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# A SYSTEMATIC REVIEW ON CHALLENGES FOR ENHANCING SUSTAINABLE CONSTRUCTION WORKFORCE DEVELOPMENT USING COLLABORATIVE TEACHING IN NIGERIAN POLYTECHNICS

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**Abstract**
The construction industry is facing significant challenges in recruiting and retaining a skilled workforce. As the construction sector evolves, educational institutions must prepare future professionals with the necessary expertise to meet industry demands. To achieve this, tertiary institutions in Nigeria have been exploring innovative approaches for course design and delivery including co-teaching initiatives that leverage the expertise of both institutions and industry professionals' lived experiences. Therefore, this paper aims to explore the challenges associated with implementing collaborative teaching and provides recommendations for overcoming these obstacles using systematic literature review. Fifty papers were included in this study. The result of this study presents development of critical thinking skills, teamwork, and problem-solving abilities as the benefits of collaborative teaching. Additionally, this paper highlights the potential of collaborative teaching to enhance the construction workforce by preparing students for the demands of the industry and creating a pipeline of skilled workers.
**Keywords:** collaborative teaching, construction, workforce, challenges, sustainability

## Introduction

The construction industry plays a crucial role in a nation's economy, serving as a foundation for socioeconomic development and growth(Ikediashi et al., 2024). Construction workforce development is a crucial aspect of the Nigerian economy, as the country aims to build and maintain infrastructure to support its growing population. Architectural, Engineering, and Construction (AEC) professionals use both technical and soft (social) skills to tackle difficult infrastructure problems for our society. Specifically, the interdisciplinary nature of project delivery necessitates increased collaboration among specialists in order to effectively manage such difficulties. Technical skills are concerned with contractual arrangements, documentation, and processes, all of which are customised to the discipline's current understanding(Emmitt, 2013). Social skills, on the other hand, are focused with how to collaborate with people and hence cover topics such as bargaining, communication, and motivation. Social skills are essential for delivering the solution, whereas technical skills focus on issue solutions. Furthermore, the development of complicated designs and the adoption of advanced design and building processes are increasingly necessitating the construction industry to form successful partnerships with industry professionals.

Effective construction management is critical to completing projects, ensuring they are finished on time, within budget, and up to quality standards while satisfying health and safety, environmental and utility requirements. As the construction sector evolves, educational institutions must prepare future professionals with the necessary expertise to meet industry demands(Haupt & Harinarain, 2016; Zulu et al., 2018). To achieve this, tertiary institutions in Nigeria have been exploring innovative approaches for course design and delivery including co-teaching initiatives that leverage the expertise of both institutions and industry professionals' lived experiences. The co-teaching approach replaces the typical student teaching practicum with a paradigm of active cooperation, continuing professional learning, and shared leadership throughout practicum.

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Co-teaching initiatives between Higher Education Institutions (HEIs) and industry professionals can help fill the skill gap experienced in the construction workforce. Skill gap is the difference in the skills required on the job and the actual skills possessed by the employees. This can arise when a worker does not have all the skills necessary to do the job effectively. Therefore, this research aims to investigate the challenges of collaborative teaching framework in order to develop a model for the Nigerian polytechnic.

**Literature review**

Sustainable construction is an emerging field that is gaining momentum worldwide, including in Nigeria. The Nigerian government has recognized the importance of sustainable construction and has put in place policies and regulations to promote its development. However, the success of sustainable construction in Nigeria depends on the availability of a skilled workforce that is knowledgeable in sustainable construction practices(Ikediashi et al., 2024). Polytechnics in Nigeria play a vital role in developing this workforce. Collaborative teaching can enhance sustainable construction workforce development in Nigerian polytechnics. Collaborative teaching involves two or more teachers working together to plan and deliver a course. It has been shown to be an effective teaching method in various fields, including construction education. In the context of sustainable construction, collaborative teaching can bring together experts from different fields, such as engineering, architecture, and construction management, to deliver a comprehensive course that covers various aspects of sustainable construction.

Several studies have investigated the use of collaborative teaching in sustainable construction education. For instance, a study by Valdes-Vasquez and Clevenger (2015) investigated the impact of collaborative teaching on the knowledge and skills of construction students in sustainable construction practices. The study found that collaborative teaching improved students' knowledge and skills in sustainable construction practices. Another study by (Ogunsanmi, 2016) investigated the effectiveness of collaborative teaching in enhancing the sustainable construction knowledge of construction students in Nigerian universities. The study found that collaborative teaching was an effective method for teaching sustainable construction. According to Hsieh and Nguyen (2015), collaborative teaching practices are of four approaches: supportive, parallel, complementary, and team co-teaching.

Supportive co-teaching is defined as one teacher taking the lead in instruction while the second teacher rotates, provides one-on-one tutorial assistance, or assesses while the other co-teacher guides the class. Parallel co-teaching entails both co-teaching partners working with different groups of students in separate portions of the classroom. In this strategy, each co-teacher eventually works with every student in the class, either by rotating or transferring groups over time. In complimentary coteaching, one co-teacher improves the instruction offered by the other co-teacher. Finally, team co-teaching entails both co-teachers providing simultaneous instruction, and both co-teachers must be comfortable taking the lead and supporting throughout the class based on their own skills and knowledge bases. In team co-teaching, it is critical that both co-teachers are perceived as equally knowledgeable and credible.In the context of Nigerian polytechnics, collaborative teaching can enhance sustainable construction workforce development. Polytechnics in Nigeria offer various courses related to construction, such as building technology, quantity surveying, and civil engineering. These courses can be enhanced by incorporating sustainable construction practices through collaborative teaching. By bringing together experts from different fields, polytechnics can offer comprehensive courses that cover various aspects of sustainable construction, including design, construction, and management.

**Challenges of Implementing Collaborative Teaching in Nigerian Polytechnics**

Collaborative teaching is an approach in which two or more instructors work together to design and deliver instruction to students. While this approach has been shown to have many benefits for both instructors and

students such as improved student learning outcomes and increased job satisfaction for teachers, it also presents several challenges that need to be addressed to ensure its success. However, with careful planning and institutional support, these challenges can be overcome, and collaborative teaching can be an effective approach to instruction in higher education. According to Mizzi (2017), poor communication, low coordination, and inability to work effectively in teams hinder group dynamics as a result of favouritism and social dynamics. Members of the team may have different skills level which can create frustration and inefficiency. Again, teachers need to communicate regularly, openly, and honestly to ensure that they are on the same page (Ikediashi et al., 2024). Frequent communication can be hindered by factors such as language barriers, personality conflicts, and power imbalances. *Lack of collaboration skills:* According to Hsieh and Nguyen (2015), Collaborative teaching requires teachers to have a shared vision of what they want to achieve. This can be difficult if teachers have different teaching styles, philosophies, or goals. However, teachers need to work together to identify their strengths and weaknesses and determine how they can best contribute to the teaching team. This implies stating the responsibilities and roles of each team member. *Time Constraints:* Collaborative teaching requires instructors to work together, which can be time-consuming. This can be a significant challenge, especially for instructors who have a heavy workload. According to a study by Ahmed Hersi et al. (2016), time constraints are one of the biggest challenges of implementing collaborative teaching in higher education institutions as each teachers have different schedules and conflicting priorities. They found that instructors who are already overworked may be hesitant to take on additional responsibilities, making it difficult to implement collaborative teaching. *Different Teaching Styles:* Another challenge of implementing collaborative teaching is that instructors may have different teaching styles. This can lead to conflicts when trying to design and deliver instruction together. According to a study by Ikediashi et al. (2024), differences in teaching styles can cause tension and lead to a lack of cohesion between instructors, which can negatively impact the effectiveness of collaborative teaching. *Lack of Institutional Support:* Collaborative teaching requires institutional support to be successful. However, some institutions may not provide the necessary resources or support for instructors to collaborate effectively. According to a study by Ahmed Hersi et al. (2016), lack of institutional support is a common challenge of implementing collaborative teaching in higher education institutions. They found that instructors often have to work around institutional barriers to effectively collaborate, which can be time-consuming and frustrating. *Difficulty in Assessing Student Learning:* Collaborative teaching can make it difficult to assess student learning, participation, and group outcomes. With multiple instructors involved in designing and delivering instruction, it can be challenging to assess each instructor's contribution to student learning. According to a study by Johnson and Johnson (2009), assessing student learning in collaborative teaching can be complex and require careful planning. *Resistance to Change:* can be a significant challenge when implementing collaborative teaching in higher education institutions. According to a study by Spencer-Oatey (2013), some instructors may be resistant to change and may not be willing to try new teaching approaches. This can make it difficult to implement collaborative teaching, which requires a willingness to work together and try new approaches. *Resource Allocation:* Insufficient access to materials, technology, or administrative support for collaborative efforts. According to Ahmed Hersi et al. (2016), frequent software glitches, system incompatibilities, or lack of IT support disrupt collaborative activities. Students and teachers both have varying levels of comfort and skill with digital tools which limits the effective use of technology.

***Table 1: Challenges of collaborative teaching***

| S/N | Challenges | Reference(s) |
|---|---|---|
| 1. | Lack of communication skills | (Mizzi, 2017), |
| 2. | *Time Constraints* | (Ahmed Hersi et al., 2016) |

| | | |
|---|---|---|
| 3. | *Different Teaching Styles* | (Ikediashi et al., 2024) |
| 4. | Lack of Institutional Support | (Ahmed Hersi et al., 2016) |
| 5. | Difficulty in Assessing Student Learning | (Johnson & Johnson, 2009) |
| 6. | Resistance to Change | (Spencer-Oatey, 2013) |
| 7. | *Resource Allocation* | (Ahmed Hersi et al., 2016) |
| 8. | Technical Issues | (Ahmed Hersi et al., 2016) |
| 9. | Technological Proficiency | (Ahmed Hersi et al., 2016) |
| 10. | Lack of collaboration skills | (Hsieh & Nguyen, 2015), (Ikediashi et al., 2024) |

**Benefits of Collaborative Teaching**

Collaborative teaching has several benefits that can strategically enhance construction workforce development and improve teaching and learning in Nigeria polytechnic. One of the benefits is that it allows for the sharing of knowledge and expertise between teachers, which can improve the quality of education. According to a study by Ma and Marion (2024), students who participated in collaborative learning had higher achievement scores than those who learned individually. Collaborative teaching allows students to learn from one another and to share their knowledge and experiences, which can lead to deeper and more meaningful learning. This increases students' problem-solving skills as students collaborative work on projects and come up with practical and effective solutions to identified problems. Johnson and Johnson (2009) stated that collaborative learning can improve students' social skills and attitudes toward school. However, Birrell and Bullough (2005) stated that collaborative teaching promotes teamwork and collaboration among students, which can enhance students' learning experience. This enables the development of emotional well-being and social skills such as communication, teamwork and leadership which allows for positive relationships with peers which is essential in the construction industry. Construction projects require collaboration among different professionals and by promoting teamwork in the classroom, students can learn how to work together effectively and improve their communication skills. This provides students with a more diverse and well-rounded skill set that can enhance their employability. Collaborative teaching can increase students' motivation and engagement in the learning process and also be a factor of job satisfaction and increase motivation. According to a study by Kirschner et al. (2006), collaborative learning can lead to increased motivation and engagement in the classroom. Collaborative teaching allows students to take ownership of their learning and to be actively involved in the learning process, which can lead to greater motivation and engagement for both students and teachers. This enables teachers to develop new skills and knowledge as well as improve their teaching practice (Ikediashi et al., 2024). Collaborative teaching allows teachers to learn from one another and to share their expertise, which can lead to improved teaching and learning outcomes. Also, collaborative teaching brings together professionals from different fields who share knowledge and experience with students. This approach can help students to gain a better understanding of different aspects of construction and bridge the gap between theory and practice by providing students with practical experience.

***Table 2: Benefits of collaborative teaching***

| S/n | Benefits | Reference(s) |
|---|---|---|
| 1. | Sharing of knowledge and experience | (Ikediashi et al., 2024; Ma & Marion, 2024) |
| 2. | Improved Learning Outcomes | (Ma & Marion, 2024) |
| 3. | Enhanced Social Skills | (Ma & Marion, 2024) |
| 4. | Increased Motivation and Engagement | (Kazaz & Ulubeyli, 2007) |
| 5. | Professional Development for Teachers | (Kirschner et al., 2006) |
| 6. | Teamwork | (Birrell & Bullough, 2005) |

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| | | |
|---|---|---|
| 7. | Collaboration | (Birrell & Bullough, 2005) |
| 8. | Enhanced communication skills | (Ma & Marion, 2024) |
| 9. | Positive relationships | (Ikediashi et al., 2024) |
| 10. | Improved problem-solving skills | (Ikediashi et al., 2024) |
| 11. | Enhanced employability | (Birrell & Bullough, 2005) |

**Strategies to implement collaborative teaching in construction education**

Collaborative teaching is an essential strategy which can significantly improve the performance of the construction workforce. One effective technique is project-Based Learning. Project-based learning is a teaching strategy that allows students to work on real-world projects and engage in problem-solving activities. This method involves the use of project-based activities that require students to collaborate, communicate, and work in teams to complete a project. According to Xiaoping and Tao (2021), project-based learning has been shown to improve students' problem-solving skills, communication, and teamwork, which are all essential skills for the construction industry. Again, integration of technology can help to promote collaboration and communication among students. This method includes the use of online platforms, such as discussion forums, video conferencing, and collaborative software, to facilitate communication and collaboration among students. Vallance (2007) stated that technology integration improves students' communication, collaboration, and problem-solving skills, which are critical skills for the construction industry. However, the use of peers to facilitate learning can as well students' communication skills. Peer-assisted learning has been shown to improve students' communication, collaboration, and critical thinking skills, which are essential skills for the construction industry(Tibingana-Ahimbisibwe et al., 2022). Lastly, the use of group discussion, case studies and problem-solving exercises which are forms of active learning can enhance the construction workforce. According to Doolittle et al. (2023), active learning has been shown to improve students' critical thinking skills, communication, and collaboration, which are essential skills for the construction industry.

**Conceptual framework**

Fellows and Liu (2015) noted that a model must capture and represent the reality being modelled as closely as is practical, it must include the essential features of the reality, while being relatively easy to construct and operate. The conceptual model of this study builds on the existing literature and attempts to unify existing constructs and represents their linkages. The conceptual framework for enhancing construction workforce in the Nigerian construction industry consists of getting the input, understanding the challenges and enhancing of the process.

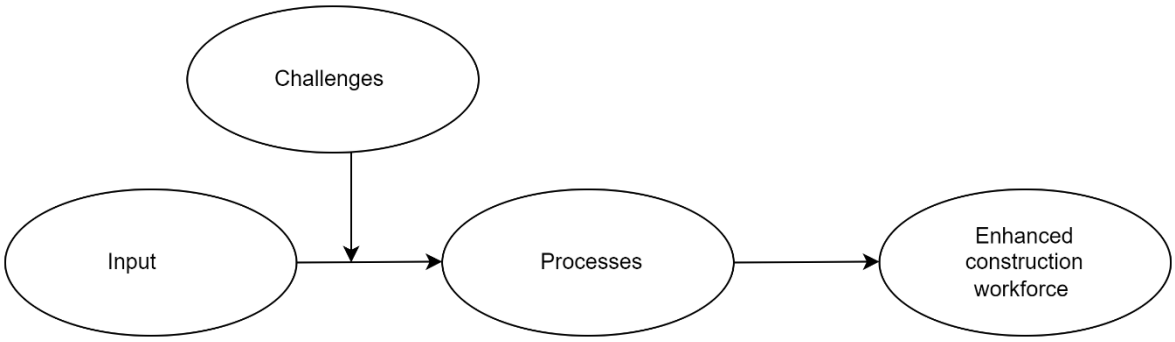



**Figure 1: Conceptual framework**

**Methodology**

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Systematic review is a best-known type of literature review that provides a holistic picture of a research topic through a systematic literature se lection, appraisal, and synthesis (Grant & Booth, 2009). Systematic reviews provide comprehensive and repeatable literature selection procedures to collect and analyse secondary data, but many present the results only with narrative commentary, lacking quantitative analysis. Literature review on the challenges and benefits of collaborative teaching served as the foundation for this study. The review focused on scholarly works and papers presented at conferences on issues surrounding collaborative teaching in order to achieve an enhanced sustainable construction workforce. Due to its recovery precision and performance accuracy, this method has always been used to locate important papers for investigations(Osei-Kyei & Chan, 2015).

Scopus is a world-leading academic databases with high reputations (Adriaanse & Rensleigh, 2013). Research shows that more and more academic articles prefer to search literature in Scopus because they are highly recognized by researchers worldwide in tracking the newest knowledge in various research fields (Peters et al., 2020). Be sides, the lists of indexed content in Scopus are clear, which is another merit (Levine-Clark & Gil, 2009). Although Google Scholar has rich content, the information in Google Scholar is less clear than Scopus (Levine-Clark & Gil, 2009). Therefore, this study chose to search relevant studies in Scopus. The search criteria term used in this study are- 'collaborative teaching', 'co-teaching', and 'collaborative working'.

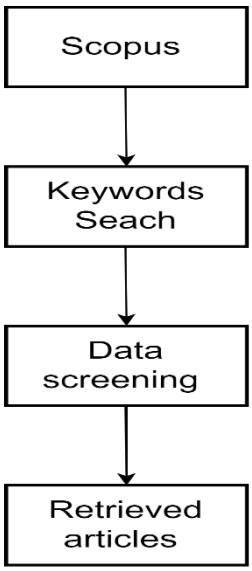
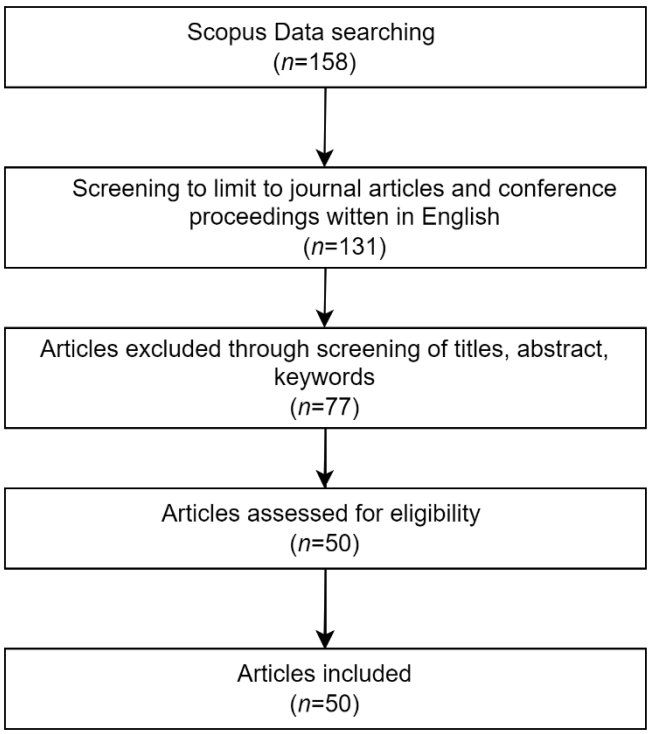



***Figure 2: Research methodology***

After the key words search, 158 studies were selected from Scopus. First, non-English articles and duplicates were excluded(n=27). Second, the title and abstract were scanned. If relevant information on collaborative teaching appeared in the title and the abstract, the full text of this study would be downloaded and examined. Fifty-four studies got through the scan of the title and abstract, and they were examined with full text. However, among these studies, four studies lacked essential quantitative information, which led to exclusion from the literature database. Therefore, only fifty studies met all the criteria and were left in this study.




**Discussion**

Collaborative teaching in higher learning institutions has been widely recognized as an effective approach to enhance student learning outcomes. Collaborative teaching is a teaching approach that brings together multiple educators to design and deliver a coherent and comprehensive curriculum which can be used to enhance the sustainable construction workforce. This approach is becoming increasingly popular in sustainable construction education as it allows for the integration of diverse expertise and perspectives to enhance the learning experience and prepare students for the evolving demands of the industry(Ma & Marion, 2024). Through literature review, 10 challenges and 10 benefits of collaborative teaching were identified in this study. One of the major challenges is the lack of time and resources. Collaborative teaching requires a significant amount of time and effort from the instructors, which can be difficult to manage in the face of other responsibilities such as research and administrative duties. Additionally, institutions may not have the necessary resources, such as technology or funding, to support collaborative teaching initiatives.

Another challenge is the potential for conflicts between instructors. Collaborative teaching involves bringing together different perspectives and teaching styles, which can lead to disagreements and misunderstandings(Ikediashi et al., 2024). Therefore, it is important to establish clear communication channels and protocols for conflict resolution. Furthermore, the assessment of student learning outcomes can be a challenge in collaborative teaching. Since multiple instructors are involved, it can be difficult to determine which instructor contributed to the success or failure of a particular learning outcome. As a result, institutions must develop clear evaluation criteria and methods to assess the effectiveness of collaborative teaching.

However, collaborative teaching can promote interdisciplinary learning, which is crucial in sustainable construction education. Sustainable construction involves the integration of different disciplines. Collaborative teaching can facilitate the integration of these disciplines by bringing together educators from different fields to design and deliver a curriculum that encompasses all aspects of sustainable construction.

Secondly, collaborative teaching can enhance the practical skills of students. Sustainable construction education requires hands-on experience in sustainable building practices, green materials, and renewable energy systems. Collaborative teaching can involve industry partners in the curriculum design and delivery to

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provide students with practical experience and real-world projects. Thirdly, collaborative teaching can enhance the critical thinking and problem-solving skills of students. Sustainable construction requires innovative solutions to complex problems such as reducing carbon emissions, minimizing waste, and conserving energy. Collaborative teaching can encourage students to think creatively and collaboratively to find sustainable solutions to these challenges. Fourthly, collaborative teaching can enhance the cultural competency of students. Sustainable construction is a global issue, and it requires an understanding of diverse cultures and perspectives. Collaborative teaching can bring together educators and students from different cultural backgrounds to promote cultural exchange and understanding.

Collaborative teaching is a promising approach to enhance the sustainable construction workforce. It can promote interdisciplinary learning, enhance practical skills, encourage critical thinking and problem-solving, and promote cultural competency. Collaborative teaching should be further explored and implemented in sustainable construction education to prepare the future workforce for the challenges of the industry.

**Conclusion**

To implement collaborative teaching in Nigeria polytechnics, there are several steps that can be taken. Firstly, it is important to identify the key disciplines that should be involved in the teaching process. Once these disciplines have been identified, it is important to work with them to develop a curriculum that incorporates their expertise and knowledge. Another important step is to provide training and support for the teachers involved in the collaborative teaching process. This might involve providing workshops and training sessions to help teachers develop their skills and knowledge and providing ongoing support and feedback to help them improve their teaching. Finally, it is important to evaluate the effectiveness of the collaborative teaching approach. This can be done through student feedback, assessments, and other metrics. By regularly evaluating the effectiveness of the approach, it is possible to make adjustments and improvements as needed and ensure that students are receiving the best possible education and training. In conclusion, collaborative teaching in Nigeria polytechnics can help to enhance construction workforce development by improving the quality of construction education and training. By bringing together experts from different disciplines, students can gain a more well-rounded education and develop the skills they need to succeed in the workforce. With the right support and resources, collaborative teaching can help to build a skilled and capable construction workforce in Nigeria.

**Implications**

Collaborative teaching in Nigeria polytechnics can help to address the skills gap challenge by improving the quality of construction education and training. Collaborative teaching involves bringing together experts from different disciplines to work together to deliver a comprehensive curriculum. This will bring unique perspectives and knowledge to the classroom, providing students with a more well-rounded education. One of the key benefits of collaborative teaching is that it can help to bridge the gap between theory and practice. Often, construction education focuses heavily on theoretical concepts, which can be difficult for students to apply in real-world situations. By involving practitioners in the teaching process, students can gain a better understanding of how these concepts are applied in practice and develop the skills they need to succeed in the workforce. Another benefit of collaborative teaching is that it can help to improve the quality of teaching and learning. By bringing together experts from different disciplines, students can benefit from a wider range of teaching styles and approaches. This can help to engage students who might otherwise struggle with traditional teaching methods and provide them with a more stimulating and engaging learning experience.

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