INTERNATIONAL JOURNAL OF ACADEMIC RESEARCH IN BUSINESS & SOCIAL SCIENCES

Vol 14, Issue 7, (2024) E-ISSN: 2222-6990

Factors Influencing the Adoption of Problem-Based Learning for Building Technology Education in Developing Countries

Ahmed Jibril Wushishi[1], Mohd Safarin Bin Nordin[2] and Mahmud Mustapha Jebba[3]

[1, 2 & 3]Faculty of Social Sciences and Humanities, School of Education, Universiti Teknologi Malaysia, 81310 Johor Bahru, Johor Malaysia, [2]Department of Technical Drawing, School of Technical Education, Niger State College of Education, PMB 39 Minna. Nigeria, [3]Automobile Technology Education, Niger State College of Education, Minna

Email: wushishi@graduate.utm.my, p-safarin@utm.my & jebba@graduate.utm.my

To Link this Article: http://dx.doi.org/10.6007/IJARBSS/v14-i7/21821 DOI:10.6007/IJARBSS/v14-i7/21821

Published Date: 26 July 2024

Abstract

Problem-based learning (PBL) is still an emerging paradigm of educational instruction in the current era. Nevertheless, PBL has been successfully adopted in many developed countries like Japan, Canada, and China. PBL has been claimed to have numerous benefits when adopted, ranging from a more motivated autonomous learner to acquiring lifelong learning skills. However, there are influencing factors that may hinder the adoption. Hence, this study explores the factors influencing the adoption of PBL in Building Technology Education (BTE) in Nigeria's Higher Educational Institutions (HEI). The study adopted a quantitative method, and the instrument used in collecting data was a questionnaire administered to 117 respondents from the Federal College of Education Gusau. Quantitative data were analyzed using descriptive statistics. All respondents agreed that all the items in the questionnaire influence the adoption of PBL in BTE. Notably, course design, and infrastructure readiness are major factors that influence the adoption of PBL

Keywords: Factors, Adoption, PBL, BTE, HEI, and Developing Countries

Introduction

Higher Educational Institutions (HEI) are immeasurable intellectual establishments in developing countries. This is because they impart a piece of in-depth knowledge and understanding to develop in the students the opportunities for lifelong learning, new frontiers of knowledge, and upgrading their knowledge and skills from time to time but based on societal needs (Dollhausen & Jütte, 2023). HEI comprises not only universities and colleges, but other professional institutions that provide teaching and learning, human resource

management, research, and innovation (Telukdarie & Munsamy, 2019). The 4th industrial revolution (4IR) is driving the global economy and associated development including HEI, which have evolved into technological centers by delivering lifelong skills for the future (Mbithi et al., 2021). HEI invariably affects the knowledge, and competence of the educated person (Whalley et al., 2021). Therefore, instructional delivery at HEI of developing countries ought to be modified to deliver services that are 4IR savvy, more importantly; the processes must be 4IR compliant to deliver lifelong skills to Building Technology Education (BTE) undergraduates.

The presence of student-centered learning in education results in vigorous collaborative self-directed learning (Kaput, 2018), and learner engagement in learning and content creation results from the influence of student-centered learning in education. The revolution in education involves teachers abandoning traditional approaches to teaching and adopting principles of skills-based guided inquiry learning like Problem-based learning (PBL), and this involves facilitators imparting useful and employable skills using their particular subject matter and professionalism for the students to practice the skills upon their graduation (Malik, 2018). PBL has been widely adopted due to its impact on students, problem-solving, decision-making, and group collaborative skills (Alkhatib, 2019). Furthermore, the independent nature of PBL made it relevant to the different abilities of learners to come up with their thoughts and individual approaches in providing solutions to the given problem through engaging in real-life activities (Gonzalez, 2019).

In Nigeria, the National Policy on Education requires the education sector to develop and standardize quality education, training, and research (Hodge et al., 2020). However, research has shown that PBL adoption in HEI of developing countries like Nigeria is still in the early stages, with literature showing a gap in the adoption (Aidoo, 2023). Since the educational system in Nigeria has been transformed new specifications are required to establish more robust teaching and learning approaches for success within their structures and the boundaries that may be required. PBL is essential in allowing transformation from a traditional teaching and learning approach to a more problem-solving learning approach. Learners can study effectively in PBL and facilitators can also do their job easily. For this reason, the paper examines, analyzes, and compares several studies relevant to the adoption of PBL and identifies the influencing factors that must be addressed to develop a successful PBL approach in HEI of developing countries. The contributions of this paper are as follows:

1. The paper examines an in-depth adoption of PBL in HEI of developing countries to create a persuasive and operational system.
2. Influencing factors based on the existing studies examined for PBL adoption in HEI are highlighted.
3. Lastly, a comparative analysis of these influencing factors highlighted is presented to determine which factors should be prioritized for effective PBL in HEI.

However, evaluations and comparisons of existing related papers assist in understanding the overall idea and identifying the aspects of PBL adoption that need more attention, and improvement, and make recommendations for future research. The paper will help future researchers grasp the state of education in developing countries and the requirements for adopting PBL in HEI.

PBL in the Changing Terrain of HEI

The concept of learning through problem management is not new but the emergence of PBL as an approach started from the works of Barrows, who found out in his research in medical instruction that medical students did not seem to think at all for the most part (Tawfik, 2015). There has been growing anxiety about HEI in Nigeria to re-assess and make clear their aims to give the best to the students (Ogunode & Musa, 2020). The move towards a model of HEI which is receptive to industry demand in the world of work has increased for greater vocational relevance and this move has brought a closer bond between HEI and industry (Nwosu et al., 2023). This has fostered changes in curricula generally, in precise the growth of personal skills and potential for life and work through the development of key skills in HEI has gained the utmost attention (Lozano et al., 2022). Innovations such as National Vocational Qualification (NVQ) and National Qualification Framework (NQF) in Nigeria have shown that the customs within the system have changed (OPOOLA, 2020). A more distinct student population compared to former years necessitates a broader range of approaches, that will take into cognizance the diversity of student learning requirements and study patterns (Yaayin, 2018). Such demands have made HEI in developing countries like Nigeria fully adopt PBL to take care of students' requirements (Hoidn et al., 2021).

The adoption of PBL arises from its innovative means of managing curriculum problems or initiating improvement in teaching and learning in HEI for BTE undergraduates (Tan, 2021). On the other hand, it may have been adopted because it offers prospects for life skill development and the call for the end of teacher-student boundaries in terms of knowledge development (Tan, 2021). There seem to be several reasons for the increasing popularity of PBL while at the same time, there is an obvious disdain for it as a stimulus for prompt transition in people's life. From the foregoing, the adoption of PBL is yet to be realized from the viewpoint of HEI in Nigeria. PBL is a significant approach to learning, which has to be fundamentally placed in HEI curricula compared to what it is presently. Nevertheless, PBL has been misjudged in different ways, which signifies that it has not been accepted as a fundamental approach within the HEI because it is an approach that is often misconstrued and this tends to result in wrong views about the prospects for its adoption (Wallace et al., 2020), and this misunderstanding has resulted in the sarcasm of its significant in terms of preparing students for an intricate and changing skillful life that can be acquired from it to develop student learning pattern (Yaayin, 2018). Learning should be seen as a recurring procedure in which students make modifications from which they acquire an understanding of themselves, and the methods and settings in which they can learn effectively.

Methodology

The study adopted a quantitative method with a descriptive research design which explains the phenomenon. The study was carried out at the Federal University of Technology Minna, Nigeria. The population comprised 117 respondents from the Federal University of Technology, Minna. No sampling was carried out since the population is of a manageable size. The instrument used for data collection is a structured questionnaire, developed using Google Forms after a review of relevant literature on PBL and the adoption of PBL in various institutions of higher learning. The instrument is divided into four sections. Section A sought information on the demography of the respondents, section B has six items and sought information on the individual factors that influence the adoption of PBL, Section, C dwelt on the establishment factors which include course design, training, etc., and lastly, section D was

on the influence the educational environment has on the adoption of PBL and these include class capacity, discussion room, etc. The instrument was based on a five-point Likert Scale of Strongly Agree (SA), Agree (A), Undecided (U), Disagree (d), and Strongly Disagree (SD) and was validated by experts before sending it through email to the respondents for administration which gave a response rate of 100%. Data were analyzed using Statistical Package for Social Science (SPSS 24.0) to obtain mean value and standard deviation.

Result

The questionnaire was administered to the respondents during the second semester of the 2022/2023 academic session, which was carried out under the PBL environment, and all 117 respondents (Lecturers, Curriculum planners, and Instructors) feedbacks were collected making a return rate of 100%. Similarly, to evaluate the data quantitively by describing it in a manageable form, descriptive statistics were calculated in percentage, mean, and standard deviation to analyze respondents' feedback. All the respondents (n=117) completed the questionnaire, and their demographic information can be found in Table 1. As indicated in Table 1, of these respondents, 56 were (male lecturers), 2 (male curriculum planners), 23 (male instructors), 11 (female lecturers), 2 (female curriculum planners), and 3 (female instructors). Making a total of 67 (69.1%) lecturers, 4 (4.1%) curriculum planners, and 26 (26.8%) instructors.

Table 1
Respondents Demography

Respondents			**Lecturer**	**Cur. planner**	**Instructor**
Gender	Male	Count	56	2	23
		% within Gender	69.1%	2.5%	28.4%
		% within Position	83.6%	50.0%	88.5%
	Female	Count	11	2	3
		% within Gender	68.8%	12.5%	18.8%
		% within Position	16.4%	50.0%	11.5%
Total		Count	67	4	26
		% within Gender	**69.1%**	**4.1%**	**26.8%**

Table 2 shows that Male (mean = 4.37, S.D. = .511) and Female (Mean =4.25, S.D = .577), $t_{(95)}$ = -.404, p= .804 in the case of motivation. Male (mean = 4.44, S.D. = .500) and Female (Mean =4.50, S.D = .516), $t_{(95)}$ = -.404, p= .659 in the case of course design. Since the p-value in both cases is greater than 0.05, there is a significant difference in the perceptions of the respondents on PBL adoption which is in favor of the male for motivation, and the course design for the females, whose mean values are higher in both cases. Similarly, in the case of Discussion Room, the male (mean = 4.49, S.D. = .527) and Female (Mean =4.56, S.D = .512), $t_{(95)}$ = -.478, p= .481, indicating that the p-value is greater than 0.05. This indicates that there is a significant difference in the perceptions of the respondents which is still in favor of the female, which has a higher mean value.

Table 2
Analysis of Respondents Perceptions Based on Motivation, Course Design and Discussion Room

S/N		Gender	N	Mean	Std.	t	df	Sig.
1	Motivation	Male	81	**4.37**	.511	**.843**	95	.804
		Female	16	4.25	.577	.776		
2	Course Design	Male	81	4.44	.500	**-.404**	95	.659
		Female	16	**4.50**	.516	-.395		
3	Discussion	Male	81	4.49	.527	-.478	95	.481
	Room	Female	16	4.56	.512	-.488		

Table 3 reveals that the respondents generally had positive perceptions as regards the factors influencing the adoption of PBL for BTE undergraduates in HEI of Nigeria. As indicated in Table 3, the mean values are greater than 2.5, the average mean value. The positivity of the mean value is determined by comparing each one with 2.5. Any mean value greater than or equal to 2.5 means agreement with the statement in the questionnaire item while those with less than 2.5 disagree with the statement. Hence, since all the mean values are greater than 2.5, this means the respondents agreed with the statements. For instance, item number nine (9) in Table 3, which sees infrastructure readiness as an influencing factor has a mean value of 4.57 (bold), which is greater than 2.5. This indicates that the majority of the respondents have the same perceptions. This also applies to item number fifteen (15) in Table 3 which has a mean value of 4.37 (bold) also greater than 2.5. This applies to all the eighteen items with a mean value greater than 2.5 indicating agreement as influencing factors in the adoption of PBL.

Table 3
Mean and Standard Deviation of the Respondents on each of the Item

S/N		N	Min	Max	Mean	Std. Dev
1	Motivation	97	3	5	4.35	.521
2	Perceived PBL usefulness	97	4	5	4.29	.455
3	Attitude towards using PBL	97	2	5	4.21	.499
4	Apprehension	97	4	5	4.48	.502
5	Perceived ease of use	97	2	5	4.40	.607
6	Self-Efficacy	97	4	5	4.47	.502
7	Course Design	97	4	5	4.45	.500
8	Creating a collaborative classroom	97	4	5	4.45	.500
9	Infrastructure Readiness	97	4	5	**4.57**	.498
10	Financial Readiness	97	4	5	4.45	.500
11	Locating resources	97	2	5	4.31	.651
12	Financial Constrain	97	3	5	4.37	.583
13	Class Capacity	97	4	5	4.57	.498
14	Discussion Room	97	3	5	4.51	.523
15	Support of Faculty	97	2	5	**4.37**	.618
16	Materials and resources	97	2	5	4.05	.882
17	Cognitive flexibility	97	2	5	4.28	.608
18	Adjusting to changing roles	97	3	5	4.32	.531

Discussion

Adopting PBL in developing countries' HEI is fundamental for applicable lifelong skills (Amiruddin et al., 2021; Rodrigues, 2023). For learning to be effective and successful, specific processes must be followed (Javed, 2023). In this regard, the factors influencing the adoption of PBL in HEI fall into (1) individuals, (2) institutions, and (3) environments. Individual comprises facilitators, students, and other stakeholders who acquire PBL skills to function effectively; institutions centered on universities and other non-degree awarding institutions while the environment depends on classrooms, discussion rooms, workshops, etc. Individuals must possess PBL abilities like perceived usefulness of PBL, the right attitude towards using PBL, (Anggraeni et al., 2023; Mora et al., 2017), and being cautious during the process by sustaining a high level of ethics. Facilitators are sometimes adamant about PBL and to some extent disdain the approach (Li et al., 2022). Nonetheless, the facilitators are more positive towards PBL, partly attributed to motivation, attitude, and self-efficacy as indicated in the result. This is similar to (Aidoo, 2023) who researched facilitators' responses toward PBL adoption. The individuals were reported as being frustrated at the beginning of the course, largely attributed to their uncertainty and unfamiliarity with the approach. Further, this suggests that as individuals familiarize themselves with PBL, they become more comfortable and confident, thereby, improving their attitude and expertise. Similar observations were also reported in a study by (Alt & Raichel, 2022), the authors found that the facilitators´ motivation and attitude increased significantly by the end of PBL activities.

The analysis shows that individuals are the most influencing factors that should be prioritized for effective PBL in HEI of developing countries. To alleviate this issue, the PBL facilitators should play an appropriate role in the preliminary phase of PBL adoption. This is particularly important for facilitators who are new to active learning approaches like PBL. It was considered important that courses, infrastructure, and financial readiness are designed to reflect the needs of the institution, and PBL contents should also match students' knowledge levels (Chigbu et al., 2023). For instance, when learners' foundations are not solid in terms of breadth and depth, they struggle to formulate learning objectives and participate in the collaborative classroom (Mulaudzi et al., 2023). Therefore, providing a well-designed course and infrastructure was an alternative to ensure quick and smooth adoption of the PBL approach. It was suggested that PBL be supplemented with relevant learning materials, resources, and ease of location of these materials and resources to provide an interactive platform to stimulate discussion and smoothing adoption (Nair et al., 2020). For example, tools and equipment were found to consolidate concepts and increase knowledge retention (Sukatiman et al., 2020). Therefore, going beyond the classrooms and providing discussion room relevance to the PBL process will be of utmost significance.

Implementing, adopting, and sustaining PBL is a resource-intensive process, requiring considerable financial, logistics, and faculty support (Solano et al., 2023). This could be more challenging for developing countries that face significant material and human resource shortages (Solano et al., 2023; Sukatiman et al., 2020). An oft-cited example of this in this review was the availability of a discussion room for students to prepare for the PBL activities. The overlap between facilitators and students demonstrates the significance of establishing a course design that matches students' existing knowledge to promote active student participation (Tan, 2021). Although course design is important, it should not be the main influencing factor hindering the adoption of PBL in HEI of developing countries. Furthermore, at the heart of the influencing factors is the support of the faculty. This was the fundamental consideration when adopting practices that underpin PBL with smooth implementation and

adoption. The environment is another factor that influences the adoption of PBL and encourages independent learning among students which simultaneously helps the students to become problem solvers (Rodriguez-Sanchez et al., 2024). Most respondents believed they were stimulated due to the conducive environment provided, with the availability of discussion rooms and faculty support. In their research, with 100 valid responses, Ge et al. (2022) asserted that the environment is a key influencing factor in adopting PBL in any HEI. Significant evidence was found on how the respondents perceived benefits in the PBL class from the environmental point of view. The respondents perceived that class capacity and cognitive flexibility allowed them to validate their arguments and exchange ideas resulting in better resolutions of the teaching and learning process in PBL. Class capacity and discussion room partly contributed to their concern about the achievement of the stated objectives and the sufficiency of content coverage (Mora et al., 2017).

Conclusion

In conclusion, the study on factors influencing the adoption of PBL in Building Technology Education (BTE) in Nigeria's Higher Educational Institutions (HEI) revealed important results. The major findings include the unanimous agreement among respondents that all items in the questionnaire influence the adoption of PBL in BTE, with course design and infrastructure readiness identified as major influencing factors. Moreover, the study emphasized the importance of adapting instructional delivery to be 4th Industrial Revolution (4IR) compliant and highlighted the presence of student-centered learning in education as a driving force for self-directed learning. Based on these findings, it is recommended that HEIs in developing countries like Nigeria focus on enhancing course design and preparing the necessary infrastructure to facilitate the adoption of PBL in BTE. Furthermore, HEI should align instructional delivery with the requirements of the 4IR and prioritize student-centered learning approaches to encourage self-directed learning. Conclusively, future research should continue to explore the factors that hinder the adoption of PBL in HEI, as well as evaluate the effectiveness of interventions aimed at promoting PBL in BTE. These efforts will contribute to the development of a more robust and successful PBL approach in HEI of developing countries.

References

Aidoo, B. (2023). Teacher Educators Experience Adopting Problem-Based Learning in Science Education. *Education Sciences, 13*(11), 1113.

Alkhatib, O. J. (2019). A framework for implementing higher-order thinking skills (problem-solving, critical thinking, creative thinking, and decision-making) in engineering & humanities. 2019 Advances in Science and Engineering Technology International Conferences (ASET),

Alt, D., & Raichel, N. (2022). Problem-based learning, self-and peer assessment in higher education: towards advancing lifelong learning skills. *Research Papers in Education, 37*(3), 370-394.

Amiruddin, M. H., Sumarwati, S., & Amat, K. (2021). The Impact of Problem-Based Learning (PBL) on Student Achievement in Engineering Subject Material at Vocational College Kuantan, Pahang. *Online Journal for TVET Practitioners, 6*(1), 1-6.

Anggraeni, D. M., Prahani, B. K., Suprapto, N., Shofiyah, N., & Jatmiko, B. (2023). Systematic review of problem based learning research in fostering critical thinking skills. *Thinking Skills and Creativity, 49*, 101334.

Chigbu, B. I., Ngwevu, V., & Jojo, A. (2023). The effectiveness of innovative pedagogy in the industry 4.0: Educational ecosystem perspective. *Social Sciences & Humanities Open, 7*(1), 100419.

Dollhausen, K., & Jütte, W. (2023). Higher Education and Lifelong Learning. In *Third International Handbook of Lifelong Learning* (pp. 397-420). Springer.

Ge, S., Leng, C. H., & Nizam Shaharom, M. S. (2022). The effect of students' readiness and achievement in online learning integrates problem-based learning pedagogy during the COVID-19 pandemic. *International Journal of Chinese Education, 11*(3), 2212585X221144901.

Gonzalez, L. (2019). The Problem-Based Learning Model. 2019 Eighth International Conference on Educational Innovation through Technology (EITT),

Hodge, E., Dougherty, S., & Burris, C. (2020). Tracking and the Future of Career and Technical Education: How Efforts to Connect School and Work Can Avoid the Past Mistakes of Vocational Education. *National Education Policy Center*.

Hoidn, S., Reusser, K., & Klemencic, M. (2021). Foundations of student-centered learning and teaching. *The Routledge International Handbook of Student-Centered Learning and Teaching in Higher Education*, 1-13.

Javed, F. (2023). Transformative Learning Strategies for Successful Teaching and Learning in the Transforming Higher Education. In *Active and Transformative Learning in STEAM Disciplines* (pp. 125-152). Emerald Publishing Limited.

Kaput, K. (2018). Evidence for Student-Centered Learning. *Education evolving*.

Li, A., Bilgic, E., Keuhl, A., & Sibbald, M. (2022). Does your group matter? How group function impacts educational outcomes in problem-based learning: a scoping review. *BMC medical education, 22*(1), 900.

Lozano, R., Barreiro-Gen, M., Pietikäinen, J., Gago-Cortes, C., Favi, C., Jimenez Munguia, M. T., Monus, F., Simao, J., Benayas, J., & Desha, C. (2022). Adopting sustainability competence-based education in academic disciplines: Insights from 13 higher education institutions. *Sustainable Development, 30*(4), 620-635.

Malik, R. S. (2018). Educational challenges in 21st century and sustainable development. *Journal of Sustainable Development Education and Research, 2*(1), 9-20.

Mbithi, P. M., Mbau, J. S., Muthama, N. J., Inyega, H., & Kalai, J. M. (2021). Higher education and skills development in Africa: An analytical paper on the role of higher learning institutions on sustainable development. *Journal of Sustainability, Environment and Peace, 4*(2), 58-73.

Mora, C. E., Díaz, B. A., Marrero, A. M. G., Gutiérrez, J. M., & Jones, B. D. (2017). Motivational factors to consider when introducing problem-based learning in engineering education courses. *The International journal of engineering education, 33*(3), 1000-10017.

Mulaudzi, M. A., Du Toit, A., & Golightly, A. (2023). Hybrid problem-based learning in Technology teacher preparation: Giving students a voice in their learning process. *Journal of Education (University of KwaZulu-Natal)*(90), 128-148.

Nair, S. S., Smritika, S., & Thomas, K. A. (2020). Revitalizing Education through Problem Based Learning Practices. *Shanlax International Journal of Education, 9*(1), 109-117.

Nwosu, L. I., Bereng, M. C., Segotso, T., & Enebe, N. B. (2023). Fourth Industrial Revolution Tools to Enhance the Growth and Development of Teaching and Learning in Higher Education Institutions: A Systematic Literature Review in South Africa. *Research in Social Sciences and Technology, 8*(1), 51-62.

Ogunode, N. J., & Musa, A. (2020). Higher education in Nigeria: Challenges and the ways forward. *Electronic Research Journal of Behavioural Sciences, 3*.

Opoola, A. (2020). An Assessment of The National Vocational Qualification Framework As A Driver For Entrepreneurship Opportunities For Non-Professional Builders.

Rodrigues, H. S. (2023). Optimization And Statistics In Higher Education: A Project Based Learning In The Sustainable Development Goals Context. EDULEARN23 Proceedings,

Rodriguez-Sanchez, C., Orellana, R., Fernandez Barbosa, P. R., Borromeo, S., & Vaquero, J. (2024). Insights 4.0: Transformative learning in industrial engineering through problem-based learning and project-based learning. *Computer Applications in Engineering Education*, e22736.

Solano, J., Gutierrez, M. Z., Pinel-Guzmán, E., Henriquez, G., & Henriquez, G. S. (2023). Barriers and solutions to successful problem-based learning delivery in developing countries–a literature review. *Cureus, 15*(8).

Sukatiman, Akhyar, M., Siswandari, & Roemintoyo. (2020). Enhancing higher-order thinking skills in vocational education through scaffolding-problem based learning. *Open Engineering, 10*(1), 612-619.

Tan, O.-S. (2021). *Problem-based learning innovation: Using problems to power learning in the 21st century*. Gale Cengage Learning.

Tawfik, A. A. (2015). Essential readings in problem-based learning: exploring and extending the legacy of Howard S. Barrows. *Interdisciplinary journal of problem-based learning, 9*(2).

Telukdarie, A., & Munsamy, M. (2019). Digitization of higher education institutions. 2019 IEEE International Conference on Industrial Engineering and Engineering Management (IEEM),

Wallace, B., Knudson, D., & Gheidi, N. (2020). Incorporating problem-based learning with direct instruction improves student learning in undergraduate biomechanics. *Journal of Hospitality, Leisure, Sport & Tourism Education, 27*, 100258.

Whalley, B., France, D., Park, J., Mauchline, A., & Welsh, K. (2021). Towards flexible personalized learning and the future educational system in the fourth industrial revolution in the wake of Covid-19. *Higher Education Pedagogies, 6*(1), 79-99.

Yaayin, B. (2018). The effectiveness of problem-based learning approach to mole concept among students of tamale college of education. *Journal of Education and Practice, 9*(12), 2222-1735.