Exploring Funds of Knowledge in Betong, Sarawak Families Relevance for Science Learning

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ABSTRACT

This study explores the concept of *funds of knowledge* (FoK) within the Betong, Sarawak community, emphasizing its role in science education. The notion of FoK refers to the recognition and appreciation of the extensive cultural practices, traditions, and wisdom embedded in community life. The research aims to identify forms of knowledge commonly practiced by families in Betong, Sarawak and examine their relevance to science learning. Grounded in the understanding that students' cultural experiences shaped by home environments and daily practices inform educational engagement, this study adopts a qualitative approach with case studies research design involving three informants. Data were collected through observations, and interviews. Findings reveal diverse FoK rooted in cultural heritage, daily activities, phenomenological experiences, and ancestral traditions transmitted across generations. The community perceives these knowledge systems as vital for contemporary development and advocates their preservation for future generations. The study underscores the significance of integrating cultural knowledge into science education and highlights the ongoing practice and transmission of these FoK within the community. This research contributes to discussions on culturally relevant pedagogy and the intergenerational continuity of indigenous knowledge.

Keywords: Indigenous knowledge; cultural heritage; community-based learning; culturally relevant pedagogy; funds of knowledge

INTRODUCTION

Funds of Knowledge refers broadly to the knowledge utilized by local communities to sustain their livelihoods within specific environmental contexts (Warren, 1991). The term indigenous knowledge is widely defined as local knowledge possessed by indigenous communities or knowledge that is unique to a particular culture or society (Warren et al., 1993). Within the educational context, Funds of Knowledge encompasses the knowledge, experiences, and cultural practices that students bring from their everyday lives and social environments.

Previous research indicates that incorporating students' Funds of Knowledge into classroom practice enhances their understanding, fosters interest, promotes engagement, and ultimately improves achievement in science subjects (Fusco, 2001; Ahmad Nurulazam et al., 2015; Andree & Lager-Nyquist, 2012; McLaughlin & Barton, 2013; Borgerding, 2016; Mills et al., 2018). Furthermore, Funds of Knowledge is frequently employed as a strategy to promote equity in education, particularly for rural students, minority groups, learners from low socioeconomic backgrounds, and those who struggle with science learning (Fusco, 2001; Upadhyay, 2006; Ahmad Nurulazam et al., 2015; Borgerding, 2016).

To strengthen the relevance of science education, instructional approaches must extend beyond theoretical knowledge and factual recall, incorporating innovative curriculum and pedagogical strategies (Eilks & Hofstein, 2015). Science learning should be grounded in students' everyday experiences and community contexts, integrating conceptual understanding that enables learners to appreciate the significance of science (Greeno, 1998; Ostergaard, 2017).

Ahmad Nurulazam (2015) argues that teaching science in isolated contexts, disconnected from students' realities, fosters a sense of detachment, rendering science irrelevant, impractical, and distant from their lives. When students fail to perceive themselves as part of science, it does not become part of their identity, leading to diminished interest and reduced engagement with science in the future (Brickhouse, Lowery, & Schultz, 2000).

To cultivate deep and sustained engagement with science, it is essential to integrate students' lived experiences, cultural practices, and historical knowledge collectively conceptualized as Funds of Knowledge into science instruction (Genzuk, 1999). Accordingly, this study seeks to explore the Funds of Knowledge embedded within indigenous families in Betong, Sarawak and to analyse how this knowledge resources intersect with the scientific concepts taught in formal schooling.

Funds of Knowledge in Education Perspective

The Funds of Knowledge approach emerged in Tucson, Arizona, in the late 1980s as a theory and method through which teachers identify, recognize, and validate the knowledge, skills, resources, and strengths possessed by families, and subsequently incorporate them into educational practices and pedagogy (Moll et al., 1990). For example, Irma Olmedo (1997) documented numerous knowledge resources within extended Puerto Rican families through an oral history narrated by a grandmother about the family's migration experiences in the United States. The pedagogical challenge lies in creating meaningful connections between curriculum and instruction and the knowledge and skills identified during home visits (González et al., 1995). In the case described above, Olmedo (1997) concluded by recommending the use of oral histories in the classroom.

Based on the Vygotsky theory which emphasizes the importance of sociocultural in shaping student development and learning, highlighting the critical role of adults (parents, teachers, and peers) and communities where interactions occur between learners and their environments (Kozulin et al., 2003). From this sociocultural standpoint, students construct knowledge through communication and collaboration with peers and groups, and their understanding evolves through critical thinking and shared meaning-making (Tal & Kedmi, 2006). According to this view, when students engage in social discourse and activities around shared issues or tasks, knowledge and understanding including scientific understanding are co-constructed. Thus, learning occurs primarily through social interaction rather than individual cognitive processes

In specific cultural and socioeconomic contexts, science is practiced based on natural resources and environmental conditions. However, many science textbooks worldwide either ignore cultural components or restrict them to Western perspectives on the history of science (Forawi, 2015; Khaddour et al., 2017; Ideland, 2018). Indigenous worldviews on nature and scientific knowledge vary significantly across societies and cultures. Indigenous knowledge often reflects a sacred respect for nature, rooted in the relationship and responsibility of Indigenous communities toward the environment (Knudtson & Suzuki, 1992). Learning about Indigenous knowledge can help students recognize the deep interconnection between humans and nature within cultural frameworks, whether in their own environment or elsewhere.

In students' real-world experiences, Indigenous culture and Western science may complement each other. Introducing Indigenous knowledge into classrooms provides diverse cultural perspectives and enhances interpretation of scientific concepts (Botha, 2012), making science more relevant for learners in multicultural settings (de Beer & Whitlock, 2009). Furthermore, integrating Indigenous knowledge into school curricula can foster positive experiences and attitudes toward science while preserving local cultural values (Kasanda et al., 2005; de Beer & Whitlock, 2009; Ng'asike, 2011; Perin, 2011).

METHODOLOGY

Research design

This study employed a qualitative research approach using a case study design, which is appropriate for exploring complex social phenomena within real-life contexts. A qualitative approach allows for an in-depth understanding of participants' experiences, perspectives, and cultural practices, aligning with the exploratory nature of this research (Crawford & Irving, 2009). The case study design was selected to provide a holistic

examination of Funds of Knowledge within indigenous families in Betong, Sarawak, enabling the researcher to capture rich, contextualized data through interviews and observations (Denzin & Lincoln, 1994).

Informants

The study involved three informants from Betong, Sarawak, representing diverse age groups, ethnic backgrounds, and occupations. Two respondents were Iban women aged between 54 and 65 years, both full-time housewives with education up to the Lower secondary certificate school level. Another Iban respondent was an 18-year-old male student pursuing a Skills Certificate at the Industrial Training Institute in Kota Samarahan, Sarawak. All informants were selected to reflect a mix of rural and urban backgrounds, educational levels, and occupational experiences relevant to the study context.

Table 1. Informants background

Informant	Age	Gender	Ethnicity	Education Level	Current Occupation
Informant 1	65	Female	Iban	Lower secondary certificate	Housewife
Informant 2	54	Female	Iban	Lower secondary certificate	Housewife
Informant 3	18	Male	Iban	Skills Certificate	Student

Research method

(i) Observation

Observation was used as a supplementary method to measure research variables and support the study's findings. Through participant observation, the researcher directly observed and experienced the Funds of Knowledge practiced within the community, enabling a deeper understanding of the subject. This approach required the researcher to actively engage as a member of the group being observed while simultaneously recording events as they occurred, which enhanced the validity and reliability of the data collected (Ahmad Mahzan Ayob, 1992).

(ii)Interview

Interviews were conducted to gain an in-depth understanding of the Funds of Knowledge commonly practiced by the community in Betong, Sarawak. Since not all data could be effectively obtained through observation alone, interviews complemented and strengthened the information gathered. The semi-structured interview format was adopted, where only a brief framework of topics was prepared without predetermined questions, and responses guided spontaneous follow-up questions to explore in greater depth. This approach provided a comprehensive view of the relationship between Funds of Knowledge and science learning. Interviews were conducted individually, and responses were recorded and documented to facilitate analysis.

Data analysis process

The data analysis process followed a thematic analysis approach to systematically identify patterns and themes related to the Funds of Knowledge and their connection to science learning. After data collection through semi-structured interviews and participant observation, all audio recordings were transcribed verbatim, and observational notes were compiled. The researcher then engaged in iterative coding, beginning with open coding to categorize significant statements and actions, followed by axial coding to establish relationships among categories. Themes were developed by grouping codes that reflected recurring ideas, practices, and cultural knowledge relevant to science concepts. To ensure credibility and trustworthiness, triangulation was applied by comparing interview data with observational findings, and member checking was conducted where necessary. This rigorous process allowed for a comprehensive interpretation of the data within its sociocultural context.

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Findings

Based on the interviews and observations, the identified Funds of Knowledge are presented in Table 2.

Table 2. Funds of Knowledge

Informant	Funds of Knowledge
Informant 1	Making Tuak (Rice Wine) & Bemban Mat
Informant 2	Making Kasam Ensabi (Fermented Mustard Greens) @ Dayak Mustard
Informant 3	Making Traditional Fish Spear Gun

(i) Tuak (Rice Wine)

Tuak-making is a long-standing tradition among the Iban community, passed down through generations as part of their cultural heritage. It reflects the community's ancestral expertise in food and beverage production. Although the practice has evolved over time, it remains an important skill for many Iban people. According to a 65-year-old tuak maker, the process begins by soaking rice overnight, cooking it until soft, and mixing it with finely ground yeast. The mixture is layered and stored in large jars for fermentation, which initially produces sweet rice that can be eaten before it transforms into tuak. After a week, water and dissolved sugar are added to the fermented mixture, with proportions adjusted for sweetness. Sweet tuak, often called "tuak indu," is preferred by women, while men favor a more bitter taste. The liquid is then left to ferment for two to three weeks before consumption, though longer storage enhances its flavor and clarity, indicating quality and age. This traditional process not only preserves cultural identity but also demonstrates the Iban community's deep knowledge of fermentation and food preparation.

(ii) Kasam Ensabi (Fermented Mustard Greens) @ Dayak Mustard

Kasam Ensabi is a traditional fermented mustard green dish deeply rooted in Iban culture and passed down through generations. It reflects the community's culinary heritage and commitment to preserving ancestral knowledge. Despite modernization, the practice continues to ensure future generations maintain this cultural identity, as the dish remains a staple complement in Iban meals. The preparation involves cleaning mustard greens, mixing them with coarse salt and rice pieces, and fermenting the mixture in a sealed container for several days. Rice pieces provide sourness, while salt adds flavor. Longer fermentation improves taste and aroma. This dish, known for its distinctive sour and salty profile, can be eaten directly or fried, making it a cherished part of Iban cuisine.

(iii) Traditional Fish Spear Gun

The history of the traditional fish spear gun dates back thousands of years and is closely linked to the practice of spearfishing, an ancient method of hunting fish and other marine life underwater. While evidence shows that early humans used various fishing tools and weapons, the development of the spear gun as we know it today is more recent. According to Informant 3, traditional spear guns in this community originated in the 1960s and were used for shooting fish in rivers. This activity usually took place for one or two days depending on river conditions and was often done at night when fish were easier to catch. The spear gun was made from durable hardwood such as *tebelian* or *tapang*, which ensured longevity. The spear tip was crafted from heated iron, hammered into an arrow-like shape for sharpness, following traditional metalworking techniques. Rubber bands provided the propulsion force, and the more they were stretched, the stronger the shot. A string attached beneath the gun was used to secure fish after being speared.

DISCUSSION

This study's exploration of Funds of Knowledge among families in Betong, Sarawak demonstrates that these resources encompass culturally embedded skills and practices acquired through daily activities and transmitted across generations. Consistent with Moll et al.'s (1992) definition of Funds of Knowledge as "historically accumulated and culturally developed bodies of knowledge and skills essential for household functioning or individual well-being," the findings highlight how traditional practices such as food preparation and artisanal craftsmanship remain integral to community life. These practices not only sustain cultural identity but also represent valuable knowledge systems that can be leveraged in educational contexts.

Interviews and observations revealed strong connections between these cultural practices and scientific concepts within the school syllabus. For example, tuak-making during the Iban Gawai Festival illustrates fermentation and microorganism activity, aligning with topics on chemical changes and biological processes. These examples demonstrate how indigenous knowledge provides authentic, real-world applications of scientific principles taught in formal education.

Further findings include the preparation of *Kasam Ensabi* (fermented mustard greens), which exemplifies food preservation techniques such as salting to inhibit microbial growth, a concept addressed under Food Preservation Technology in the Year 6 syllabus. Likewise, the traditional spear gun used for fishing illustrates the application of force and speed, where the elasticity of rubber bands determines the velocity of the spear. These culturally rooted practices offer meaningful contexts for science learning, bridging abstract concepts with tangible experiences from students' cultural environments.

The integration of Funds of Knowledge into classroom instruction has significant pedagogical implications. By connecting science content to students lived experiences, educators can foster culturally responsive teaching that values diversity and promotes inclusivity (Esteban-Guitart & Moll, 2014; Hogg & Volman, 2020). Incorporating local knowledge, such as fermentation processes, and traditional technologies into science lessons not only contextualizes learning but also affirms students' cultural identities. This approach enriches educational experiences, strengthens engagement, and underscores the relevance of schooling to everyday life, thereby creating a more holistic and meaningful learning environment.

CONCLUSION

This study demonstrates the potential of leveraging the Funds of Knowledge (FoK) within Iban families in Betong, Sarawak to enhance science education by connecting indigenous practices in the school science syllabus. Cultural activities such as traditional food preparation and traditional fish spear gun involving force and speed provide authentic contexts for understanding science concept such as fermentation and the principles of force and speed, thereby making learning more meaningful and relevant. Integrating FoK into classroom instruction promotes culturally responsive pedagogy, enriches students' learning experiences, and bridges the gap between home and school knowledge, affirming learners' cultural identities while fostering inclusivity. The implications for teaching and learning science are significant: educators should incorporate students' cultural knowledge into lesson design to improve engagement, conceptual understanding, and equity in education. However, this study is limited by its small and non-representative sample of only three informants, which constrains the generalizability of the findings. Future research should involve larger and more diverse samples, explore FoK across different indigenous communities, and examine the impact of culturally integrated science instruction on students' academic performance. Additionally, developing and testing instructional frameworks that systematically embed indigenous knowledge into science curricula would provide valuable guidance for educators seeking to implement culturally responsive practices.

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