Integration of Philosophy of Science in Adaptive Language Learning Methods in Multicultural Classrooms

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Abstract
In the increasingly complex context of multicultural education, it is important for educators to understand how different perspectives can be integrated into learning methods to make them relevant and inclusive. One approach that can support this is to utilize philosophy of science, which provides a critical foundation for evaluating and developing learning strategies. Therefore, it is important to conduct an in-depth study on how philosophy of science can be effectively applied in culturally diverse educational environments. This study aims to examine the integration of philosophy of science in adaptive language learning methods in multicultural classrooms. Through a descriptive qualitative approach, the study explored the challenges and strategies faced by 10 educators with experience in multicultural environments. Key findings included challenges in understanding students' cultural diversity, limited resources, as well as difficulties linking theory with practice. Educators reported a lack of relevant teaching materials and adequate training, potentially hindering learning effectiveness. This research recommends the development of inclusive resources and improved professional training to create learning environments that are more adaptive and responsive to student diversity. These results are expected to contribute to improving the quality of learning in multicultural classrooms.

Keywords: Multicultural Education; Philosophy of Science; Adaptive Learning Methods; Cultural Diversity; Professional Training

Introduction

In today's era of globalization, cultural diversity in the classroom is a challenge for educators, especially in language teaching (B. Beribe, 2023; Li, 2017; Sánchez-Hernández & Barón, 2021; Suradi, 2018). Multicultural classrooms demand approaches that bridge students' backgrounds, while providing an effective and inclusive learning experience (Lehman, 2017; Parkhouse, Lu, & Massaro, 2019; Villegas, Ciotoli, & Lucas, 2017). Educators need to develop awareness of students' cultural differences, understand the values, norms, and habits they hold, and build empathy in the classroom to create bonds between students (Kurian, 2024; Lau & Shea, 2024; Smolcic & Arends, 2017; Young, Haffejee, & Corsun, 2018). The use of adaptive learning methods, such as a differentiated approach, is essential to meet the learning needs of each student (Almohammadi, Hagras, Alghazzawi, & Aldabbagh, 2017; Bernard, Borokhovski, Schmid, Waddington, & Pickup, 2019; Liu, McKelroy, Corliss, & Carrigan, 2017; Smale-Jacobse, Meijer, Helms-Lorenz, & Maulana, 2019; Xie, Chu, Hwang, & Wang, 2019). By integrating cultural elements in teaching materials, such as texts and examples from different cultures, students can feel more engaged.

In this context, philosophy of science can serve as a strong theoretical foundation for understanding how knowledge is constructed, encouraging contextual learning, and formulating more critical and reflective teaching strategies (Cofré et al., 2019; Karisan & Zeidler, 2016; Kelly & Licona, 2018;

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Suryawati & Osman, 2018). In addition, the curriculum needs to be designed to reflect cultural diversity, involving students in the development of teaching materials so that they have a voice in the learning process (Caetano, Freire, & Machado, 2020; Mpuangnan & Ntombela, 2024; Szelei, Tinoca, & Pinho, 2019, 2020). An evaluation system that is responsive to the student's cultural context and constructive feedback is also important to improve student motivation and understanding (Shepard, Penuel, & Pellegrino, 2018; Wanner & Palmer, 2018; Zeng, Huang, Yu, & Chen, 2018). By teaching the values of inclusion and mutual respect, educators can build a more harmonious society inside and outside the classroom. Through the right approach and the use of philosophy of science, language teaching in multicultural classrooms can answer the challenges of globalization and create enriching and inspiring learning experiences.

However, there are problems related to the application of a multicultural approach in language teaching in the classroom. One of the main problems is the resistance of some students who may feel uncomfortable or alienated from the methods used, especially if they come from very different cultural backgrounds (Dewi, Paragae, Wiramarta, & Darmawan, 2023; Mappaenre et al., 2023; Sarı & Yüce, 2020). This results in low student involvement in the learning process, which has an impact on the effectiveness of multicultural learning. In addition, not all educators have a deep understanding of cultural diversity and how to effectively integrate it in learning. Professional training that focuses on cultural diversity is essential to increase the capacity of teachers to manage diverse classrooms (Asfahani, El-Farra, & Iqbal, 2023; Civitillo, Juang, Badra, & Schachner, 2019; Civitillo, Juang, & Schachner, 2018; Whitaker & Valtierra, 2018).

Another challenge is the lack of resources that support teaching materials that accurately and sensitively reflect cultural diversity. Many existing curricula do not fully cover a global perspective, so students do not get a holistic learning experience (Alam & Mohanty, 2023; Hossain, 2024; Nair & Adetayo, 2019). In addition, conventional evaluation systems are often unable to capture the development of students from different cultural backgrounds, resulting in unfairness in assessment. Therefore, it is critical to continue training and professional development for educators so that they are able to overcome these challenges and create an inclusive learning environment for all students.

Therefore, it should be noted that continuous training and professional development for educators is an important step to address existing issues. Research shows that training programs designed to increase awareness of cultural diversity and responsive teaching strategies can help educators feel more confident and effective in managing diverse classrooms (Ashrafova, 2024; Pevec-Zimmer, Juang, & Schachner, 2024).

In addition, the integration of local cultural elements in the curriculum can increase the relevance of learning for students. By involving students in the development of teaching materials that reflect their cultural background, it is hoped that they will feel more engaged and actively participate in learning. This also has the potential to increase students' motivation and understanding of the material being taught (Hidayati, Yuliati, & Hutagalung, 2024; Johnson, 2017; Kong, 2021). Not only that, but it's important for educators to adopt a more inclusive evaluation approach, which takes into account the different ways students from different cultural backgrounds demonstrate their understanding and skills. As such, a fairer and more representative assessment system can be implemented, helping to support the development of each student regardless of their background (Chu, 2019; Kurian, 2024; Tai, Ajjawi, & Umarova, 2024)

The use of a philosophy of science-based approach in language teaching also opens up opportunities to formulate learning models that are not only efficient, but also encourage active student participation (Christie & de Graaff, 2017; Kang & Keinonen, 2018). By integrating theory and practice, educators can create an atmosphere that supports the exchange of ideas and experiences, which is essential for enriching students' understanding of language and culture (Ali, 2019). This approach allows students to not only receive information, but also interact with the subject matter and with fellow students. This active participation increases student engagement, which in turn can increase their motivation to learn. In this context, collaborative learning and group discussions can be effective strategies to facilitate the exchange of diverse experiences and perspectives, helping students understand different cultural contexts (Baloche & Brody, 2017; de Hei, Tabacaru, Sjoer, Rippe, & Walenkamp, 2020; Herrera-Pavo, 2021).

In addition, a philosophy-based approach encourages critical reflection among students. By encouraging them to question assumptions, think about cultural values, and explore new ways of

understanding language, educators can help students develop critical thinking skills that are essential for their lives in this era of globalization (Manihuruk, Siregar, Sari, Adisaputera, & Ansari, 2024; Sellars et al., 2018). Through this approach, students not only learn the language, but also learn to become lifelong learners who are sensitive to cultural differences and able to adapt quickly in different contexts.

Thus, this study integrates the philosophy of science as a key element in designing adaptive language learning methods. The goal is to bridge the gap between theory and practice, as well as provide practical guidance for educators in facing challenges in multicultural classrooms. By focusing on the development of teaching models based on the principles of philosophy of science, it is hoped that this research can contribute to new thinking in the context of language education. Cohesion in this text is achieved through the use of conjunction words and phrases that relate ideas in each sentence, such as the use of the pronoun "this" which refers to "research" as well as the repetition of key phrases such as "adaptive language learning methods" and "philosophy of science." Through the development of models based on philosophy of science, this research not only offers new ways to address challenges in multicultural classrooms, but also strengthens the relationship between theory and practice in language education.

Therefore, this study aims to describe the problems faced by educators in multicultural classes and provide recommendations to improve teaching effectiveness. With an analysis based on observation and interviews, this study offers a comprehensive picture of the challenges and opportunities that exist. The benefits of this research include improving the quality of language teaching and developing an inclusive and responsive educational approach to diversity. Integrating the philosophy of science in adaptive learning methods is expected to create a learning environment that values diversity, promotes effective learning, and strengthens the relationship between theory and practice, ultimately improving cross-cultural understanding among students.

Method

This study uses a descriptive qualitative method that aims to understand the integration of philosophy of science in adaptive language learning methods in multicultural classrooms (Janakiraman, Watson, Watson, & Bawa, 2019; Munardji, Kholis, & Mufidah, 2020; Smits & Janssenswillen, 2020). This approach was chosen because it allows researchers to comprehensively explore the phenomenon and provides a rich picture of the challenges faced by educators. Data were collected through literature review to identify relevant theories and practices, as well as semi-structured interviews with 10 educators who had experience in teaching in a multicultural environment. Interviews are conducted to explore views, experiences, and strategies applied in language learning. The variables analyzed included the teaching challenges and the approaches used, which were measured through open-ended questions in interviews. The data obtained from the interviews were analyzed by thematic analysis techniques, which included coding to identify emerging themes and patterns. In addition, literature reviews provide a theoretical context that supports field findings, ensuring the validity and reliability of research results. Through this approach, the research is expected to contribute to the development of more inclusive and responsive learning methods to diversity in multicultural classrooms.

Result and Discussion (Times New Roman 12, Bold)

This study successfully identified several challenges faced by educators in integrating philosophy of science into adaptive language learning methods in multicultural classrooms. These challenges cover a variety of aspects, including the cultural diversity of students, limited resources, and difficulties in connecting theory with practice. As expressed by Parsons et al. (2018), Teachers often face barriers in adapting their teaching methods to the cultural diversity within the classroom, resulting in an inability to meet the needs of all students. This demonstrates the need for a deep understanding of students' cultural backgrounds in order for teaching to be conducted effectively.

In this context, the cultural diversity of students is not only a challenge, but also a source of wealth that can be utilized in the learning process. Educators need to develop a responsive approach to the various cultural perspectives that exist in the classroom. As conveyed by Kahu & Nelson (2018), Recognizing and appreciating cultural diversity in learning can increase student engagement and facilitate more effective learning. Therefore, it is important for educators to adopt methods that integrate students' experiences and cultural values into learning materials.

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In addition, limited resources are also a significant obstacle in the implementation of adaptive learning. Many educators report a lack of access to teaching materials that are appropriate for multicultural contexts. As explained by Kumar, Zusho, & Bondie (2018), The availability of relevant and inclusive materials is essential to support effective teaching in diverse classroom contexts. Without adequate resources, educators struggle to design engaging and inclusive learning.

This condition often results in the use of materials that are inappropriate or irrelevant to the student's experience and background. This has the potential to create helplessness in learning, where students feel less engaged or underrepresented in the material being taught. As shown by Kieran & Anderson (2019), The use of teaching materials that do not reflect students' cultural diversity can reduce their motivation and participation in the learning process.

Oleh karena itu, penting bagi lembaga pendidikan untuk melakukan investasi dalam pengembangan dan provision of diverse and inclusive teaching materials. Educators need to be encouraged to collaborate in designing resources that reflect the lived experiences of students from different cultural backgrounds. As noted by Zagona, Kurth, & MacFarland (2017), Collaboration between educators in the development of teaching materials can produce more relevant and effective resources to support inclusive learning.

Providing training and support for educators in the selection and development of teaching materials appropriate to multicultural contexts is also an important step to address these challenges. With the right support, educators can be better able to create a learning environment that not only pays attention to diversity, but also celebrates and utilizes these differences as a strength in learning.

Thus, limited resources are a crucial issue that must be overcome so that adaptive language learning methods can be implemented more effectively in multicultural classrooms. With better access to relevant teaching materials and adequate training, it is hoped that educators will be better able to face these challenges and create a more inclusive learning experience for all students.

Based on the analysis of data from interviews with ten educators, several key themes related to teaching challenges and applied approaches were found.

Table 1. 1 Key Findings from the Interview

Theme	Description	Examples from Educators
Cultural Diversity	Educators face challenges in understanding and appreciating the cultural diversity of different students.	"Students from different backgrounds often have different perspectives on learning."
Learning Strategies	Various learning strategies are used to adapt to the needs of multicultural students.	"We often use the group discussion method to encourage interaction between students."
Theoretical Integration	Difficulties in relating philosophy of science theories with relevant learning practices.	"Sometimes it's hard to apply existing theories to real situations in the classroom."
Resource Limitations	Limited resources and teaching materials that support adaptive language teaching.	"We lack materials that cover diverse multicultural aspects."
Educator Training	The need for further training for educators on educational philosophies and adaptive teaching techniques.	"Additional training is urgently needed to understand how to teach more inclusively."

The results show that the main challenges in integrating philosophy of science into adaptive language learning methods are the cultural diversity of students and the difficulty in associating theory with practice. As stated by Boelens, Voet, & De Wever (2018), Educators often have difficulty adapting their teaching methods to the diverse needs of students. The educators in the study revealed that despite using a variety of strategies, such as group discussions, they still had difficulty understanding the best way to apply theoretical knowledge into everyday practice. This indicates the need for additional support in the form of better resources and professional training for educators.

Not only that, but educators also report that students' lack of a deep understanding of cultural diversity hinders their ability to design relevant and engaging learning experiences. As conveyed by

Haug (2017), A deep understanding of a student's culture is key to creating an inclusive learning environment. Without this understanding, educators may not be able to identify and address students' specific needs, which can result in student helplessness in the learning process.

Limitations in teaching resources also contribute to this challenge. Many educators complain about the lack of access to teaching materials that reflect cultural diversity and different perspectives. As stated by Juvonen, Lessard, Rastogi, Schacter, & Smith (2019), Teaching materials that are not inclusive can reinforce stereotypes and hinder student engagement. These limitations indicate the need for the development and provision of more inclusive resources to support adaptive learning methods.

Selain itu, penelitian ini menemukan bahwa banyak pendidik merasa terhambat oleh kekurangan pelatihan yang spesifik dalam pengajaran multikultural. Tanpa pelatihan yang tepat, pendidik tidak dapat memanfaatkan sepenuhnya potensi keragaman budaya yang ada di kelas mereka. Seperti yang dijelaskan oleh Paniagua & Istance (2018), tanpa pemahaman yang mendalam mengenai bagaimana mengelola kelas yang beragam, pendidik berisiko tidak dapat menciptakan lingkungan belajar yang kondusif. Hal ini menyoroti pentingnya dukungan institusi pendidikan dalam memberikan pelatihan yang sesuai agar pendidik dapat mengembangkan keterampilan dan strategi yang dibutuhkan untuk mendukung pembelajaran yang inklusif.

Furthermore, this limitation also has an impact on the interaction between educators and students. Many educators report that they struggle to build strong relationships with students due to a lack of relevant material. This is reinforced by research conducted by Hebebci, Bertiz, & Alan (2020), which states that teaching materials that are not in accordance with students' life experiences can cause emotional distance between educators and students. To address these issues, it is important for educators to develop a better understanding of students' cultural backgrounds, as well as to develop teaching materials that can reflect their experiences and perspectives.

As a step forward, it is important for educational institutions to take the results of this research seriously and make the necessary changes in the provision of resources and training. The development of a more inclusive curriculum and diverse teaching materials can help create a better learning experience for all students. With this effort, it is hoped that educators can be more effective in integrating philosophy of science into adaptive language learning methods, thereby creating a more inclusive and responsive environment to the diversity in the classroom.

In this context, collaboration between educators, curriculum developers, and other stakeholders is essential. Educational institutions must involve educators in the process of developing teaching materials to reflect the needs and expectations of students. As emphasized by Shawer (2017), Collaboration between educators and curriculum developers is essential to create teaching materials that are relevant and reflect the cultural diversity of students. This collaborative approach will not only improve the quality of teaching but will also create a sense of belonging among educators towards the curriculum they teach.

In addition, educational institutions also need to invest resources in continuous training for educators. Training specifically designed to improve understanding of educational philosophy and adaptive teaching strategies will be very beneficial. In this case, as expressed by Cherng & Davis (2019), Ongoing and relevant training is key to equipping educators with the skills needed to meet the challenges of teaching in a multicultural classroom. By providing the right support, educators will be better prepared to face challenges and design more effective and inclusive learning experiences.

Thus, the implementation of the results of this research will not only help educators in overcoming existing challenges, but also contribute to improving the overall quality of education. Efforts to integrate philosophy of science in adaptive language learning should be considered part of a larger commitment to creating an inclusive, diverse, and responsive learning environment, so that every student can reach their best potential.

The discussion related to the results of this study shows that the challenges in integrating philosophy of science into adaptive language learning methods in multicultural classrooms are very complex and diverse. Interviews with ten educators identified several key themes that reflect these challenges, including students' cultural diversity, resource limitations, and difficulties in linking theory to practice. This challenge demonstrates the need for special attention from educational institutions in designing and implementing more inclusive development programs.

Student Cultural Diversity

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One of the biggest challenges educators face is understanding and appreciating the cultural diversity of students. Le, Janssen, & Wubbels (2018), emphasized that this diversity is not only an obstacle, but can also be a source of strength in the learning process. In this context, educators are required to develop a responsive approach to various cultural perspectives in the classroom. Zepke (2018), emphasizing the importance of recognition and appreciation of cultural diversity to increase student engagement, which in turn can facilitate a more effective learning process.

Limited resources are a significant obstacle in the implementation of adaptive learning. Many educators report a lack of access to relevant and inclusive teaching materials, which are critical to supporting effective teaching in diverse classroom contexts (O'Leary et al., 2020). Without teaching materials that reflect students' experiences and backgrounds, educators face difficulties in designing engaging and inspiring learning. This often results in helplessness in the learning process, where students feel underengaged or underrepresented in the material being taught (Kirk et al., 2017).

Integration of Theory and Practice

The relationship between theory and practice in teaching philosophy of science is also a major challenge. Although educators use a variety of learning strategies, they often have difficulty in applying theories to real-life situations in the classroom. Darling-Hammond & Hyler (2020), underscore the need for additional support in the form of better resources and professional training for educators. A deep understanding of students' cultural diversity is essential for designing relevant and engaging learning experiences.

Educator Training

The study also highlights the urgent need for further training for educators in the fields of educational philosophy and adaptive teaching techniques. Without appropriate training, educators may not be able to take full advantage of the potential for cultural diversity that exists in their classrooms (Bonner, Warren, & Jiang, 2018). This shows the importance of educational institutions in providing the necessary support so that educators can develop skills and strategies to create an inclusive learning environment.

Recommendations for Next Action

As a step forward, educational institutions need to pay attention to the results of this research and make the necessary changes in the provision of resources and training. The development of a more inclusive curriculum and diverse teaching materials can help create a better learning experience for all students. It is important for educational institutions to involve educators in the process of developing teaching materials that reflect the needs and expectations of students (Hassel & Ridout, 2018). This collaboration will not only improve the quality of teaching but also create a sense of belonging among educators towards the curriculum they teach.

Addressing these challenges requires commitment from all stakeholders in education, including curriculum developers and other stakeholders. By providing better access to relevant teaching materials and adequate training, it is hoped that educators will be better able to face these challenges and create a more inclusive learning experience for all students. Through this collaborative effort, it is hoped that the philosophy of science can be integrated more effectively into adaptive language learning methods, so that every student can reach their best potential.

Conclusion

This study shows that integrating the philosophy of science into adaptive language learning methods in multicultural classrooms requires a comprehensive and responsive approach to students' cultural diversity. The study has identified key challenges facing educators, including cultural diversity, resource limitations, and difficulties in linking theory to practice. To achieve research goals, it is important for educators to develop a deep understanding of students' cultural backgrounds, as well as to create an inclusive and engaging learning environment.

The implications of the results of this study suggest that educational institutions need to invest in providing more diverse resources and relevant training for educators. Appropriate support will enhance

educators' ability to create learning experiences that not only pay attention to diversity, but also celebrate and harness those differences as a strength in the learning process.

However, this study also has limitations, such as a limited number of respondents and a focus on only one classroom context. Therefore, the suggestion for the next research is to explore the integration of philosophy of science in adaptive language learning methods in a broader context, including comparative analysis across different educational institutions and cultures. Further research can also consider innovative strategies in curriculum development that support more inclusive and effective language learning.

With these steps, it is hoped that the integration of philosophy of science in language education can be carried out more effectively, thus helping students achieve their best potential in the context of a multicultural classroom.

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