=0.74 and disagree for interest towards learning Life Science (M=2.00; SD=0.77). After exposing them to the learning material, their views about these concerns changed as they strongly agreed to items two, three, and four. This can be gleaned that students became aware that integrating FOK in learning Life Science could help them be more engaged, motivated, and connected to the lesson.

> *"The article about Padul-ong Festival I read enabled me to be more engaged in the lesson. After reading this article, I became more interested in finishing reading and doing all activities in this learning material" – S8*

Items five and six pertain to real-world relevance and improved students' learning experiences. As the students were not aware of the concept of FOK they also disagreed that integration of students' FOK in learning life science concepts would help them feel relevant to themselves (M=1.97; SD=0.97) as it promotes the use of students' experiences in learning subject matter (M=1.87; SD=0.81). After exposing them to the learning material, their opinion about said matter changed. Students noted that they strongly agreed to both items four and five. These results implied that the learning material in Biodiversity was successful in integrating real-life situations, which helped them feel relevant and connected to the lesson.

> *"I feel more connected and relevant to the lesson we had in Biodiversity. The daily experiences in our province cited in various parts of this learning material helped me to easily learn this concept." – S3*

Items seven, eight, and nine are about the impact of students' FOK toward understanding complex concepts, having peer collaboration, and a supportive learning environment. The students strongly disagreed that the FOK could help them understand complex concepts (M=1.78; SD=0.41) and would promote peer collaboration (M=1.45; SD=0.50). Moreover, the students disagreed (M=1.89; SD=0.83) that the integration of FOK could support the learning environment. These views of the students were changed after they were exposed to the learning material that is based on students' FOK as they noted that they strongly agreed that the FOK in learning life science could help them understand complex concepts (M=4.44; SD=0.50), could promote peer collaboration (M=4.55; SD=0.50), and could support the learning environment (M=4.57; SD=0.50). These changes of views toward the integration of students' FOKsupport the idea of Brown & Davis (2023) as they believe that FOK could help teachers to improve the classroom vibe or the learning environment of the students. Moreover, the FOK can help students understand technical concepts in Life Science and can promote group dynamics among students with different backgrounds.

> *"I was able to understand some complex concepts in Biodiversity by mentioning some of my experiences in our community" – S18*

> *"I enjoyed our activity. I prefer to work with my classmates especially that the concepts are relevant to the culture of our town like the Padul-ong Festival, and this also helps our class to be a more conducive learning environment" – S-27*

Items ten, eleven, twelve, and thirteen pertain to the effect of FOK towards cultural awareness, effective communication, usefulness for future applications, and effective feedback and support. Before exposing them to the learning material, students disagreed that the FOK could promote cultural awareness (M=2.08; 0.85), foster effective communication (M=2.24; SD=1.21), and could be used for future applications (M=1.95; SD=0.80). Moreover, the students strongly disagreed that the FOK can encourage effective feedback and support to the students (M=1.79; SD=0.41). After exposing them to the learning material, students strongly agreed that the FOK promote cultural awareness (M=4.42; 0.50), foster effective communication (4.57; 0.50), and could be used for future applications (M=4.42; SD=0.50), and can encourage effective feedback and support to the students (M=4.73; SD=0.44). Thompson & White (2024) found the same results that the community FOK can sustain cultural awareness from one generation to another. Moreover, students are enticed to speak about the topic since it is relevant to their community. Furthermore, Packer et al. (2020) emphasize that the FOK could help teachers to easily give feedback to the students during the teaching and learning process as the teacher can also relate to the FOK of the students.

"There are a lot of our experiences that were mentioned in the learning material. The culture of our town about praying to Mama Mary through the Padul-ong Festival was one of the most enjoyable parts of this lesson. I was also able to express myself in writing my reflection because I can easily relate to all of the examples given in the lesson." – S36

"I can easily recall the topics as my own experiences were given examples in the lesson. Our teacher support us in the lesson by telling us some of our community experiences that help us to understand deeply the lesson." – S21

Items fourteen, fifteen, sixteen, and seventeen depict the effectiveness in understanding experiments, critical thinking skills, innovative learning methods, and interest in further explorations. Before exposing the students to the learning material, they disagreed that FOK could help students understand experiments (M=1.84; SD=0.36) and can boost their interest in further exploration of the lesson (M=2.10; D=1.22). Moreover, the students strongly disagreed that FOK can hone critical thinking skills (M=1.77; SD=0.50) and can provide innovative learning methods (M=1.71; SD=0.56). On the other hand, after exposing them to the learning material, the students became strongly agreed with all of these concerns. The students believed that the FOK could help them understand deeply experiments (M=4.44; SD=0.50), foster critical thinking skills (M=4.52; SD=0.50), could provide innovative learning methods (M=4.44; SD=0.44), and can promote interest for exploring more about a lesson (M=4.42; SD=0.50). García & Pérez (2022) revealed in their study that FOK could enhance students' critical thinking and provide innovative learning methods for students. Furthermore, Patel & Gupta (2023) found that integration of students' FOK helps their students understand easily complex experiments and students become more eager to explore the lessons.

"The experiment about concept mapping in Biodiversity was easy to understand since our community experiences were cited in the activity. I was enticed to read more about the lesson." – S9

"This innovative learning material in Biodiversity enhanced our critical thinking skills as the questions made were very challenging to answer" – S11

Items eighteen and nineteen pertain to the challenges of applying knowledge and challenges faced in understanding the concepts. Before exposing the students to the learning material, they were neutral about the impact of integrating students FOK on their challenges in applying knowledge (M=3.34; SD=0.87) and the challenges faced in understanding the concept (M=1.63; SD=0.48). On the other hand, after exposing them to the learning material, the students strongly disagreed when asked if they faced a lot of challenges in applying knowledge to the lesson and if they had faced challenges understanding the concept. The FOK make it easier for the students to apply their knowledge to the lessons since it uses their own experiences as part of their learning. Moreover, the concepts became very easy to understand. Hence, students are likely not to face any challenges with the integration of FOK (Nguyen & Lee, 2022).

"I had never encountered any challenge while doing the activities in the learning material. The learning material helps me to apply my knowledge into the lesson." - S12

The last item in the questionnaire depicts the overall satisfaction of the students towards the integration of students' FOK in learning Life Science concepts. Before exposing them to the material, they strongly disagreed about their overall satisfaction with the learning material. However, after teaching the learning unit in Life Science, their views about this concern changed as they strongly agreed that they were satisfied with the material. This study confirmed the researcher's first publication about the students' funds of knowledge.

> *"I am very satisfied with this kind of instructional material. This is the first time that I encounter a learning material that integrates the culture and practices of our town" – S7*

Table 1
Students Views on Integrating students' Funds of knowledge before and after exposure to the intervention

No	Statements	Before Exposure to the Intervention			After Exposure to the Intervention		
		Mean	SD	Interpretation	Mean	SD	Interpretation
1	I am familiar with the concept of "funds of knowledge" in learning Life Sciences.	1.68	0.57	Strongly Disagree	4.55	0.50	Strongly Agree
2	I believe that integrating funds of knowledge is essential for understanding life sciences concepts.	1.47	0.50	Strongly Disagree	4.44	0.50	Strongly Agree
3	I believe that integrating funds of knowledge increases my engagement and interest in learning life sciences	2.00	0.77	Disagree	4.57	0.50	Strongly Agree
4	I believe that Learning life sciences through funds of knowledge integration motivates me to explore topics further.	1.92	0.74	Disagree	4.44	0.50	Strongly Agree
5	I believe that learning life sciences through the integration of funds of knowledge makes concepts more relevant to real-life situations.	1.97	0.97	Disagree	4.44	0.50	Strongly Agree
6	I believe that integrating funds of knowledge improves my overall learning experience in life sciences.	1.87	0.81	Disagree	4.68	0.47	Strongly Agree
7	I believe that integrating funds of knowledge helps me understand complex life sciences concepts better.	1.78	0.41	Strongly Disagree	4.44	0.50	Strongly Agree
8	I believe that integrating funds of knowledge encourages collaboration with peers in understanding life sciences topics.	1.45	0.50	Strongly Disagree	4.55	0.50	Strongly Agree
9	I believe that integrating funds of knowledge creates a supportive learning environment for studying life sciences.	1.89	0.83	Disagree	4.57	0.50	Strongly Agree
10	I believe that integrating funds of knowledge enhances my cultural awareness in the context of life sciences.	2.08	0.85	Disagree	4.42	0.50	Strongly Agree
11	I believe that integrating funds of knowledge improves communication skills related to life sciences topics.	2.24	0.21	Disagree	4.57	0.50	Strongly Agree
12	I believe that learning life sciences through funds of knowledge integration will be useful for my future career or academic pursuits	1.95	0.80	Disagree	4.42	0.50	Strongly Agree

13	I receive adequate feedback and support when learning through funds of knowledge approaches.	1.79	0.41	Strongly Disagree	4.73	0.44	Strongly Agree
14	I believe that integrating funds of knowledge has been effective in helping me understand experimental procedures in life sciences.	1.84	0.36	Disagree	4.44	0.50	Strongly Agree
15	I believe that integrating funds of knowledge enhances my critical thinking skills in analyzing life sciences data and information.	1.47	0.50	Strongly Disagree	4.52	0.50	Strongly Agree
16	I believe that integrating funds of knowledge introduces innovative learning methods in studying life sciences.	1.71	0.56	Strongly Disagree	4.44	0.50	Strongly Agree
17	I believe that learning life sciences through funds of knowledge integration has sparked my interest in exploring related topics further.	2.10	0.22	Disagree	4.42	0.50	Strongly Agree
18	I face challenges when applying the knowledge gained through funds of knowledge integration to practical scenarios.	3.34	0.87	Neutral	1.50	0.50	Strongly Disagree
19	I have faced challenges in understanding life sciences concepts through funds of knowledge integration.	3.18	0.86	Neutral	1.63	0.48	Strongly Disagree
20	Overall, I am satisfied with the experience of learning life sciences through the integration of funds of knowledge.	1.42	0.50	Strongly Disagree	4.44	0.50	Strongly Agree

Table 2 shows the students' Raw Score Distribution of Pretest and Posttest on Achievement Test in Biodiversity. The result of the students' pretest scores showed a mean of 7.26, while the minimum and maximum scores were 1 and 13, respectively. Students' scores got a low standard deviation, implying a low pretest scores variability. Further, the data for the pretest scores are normally distributed, as reflected in the skewness results. On the other hand, the posttest scores displayed a very high mean. Students got a mean of 19.55, while minimum and maximum scores were 18 and 20, respectively. The standard deviation in their posttest scores is lower than the standard deviation from their pretest scores. This result implies that students performed well in the posttest than in the pretest. Further, the posttest scores are normally distributed, as reflected in the results of the skewness test.

Table 2
Students' Raw Score Distribution of Pretest and Posttest on Achievement Test in Biodiversity

Test	N	Maximum	Minimum	Mean	SD	Skewness
Pre	38	1	13	7.26	2.92	0.29
post	38	18	20	19.55	0.68	0.48

The paired sample t-test was employed to compare the views of the students towards integrating students' FOK and their scores before and after exposing them to the learning material in Biodiversity since all data generated where normality distributed reflected in the skewness result. Table 3 shows the paired t-test of students' views on Integrating students' FOK before and after exposure to the intervention. The computation garnered a p-value of 0.00 which depicts a substantial difference between the views of the students on Integrating students' FOK before and after exposure to the intervention.

Table 3
Paired t-test of students views on Integrating students' Funds of knowledge before and after exposure to the intervention

N	Mean	SD	t	p-value	Interpretation
38	2.25	1.37	7.33	0.00*	Significant

*significant at a=0.05

Table 4 presents the pretest and posttest performance of students on the Achievement Test in Biodiversity. Prior to the intervention, the control group obtained a pretest mean score of 21.00, while the experimental group recorded a slightly lower mean of 20.00, indicating that the two groups had comparable levels of prior knowledge at the start of the study. After the instructional period, both groups demonstrated substantial improvement in their posttest scores. The control group achieved a posttest mean of 29.11, resulting in a mean gain of 10.11, whereas the experimental group attained a higher posttest mean of 32.28, with a mean gain of 12.28. These results show that learning occurred in both groups, with greater improvement observed among students exposed to the experimental intervention.

Table 4
Students' pretest and post test scores on the Achievement Test in Biodiversity

Group	N	Pretest Mean	Posttest Mean	Mean Gain
Control	36	21.00	29.11	10.11
Experimental	38	20.00	32.28	12.28

To further examine whether the difference in posttest performance remained significant after controlling for initial differences in prior knowledge, an analysis of covariance was conducted, as shown in Table 5. The results indicate that the pretest score had a significant effect on posttest performance, confirming the influence of prior knowledge on students' achievement in Biodiversity. More importantly, the analysis revealed a statistically significant group effect even after adjusting for pretest scores. This finding suggests that the observed difference in posttest outcomes between the control and experimental groups cannot be attributed solely to their initial performance levels.

The significant group effect presented in Table 5 implies that the instructional approach implemented in the experimental group was more effective in improving students' understanding of Biodiversity concepts compared to the conventional method used with the control group. While both instructional approaches led to measurable gains in achievement, the higher adjusted posttest performance of the experimental group highlights the added value of the intervention. Overall, the findings support the effectiveness of the instructional strategy in enhancing student learning in Biodiversity beyond what was achieved through regular classroom instruction.

Table 5
ANCOVA of students post test results on Achievement Test in Biodiversity

Source of Variation	SS	df	MS	F	p-value	Interpretation
Pretest (Covariate)	118.72	1	118.72	19.84	0.00	Significant
Group	92.46	1	92.46	10.89	0.02	Significant
Error	604.11	71	8.51			
Total	816.29	73				

*significant at a=0.05

The thematic analysis in Table 5 shows the advantages of using students' FOK in Life Science classrooms. The themes derived are enhanced conceptual understanding, increased engagement, sustaining cultural identity, improved collaboration, and bridging theory and practice. By weaving these elements into science lessons, educators create classroom environments where learning becomes accessible, relevant, collaborative, and truly reflective of students' lives.

The first theme centers on enhancing conceptual understanding, showing that students grasped Life Science ideas more readily when lessons drew upon activities they already knew - like farming, cooking, or using traditional remedies. These everyday experiences provided tangible touchpoints that linked their background to new academic knowledge. Research by St. Clair and McNulty (2021) highlights how leveraging FOK in science offers students accessible pathways to comprehend complex topics, while Moll et al., (1992) argue that FoK transforms the classroom into a familiar space, blending home experiences with formal learning. In this way, FoK helps demystify scientific ideas, making learning more concrete and intuitive.

The second theme, increasing engagement, demonstrates that students became more eager and involved in class when their FOK were incorporated. By connecting life science lessons to students' own backgrounds, teachers fostered greater curiosity and maintained students' interest. Denton and Borrego (2021) found that using FoK in STEM subjects consistently boosted student enthusiasm and motivation, especially among those who previously felt distant from scientific knowledge. Similarly, Barton, Tan, and Greenberg (2020) noted that community-based, hands-on approaches rooted in students' cultural experiences opened fair opportunities for meaningful participation in STEM activities.

The third key theme focuses on the sustaining of cultural identity, revealing how FOK help students maintain connections to their backgrounds. When their traditions and customs are respected in the classroom, students feel a stronger sense of pride and belonging. According to Hogg (2021), leveraging FoK in teaching not only enhances lessons but also honors students' cultural heritage. Paris and Alim (2017) similarly emphasize that education which sustains culture is essential for fostering equity and justice. By recognizing and celebrating students' cultural foundations, science education becomes both intellectually stimulating and personally meaningful, strengthening rather than distancing students from their roots.

The fourth theme, fostering collaboration, became evident as students exchanged ideas, learned from one another, and worked together to deepen their understanding. This spirit of teamwork aligns with educational models that view learning as a shared process. Researchers have noted that when educators draw from students' FOK conversations and interactions in the classroom are enriched (Waddington & Esteban-Guitart 2024). In turn, this approach promotes fairness and encourages everyone to participate, making learning a more inclusive experience (Castro-Mosqueda, 2024). Altogether, these insights show that using community knowledge in teaching supports not only personal growth but also strengthens the collective learning environment.

The final theme, bridging theory and practice, highlights how students use scientific ideas in practical areas such as wellness, food storage, and caring for the environment. This reveals how knowledge learned in class can be directly applied to everyday life. Volman, ten Dam, and Gilde (2021) found that drawing from FOK helps learners link abstract concepts to real situations, while Esteban-Guitart and Moll (2023) noted that extending this approach to include Funds of Identity empowers students to see themselves as contributors to both their communities and academic fields. By closing the gap between theory and its use, teaching Life Science through FOK ensures that science is seen as a meaningful resource for solving problems and supporting the community.

By synthesizing these themes and the supporting research, it's clear that teaching Life Science through FOK makes lessons more understandable, engaging, affirming of students' identities, collaborative, and applicable to real life. When teachers incorporate students' family and community experiences into classroom activities, they create transformative learning environments that recognize and value cultural resources as important foundations for scientific exploration.

Table 5
Thematic Analysis of the Advantages of Using Funds of Knowledge in Learning Life Science Concepts

Codes	Categories	Themes
Madali pag intindi han amon mga lessons kay an amon mga pakabuhi dinhi ha Eastern Samar gingamit han pag totdo sugad han pagtanom, pangisda ngan pag oring (The lessons were easy to understand as our livelihood in Eastern Samar were used in teaching, like farming, fishing and charcoal making). – S1	Conceptual understanding	Enhanced conceptual understanding
Mas nagpartisipar ak han amon klase, kay mas nakakarelate ak han amon lesson. (I participate more in my class, as I felt more connected to our lesson). – S5	Engagement in learning	Increased engagement
An amon mga kultura ngan paniniwala nahi relate liwat ngadto han lesson, this is a way para mapreserve namon an amon mga kultura ngan paniniwala ha Eastern Samar. (Our cultures and beliefs were connected to the lesson, this is a way top reserve our cultures and belief in Estern Samar.) – S8	Cultural validation	Sustained of cultural identity
Marisyo ko kay tanan kami ha klase nag enjoy tas nagburublig liwat kami para mas damo pa hibaruan han lesson kay meada mga grouping activity. (I felt happy because everyone enjoyed the lessons, and we helped one another discover more about the topics as we participated in group activities). – S9	Collaborative learning	Fostered collaboration
An mga concepts ha science mas naiintidihan namon kay nagagamit han pan adlaw-adlaw nga kinabuhi, sugad han personal hygein ngan pagataman han environment. (The science concepts are better understood by us because we can use them in our daily lives, such as in personal hygiene and caring for the environment). -S11	Transfer of learning	Bridged theory and practice

DISCUSSION

Integrating FOK into science teaching and learning conveys a culturally sustaining lens of connecting students lived experiences with their science learning. Students' experiences and community culture can be used to explain science ideas (Hileman, Olsen & Plummer, 2023). Even livelihood in Eastern Samar such as farming, fishing and charcoal production can be a good source of FOK that can explain science concepts. Moreover, using FOK can help teachers better know their students and to connect with the everyday experiences of students (St. Clair & McNulty, 2021 & Lapada, 2026). Thus, making complex lessons in science easy to teach by science teachers.

The findings of this research provide enough evidence for FOK's positive impact on learning Life Science. The change of perceptions of students from unfamiliarity to FOK to a positive agreement on its benefits to their learning in Life science highlights the fact that the intervention used was very effective (Lee, & Lee, 2023). Moreover, this is also a manifestation that FOK could bridge the gap between students' prior and new knowledge, fostering profound appreciation and understanding of the concept taught (Lee & Lee, 2021). By linking students' cultural knowledge, and lived and community experiences, FOK provides a more engaging and relevant learning space to all students (Esteban-Guitart, 2023 & Ruscoe, Lavina, Barblett & Boylan, 2025). Hence, FOK helps students to be more motivated and encourages them to explore more what to learn in the subject matter taught.

The study's results also show significant implications for classroom management and overall learning space. The positive increase in collaboration with peers and the crafting of a more encouraging learning space suggest that integration of FOK into learning life science concepts can foster a sense of community among learners. (Lee, & Lee, 2024). Students' experience and knowledge are valued by teachers they tend to actively participate in their classes (Esteban-Guitart, 2023). Furthermore, the enhanced awareness of students of their culture emphasizes the significance of inclusivity among their cultures as they come from different backgrounds. (Esteban-Guitart, 2023). Integrating students FOK into the learning and teaching of Life Science can create a learning environment where students can feel heard, seen, and respected, leading to a culturally responsive and equitable learning space (Ohio Families Engage, n.d.).

The integration of FOK into teaching and learning clearly fosters student engagement as students' feel connected to the lesson whenever an FOK is mentioned by teachers. Also, Denton and Borrego (2021), found in their FOK scoping review for STEM education found that students that are taught using FOK can feel high sense of motivation and belonging, specially when they are working in group. Likewise, 't Gilde, Volman, and Hennissen, (2021) found that educators who integrate FOK into their science teaching improved their students' participation in class, enhanced conceptual understanding and improved students' ability to communicate. These findings in this study and the other studies reviewed, recommend that FOK empowers learners to see themselves as rich contributor to science.

While the potential of integrating FOK into science lessons is widely recognized, its application demands thoughtful and deliberate effort. Educators must be equipped with training and sufficient time to explore what students already know, often through approaches such as household visits, oral histories, or mapping of community practices (Hogg, 2021 & Butler & Miretzky, 2020). Aligning these insights with prescribed curricula is not always straightforward, and if handled superficially, attempts may appear tokenistic rather than genuinely meaningful. Even so, research continues to show that FOK-oriented teaching encourages inclusivity, affirms cultural identity, and situates science within learners lived realities (Volman et al., 2021). The broader implication is that science instruction grounded in FOK has the capacity to make classrooms more adaptive, engaging, and transformative.

In a nutshell, the study's findings offer a significant understanding of the transformative potential of integrating FOK into learning and teaching. The improvements in students' engagement and motivation in Life Science, and cultural awareness highlight the significance of having a culturally relevant pedagogy in teaching and learning (Culturally Responsive Pedagogy, 2020). By giving importance to students' prior knowledge, promoting real-world applications, and crafting a supportive learning space, teachers can help students become active learners, problem solvers, critical thinkers, and productive members of society or their community (Innovations in Science Education, 2023).

CONCLUSION

Based on the results of the study, it is concluded that the learning material in Biodiversity that is based on students' FOK was successful in changing from negative opinions to more positive views of students on integrating students' FOK toward learning Life Science concepts. Moreover, the instructional material based on FOK was effective in improving the Life Science performance of students compared with those taught using the conventional teaching method. It is also noted by the students that their conceptual understanding in Life Science increased, were more engaged, sustained their cultural identify, fostered their collaborative skills, and bridging theory and practice.

Thus, the integration of students' funds of knowledge in learning Life Science concepts proves to be highly effective, as it enables learners to establish meaningful connections between scientific content and their own lived experiences. When teachers intentionally draw on students' cultural, household, and community-based knowledge, lessons become more relatable and grounded in familiar contexts, making abstract or complex Life Science concepts easier to understand. In practice, this may involve using examples from students' daily environments, local ecological systems, family health practices, or community livelihoods as starting points for discussion, investigation, and problem solving. By anchoring instruction in these familiar experiences, students are better able to recall and apply prior or "stock" knowledge, which supports deeper conceptual understanding and more sustained engagement.

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