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Bridging Language and Science Learning: The Lived Experiences of Science Teachers in Multinational Classrooms

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Abstract*—This qualitative phenomenological study explored how science teachers experienced bridging language and science learning in multinational classrooms. Seven science teachers from Sampoerna Academy–Citra Garden, West Jakarta, Indonesia, participated through in-depth, semi-structured interviews. Guided by Husserlian descriptive phenomenology and Moustakas' analytical procedures, the study used epoché, horizontalization, significant statements, formulated meanings, thematic clustering, and the synthesis of textural and structural descriptions. The findings generated six themes: language shapes access to scientific meaning; bridging requires instruction to be reworked around learner readiness; meaning is built through peers and familiar language resources; seeing and doing make science less dependent on words alone; multinational teaching changes how teachers understand learners and their own practice; and bridging language and science is also an institutional responsibility. The findings indicate that learners' scientific understanding and their ability to communicate that understanding in English do not always develop at the same rate. Teachers responded through simplified explanations, scaffolding, differentiation, peer assistance, familiar-language support, visual resources, demonstrations, and hands-on learning. The study proposed the Context-Sensitive Language and Science Bridging Framework for Multinational Classrooms, comprising six connected components that address language access, instructional support, social mediation, multimodal learning, teacher responsiveness, and institutional support.*

Keywords*—Culturally responsive teaching; multilingual classrooms; science education; scientific language; translanguaging.*

I. INTRODUCTION

Science learning requires learners to do more than remember facts and definitions. They must interpret information, understand specialized terminology, follow instructions, discuss evidence, explain phenomena, and communicate conclusions. Language is therefore closely connected to the ways learners access and demonstrate scientific understanding. This relationship becomes especially important in multinational classrooms, where students bring different first languages, levels of English proficiency, cultural backgrounds, and prior educational experiences [1], [2].

In English-medium science classrooms, learners may encounter difficulty understanding unfamiliar scientific terms, interpreting explanations, following written directions, or expressing ideas in English. These difficulties do not necessarily indicate an absence of scientific understanding. A learner may understand a process or concept but struggle to explain it using the language expected in class. Research on multilingual science education emphasizes that language and science learning can develop together when learners participate in meaningful scientific practices and draw on their existing linguistic resources [3]–[5].

Teachers consequently make instructional decisions that connect scientific content with accessible language and multiple forms of representation. These may include simplifying or rephrasing explanations, introducing vocabulary gradually, using pictures and demonstrations, providing scaffolds, organizing peer interaction, and recognizing students' familiar languages as resources for meaning-making. Multimodal and culturally responsive approaches can provide additional ways for learners to participate in science and communicate their understanding [6]–[9].

Although existing studies discuss language integration, translanguaging, scaffolding, and inclusive science instruction, there remains value in understanding how science teachers themselves experience the everyday work of bridging language and science in multinational school settings. This study therefore explored the lived experiences of science teachers at Sampoerna Academy–Citra Garden, West Jakarta, Indonesia. It was guided by the central question: How did science teachers experience bridging language and science learning in multinational classrooms? Specifically, it examined their significant experiences, the meanings formulated from those experiences, the themes that emerged, and the instructional framework that could be proposed from the findings.

II. METHODOLOGY

Research Design and Setting

The study employed a qualitative phenomenological research design grounded in Husserlian descriptive phenomenology. This approach was selected to understand the participants' firsthand experiences and the meanings they attached to teaching science in linguistically and culturally diverse classrooms. The study was conducted at Sampoerna Academy–Citra Garden, a private international school in West Jakarta, Indonesia, during School Year 2026–2027.

Participants and Data Generation

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Seven science teachers participated through total enumeration. All science teachers who met the inclusion criteria were invited: they were officially teaching Science at the research site during the school year, had direct experience teaching learners from diverse linguistic and cultural backgrounds, had encountered language-related considerations in science learning, and voluntarily agreed to participate. The primary data were generated through individual, in-depth, semi-structured interviews. Interviews were conducted at mutually convenient times in private settings, using open-ended questions and follow-up prompts. With participants' permission, interviews were audio-recorded and supplemented by field notes. Recordings were transcribed verbatim, checked for accuracy, and anonymized through participant codes.

Data Analysis

The interview narratives were analyzed following Moustakas' phenomenological procedures [10]. The researcher practiced epoché or bracketing and repeatedly read the transcripts to become familiar with the accounts. Horizontalization was then undertaken by identifying significant statements or horizons directly related to the phenomenon. Repetitive, overlapping, or irrelevant statements were removed, and formulated meanings were developed from the retained statements. Related meanings were clustered into themes. Individual textural descriptions captured what each participant experienced, while structural descriptions explained how the experiences occurred within classroom conditions. These descriptions were synthesized to develop composite descriptions and the shared essence of the phenomenon.

Trustworthiness and Ethical Considerations

Trustworthiness was addressed through credibility, transferability, dependability, and confirmability. The researcher returned to original transcripts during analysis, maintained an audit trail and reflexive journal, and used member checking and peer or expert review where appropriate. Detailed descriptions of the setting and participants supported transferability. Participation was voluntary and based on informed consent. Confidentiality and privacy were maintained through participant codes and the removal of identifying information. The researcher also maintained a distinction between professional and research roles and practiced bracketing to reduce the influence of prior assumptions.

III. Results And Discussion

Analysis of the seven teachers' narratives produced six interconnected themes. Together, the themes describe bridging language and science as an ongoing process involving access to scientific meaning, instructional adjustment, social and linguistic mediation, multimodal learning, teacher responsiveness, and institutional conditions.

A. Language Shapes Access to Scientific Meaning

Participants described language as closely connected to learners' access to science. Learners sometimes struggled with English-medium explanations, scientific terminology, classroom instructions, written questions, and the language required to express answers. Teachers also encountered situations in which students appeared to understand a concept but could not readily communicate that understanding in English. This distinction suggests that scientific understanding and English expression do not always develop at the same pace. The finding is consistent with research that treats language as an integral part of science learning and emphasizes the need to support learners in interpreting and communicating scientific ideas [3], [4], [11].

B. Bridging Requires Instruction to Be Reworked Around Learner Readiness

Teachers experienced substantial differences in learners' English proficiency, prior knowledge, science readiness, and learning pace, including among students in the same grade. A single explanation or task structure did not always meet the needs of all learners. Participants described simplifying language, rephrasing explanations, breaking complex content into smaller parts, adjusting pacing, and providing scaffolded or differentiated support. These practices reflect the role of teacher facilitation in making disciplinary learning accessible while retaining the intellectual demands of science. Research on scaffolding and language-integrated science instruction similarly highlights the importance of structured support that enables multilingual learners to participate in scientific discourse [5], [6], [12].

C. Meaning Is Built Through Peers and Familiar Language Resources

Participants described classmates, mixed-ability grouping, translation, and familiar languages as practical resources when teacher explanations in English were not immediately understood. Peer explanation sometimes helped learners clarify a word, instruction, or scientific idea. The accounts did not portray familiar-language support as identical across classrooms; for some teachers it was an immediate or temporary bridge, while others described more regular peer or bilingual assistance. This finding aligns with research that views translanguaging and learners' linguistic resources as potential tools for meaning-making rather than barriers to science participation [7], [8], [13].

D. Seeing and Doing Make Science Less Dependent on Words Alone

Teachers reported using pictures, gestures, models, demonstrations, videos, simulations, laboratory work, and hands-on activities to support understanding when spoken or written explanations were insufficient. These approaches allowed learners to observe, manipulate, and experience scientific ideas rather than depending only on verbal explanation. Multimodal representation can be particularly useful when concepts are abstract or when learners are still developing proficiency in the language of instruction [9]. The participants' accounts indicate that practical and visual experiences provided alternative routes into scientific meaning and supported participation.

E. Multinational Teaching Changes How Teachers Understand Learners and Their Own Practice

Participants described becoming more flexible and attentive to differences in learners' linguistic, cultural, and educational backgrounds. Some questioned earlier assumptions that

students at the same grade or level would have similar readiness. Others described using familiar cultural or everyday experiences to build connections with science content. These accounts suggest that teaching in multinational classrooms can reshape teachers' understanding of learner diversity and their own responsibilities. Culturally responsive science education similarly emphasizes recognizing learners' experiences and perspectives as meaningful resources for participation and learning [14].

F. Bridging Language and Science Is Also an Institutional Responsibility

Participants identified conditions that extended beyond individual classroom practice, including curriculum pacing, assessment requirements, class size, learners' language readiness upon entry, preparation time, and access to professional support. They described possible supports such as language screening, English support classes, professional development, orientation, bilingual assistance, and collaborative planning. These accounts indicate that responsive classroom strategies may be strengthened or restricted by school-level conditions. Professional development and institutional structures are therefore relevant to sustained language-responsive science instruction [12].

IV. Proposed Context-Sensitive Language and Science Bridging Framework

The six themes provided the basis for the Context-Sensitive Language and Science Bridging Framework for Multinational Classrooms. The framework is intended as a flexible, findings-based guide rather than a fixed sequence or single method. It brings together six connected components: (1) Language and Scientific Meaning Access, which helps teachers identify language demands in vocabulary, instructions, explanations, learner expression, and assessment; (2) Responsive Scaffolding and Differentiation, which guides adjustments to explanations, pacing, tasks, and support according to learner readiness; (3) Peer and Familiar-Language Mediation, which recognizes peer interaction and familiar linguistic resources as possible supports for understanding; (4) Multimodal and Experiential Science Learning, which encourages visuals, demonstrations, observation, simulations, and hands-on activities; (5) Teacher Responsiveness to Linguistic, Cultural, and Experiential Diversity, which encourages attention to learners' backgrounds and prior experiences; and (6) Institutional Language and Science Support, which identifies school-level structures, resources, and professional learning needed to sustain responsive teaching.

The framework presents these components as interconnected. Teacher responsiveness and institutional support shape the conditions for scaffolding and differentiation. These practices, in turn, support language access, peer and familiar-language mediation, and multimodal science learning. The components are intended to work together so that learners can engage with scientific concepts through multiple forms of communication and experience. Its applicability should be examined in other multilingual and multinational settings before broader implementation.

V. Conclusion And Recommendations

The study found that science teachers experienced bridging language and science learning as a continuing responsibility shaped by linguistic, cultural, instructional, and institutional differences. Learners' difficulty expressing scientific understanding in English did not necessarily mean that they lacked conceptual understanding. Teachers responded by adapting explanations and tasks, providing scaffolding and differentiation, drawing on peers and familiar languages, and using visual and experiential forms of science learning. The findings also showed that teachers' responsiveness depends partly on school conditions, including curriculum demands, assessment practices, preparation time, and professional support.

The shared essence of the experience was the continuous effort to make scientific meaning accessible across differences in language proficiency, readiness, culture, prior experience, and confidence. The proposed framework organizes the practices and conditions identified by the participants without prescribing one fixed method for every classroom. Future researchers may pilot, validate, and evaluate the framework in varied multilingual settings. School administrators may consider language-needs screening, coordinated support between science and language teachers, relevant professional development, and accessible instructional resources. Science teachers may plan explicitly for scientific vocabulary, instructional language, learner expression, and assessment wording while selecting scaffolds, peer support, familiar-language resources, visuals, demonstrations, and hands-on activities according to learners' needs.

References

[1] Boza, L., Curran, F. C., Harris-Walls, K., Tan, T. S., & Deig, A. (2024). Multilingual learners' exposure to science and language inputs in elementary school: ¿Qué sabemos? Science Education, 108(6), 1549–1589. https://doi.org/10.1002/sce.21888

[2] Buxton, C. A., & Lee, O. (2023). Multilingual learners in science education. In N. G. Lederman, D. L. Zeidler, & J. S. Lederman (Eds.), Handbook of research on science education (Vol. 3, pp. 291–324). Routledge. https://doi.org/10.4324/9780367855758-13

[3] Lee, O. (2021). Asset-oriented framing of science and language learning with multilingual learners. Journal of Research in Science Teaching, 58(7), 1073–1079. https://doi.org/10.1002/tea.21694

[4] Lee, O., Bauler, C. V., Kang, E. J. S., & Ocol, T. (2022). "Doing" science, using language: Professional development to promote science and language integration with a focus on multilingual learners. NYS TESOL Journal, 9(1).

[5] Lee, O., Grapin, S., & Haas, A. (2023). Teacher professional development programs integrating science and language with multilingual learners: A conceptual framework. Science Education, 107(5), 1302–1323. https://doi.org/10.1002/sce.21807

[6] Grapin, S. E., Haas, A., Llosa, L., & Lee, O. (2023). Developing instructional materials for English learners in the content areas: An illustration of traditional and contemporary materials in science education. TESOL Journal, 14, e673. https://doi.org/10.1002/tesj.673

[7] Charamba, E. (2023). Translanguaging as bona fide practice in a multilingual South African science classroom. International Review of Education, 69, 31–50. https://doi.org/10.1007/s11159-023-09990-0

[8] De Los Reyes, R. A., & Bagona, E. R. (2024). Translanguaging in teaching and learning science in selected multilingual elementary classrooms in the Philippines. Journal of Language, Identity & Education, 23(6), 940–954. https://doi.org/10.1080/15348458.2022.2070848

[9] Ding, A.-C. E. (2024). Supporting multilingual learners' science learning from the multimodal perspective: The case of a VR-enhanced science unit. Journal of Research on Technology in Education, 56(6), 788–808. https://doi.org/10.1080/15391523.2023.2221871

[10] Moustakas, C. (1994). Phenomenological research methods. SAGE Publications.
[11] Pun, J. K. H., Fu, X., & Cheung, K. K. C. (2024). Language challenges and coping strategies in English medium instruction (EMI) science classrooms: A critical review of literature. Studies in Science Education, 60(1), 121–152. https://doi.org/10.1080/03057267.2023.2188704
[12] Heppt, B., Henschel, S., Hardy, I., Hettmannsperger-Lippolt, R., Gabler, K., Sontag, C., Mannel, S., & Stanat, P. (2022). Professional development for language support in science classrooms: Evaluating effects for elementary school teachers. Teaching and Teacher Education, 109, 103518. https://doi.org/10.1016/j.tate.2021.103518
[13] Tai, K. W. H. (2022). Translanguaging as inclusive pedagogical practices in English-medium instruction science and mathematics classrooms for linguistically and culturally diverse students. Research in Science Education, 52, 975–1012. https://doi.org/10.1007/s11165-021-10018-6
[14] Smith, T., Avraamidou, L., & Adams, J. D. (2022). Culturally relevant/responsive and sustaining pedagogies in science education: Theoretical perspectives and curriculum implications. Cultural Studies of Science Education, 17, 637–660. https://doi.org/10.1007/s11422-021-10082-4
[15] Vygotsky, L. S. (1978). Mind in society: The development of higher psychological processes. Harvard University Press.