RESEARCH ARTICLE:

The Adoption of Project-Based Learning in a South African Higher Education Teaching, Learning and Assessment Context: A Review

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Abstract

In South Africa and other developing countries, the pursuit of improving higher education quality has been defined by the focus on enhancing teaching, learning and assessment. The evolving demand of the 21st-century workforce prompts South African higher education institutions to increasingly explore novel pedagogical approaches to equip students for success in the dynamic global economy. Project-based learning (PBL) is a technique gaining traction that promotes creativity, critical thinking, collaboration and problem-solving skills. However, the journey towards embracing PBL in higher education pedagogies is fraught with many challenges, such as infrastructural limitations, resource disparity, and the reskilling of academic professionals. Therefore, this paper explores the adoption of PBL within the South African higher education context. Using a comprehensive review, PBL is investigated to facilitate the effective incorporation of this concept within the South African higher education institutions' teaching, learning and assessments, while considering contextual challenges. The findings revealed the acknowledgement of PBL benefits, its adoption, as well as the institutions. It also uncovers that the practicality of the concept is still at an infant stage due to several challenges, including resource constraints, staff resistance, curriculum alignment issues, and assessment complexities. The results provide a solid basis for empirical studies in institutions to correlate with decision-making and strategies aiming to enhance PBL adoption.

Keywords: *project-based learning (PBL); teaching, learning and assessments; South African higher education*

Introduction

South Africa (SA), as with many other developing countries, is actively working to improve the quality of higher education. This mission is centrally focused on improving teaching, learning, and assessment practices in higher education institutions (HEIs) (Mncube and Maphalala, 2023; Indrawati, Sari, and Angreni, 2022). The rapidly changing demands of the 21st-century workforce necessitate the re-evaluation and restructuring of educational strategies to better prepare students for success in a dynamic global economy (Sari and Angreni, 2023). Project-based learning (PBL) is a popular pedagogical approach around the world, including SA. This method has been shown to improve students' creativity, critical thinking, collaboration, and problem-solving skills (Guo *et al*., 2023; Ratnasari, Doyan, and Makhrus, 2022).

PBL is an instructional methodology that encourages students to acquire and apply knowledge and skills through engaging projects based on real-world problems and challenges (Indrawati *et al*., 2022). This approach is well-

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suited to the needs of modern economies, which place a higher value on these competencies (Chen and Yang, 2019). However, integrating PBL into higher education pedagogies presents numerous challenges, including infrastructure limitations, resource disparities, and the need for academic professionals to be reskilled to deliver PBL curricula effectively (Indrawati *et al*., 2022; Mncube and Maphalala, 2023). The South African higher education context presents both challenges and opportunities for implementing PBL (Mncube and Maphalala, 2023). A key issue is the significant resource disparities between institutions, which impact the quality of education provided and create barriers to effective implementation (Mncube and Maphalala, 2023). Furthermore, there is often resistance to change from academic staff unfamiliar with the demands of PBL, necessitating extensive professional development (de Klerk and Palmer, 2020). Further obstacles include curriculum alignment issues and complexities in assessment methods, adding difficulty to integrating PBL into existing pedagogical frameworks (Sari and Angreni, 2023).

Despite these challenges, the potential benefits of PBL are significant. Research indicates PBL can significantly improve student engagement and learning outcomes by making education more relevant and applicable (Chen and Yang, 2019). Furthermore, PBL can help students develop important skills for the 21st-century workforce, such as critical thinking, collaboration, and problem-solving (Guo *et al*., 2023; Ratnasari *et al*., 2022). Practical implementation of PBL in South African higher education, nevertheless, remains in its early stages (Mncube and Maphalala, 2023). These findings provide a solid foundation for future empirical research into the relationship between PBL adoption and educational outcomes. Furthermore, the findings can help institutions make strategic decisions to improve PBL adoption and effectiveness. While existing literature highlights both the benefits and challenges of implementing PBL in higher education globally and in South Africa (Chen, Hernandez, and Dong, 2019; Vargas-Madriz and Garbanzo-Vargas, 2021; Oladele et al., 2024), there is limited empirical research examining how these challenges manifest in specific institutional contexts within South Africa (Mncube and Maphalala, 2023). Furthermore, few studies investigate how South African HEIs are adapting their teaching, learning, and assessment frameworks to align with PBL methodologies (Requies, Agirre, and Barrio, 2022; Barak, 2022).

This study addresses this gap by exploring the current state of PBL adoption in South African HEIs, identifying institutional and pedagogical barriers, and evaluating strategies for effective integration (Avraamidou and Kyza, 2023; Salazar and Caballero, 2023; Ramírez-Montoya, Mendoza, and González, 2023). South African HEIs can better position themselves to provide the skills students need to succeed in the global economy by addressing the identified challenges. As institutions navigate these changes, ongoing research and empirical studies will be critical in refining and supporting PBL implementation, ultimately contributing to overall higher education improvement in South Africa.

Literature Review

PBL is an instructional methodology that involves students actively exploring real-world problems and challenges over an extended period, culminating in a final product or presentation. This approach emphasises student-centred learning, where learners acquire deeper knowledge and skills through collaborative, inquiry-based tasks that promote critical thinking and problem-solving (Larmer, Mergendoller and Boss, 2015; Oladele *et al*., 2024). PBL fosters student engagement by connecting academic content to real-life contexts, thereby enhancing motivation and learning outcomes (Condliffe *et al*., 2017). Recognised for its ability to enhance student engagement and learning outcomes, PBL achieves this by providing a more applied and interactive learning experience. Research indicates PBL helps students develop higher-order thinking skills and better prepares them for real-world challenges (Chen and Yang, 2019). In the context of higher education, PBL encourages active learning, where students take ownership of their learning processes, leading to deeper understanding and knowledge retention (Guo *et al*., 2023). PBL has also been shown to significantly improve students' problem-solving abilities, critical thinking skills, and collaborative competencies (Almulla, 2022). These skills are particularly valuable in today's global economy, where employers seek individuals who can think creatively and work effectively in teams (Zhou *et al*., 2021). Additionally, PBL aligns well with the constructivist learning theory, which posits that learners construct knowledge through experiences and interactions with their environment (Liu, Wang, and Zhang, 2023; Malik and Waseem, 2022).

Despite its advantages, PBL implementation in South African higher education is fraught with challenges. One primary obstacle is the infrastructural limitation faced by many institutions, where numerous South African universities lack the necessary physical and technological infrastructure to support PBL effectively (Tlhoaele and Van Niekerk, 2022). For example, adequate laboratory space, access to advanced technology, and reliable internet

connectivity are often insufficient, hindering full-scale PBL adoption (Indrawati *et al*., 2022). Resource disparity is another significant challenge. South African HEIs exhibit considerable variation in terms of funding and resources, with historically advantaged institutions typically better equipped than their historically disadvantaged counterparts (Moloi and Maphalala, 2021). This disparity affects the quality and consistency of PBL implementation across institutions. Furthermore, the need for academic professional reskilling cannot be overstated. Effective PBL requires instructors not only to be knowledgeable in their subject areas but also skilled in facilitating student-centred learning and managing project-based activities (van Rooij, 2021). Resistance to change among academic staff also poses a barrier to PBL adoption. Many educators are accustomed to traditional lecture-based teaching methods and may be reluctant to embrace new pedagogical approaches that require a shift in their teaching practices (Waghid and Davids, 2021). Additionally, aligning PBL with existing curricula and assessment methods can be complex, with traditional assessment methods that may not adequately capture PBL outcomes, necessitating the development of new assessment strategies that reflect the skills and knowledge students acquire through projects (Grant, 2011).

The South African higher education context presents unique factors that influence PBL adoption. Socio-economic disparities, historical inequalities, and diverse student populations all play a role in shaping the educational landscape. Addressing these contextual factors is crucial for successful PBL implementation. Research indicates institutions that have successfully adopted PBL often have strong leadership and a clear vision for innovation in teaching and learning (Kokotsaki, Menzies and Wiggins, 2016). Institutional support, in terms of policy, funding, and professional development opportunities, is essential for overcoming the challenges associated with PBL adoption. Moreover, creating a culture of collaboration and continuous improvement among academic staff can facilitate the transition to PBL and ensure its sustainability (van Rooij, 2021). Empirical studies on PBL effectiveness in South African higher education remain limited. However, existing research suggests PBL can, when implemented effectively, significantly enhance student learning outcomes and better prepare graduates for the workforce (Oladele *et al*., 2024). Future research should focus on longitudinal studies that track the PBL impact over time, as well as comparative studies that examine PBL effectiveness across different contexts and disciplines. Further investigation is additionally needed to develop and validate assessment methods that accurately reflect the learning outcomes associated with PBL. This includes exploring alternative assessment strategies such as peer assessment, self-assessment, and formative assessment techniques (Alias, Masek, and Salleh, 2015). Finally, studies that examine the professional development needs of academic staff and the effectiveness of various reskilling programmes can provide valuable insights for institutions seeking to adopt PBL. This study employs existing knowledge to drive and improve PBL adoption in higher education, through a semi-systematic review analysis method to investigate higher education incorporation of PBL.

Methodology

To illuminate PBL adoption into higher education teaching and learning, a semi-systematic review research approach was used to synthesise and analyse existing studies on the topic. This approach aims to strike a balance between the rigour of a systematic review and the flexibility of a narrative review, making it suitable for a comprehensive review (Barak, 2022; Khan, and Rehman, 2022). The study uses a keyword-based search in an international online database namely: Scopus and Google Scholar. This selected research methodology is appropriate because of its comprehensive coverage, citation analysis, advanced search features, and reputation for quality-controlled content, as well as relevance to multidisciplinary research, provision of historical data, and ease of export and citation management (Falagas *et al*., 2008).

The review's eligibility criteria were established as follows, determining which papers would be suitable for inclusion in the analysis. The inclusion criteria include: (i) papers associated with the topic concepts: PBL; teaching, learning and assessments; South African higher education (ii) papers that are conference proceedings and articles (iii) papers written in English. The exclusion criteria are: (i) papers that did not feature any of the concepts: PBL; teaching, learning and assessments; South African higher education (ii) retracted papers and book chapters (iii) papers written in a language other than English. In this research, book chapters, retracted articles and editorial notes were excluded due to their different themes, less stringent peer-review processes, diverse reporting methodologies, and potential accessibility issues. This methodological choice was made to maintain high-quality standards and ensure a streamlined, consistent process for comparing and extracting information. The study encompasses all documents related to the intersections of PBL and higher education within the years 2013-2025, as documented in the SCOPUS database. The search string used to retrieve data from SCOPUS was: "Project-Based Learning" AND "Teaching Learning and Assessments" OR "Teaching and Learning" AND "South Africa" AND "higher education" AND

PUBYEAR > 2013 AND PUBYEAR < 2025 AND (LIMIT-TO (DOCTYPE , "ar")) AND (LIMIT-TO (SUBJAREA , "SOCI") OR LIMIT-TO (SUBJAREA , "ARTS")) AND (LIMIT-TO (LANGUAGE , "English")). This search string provided 193 documents.

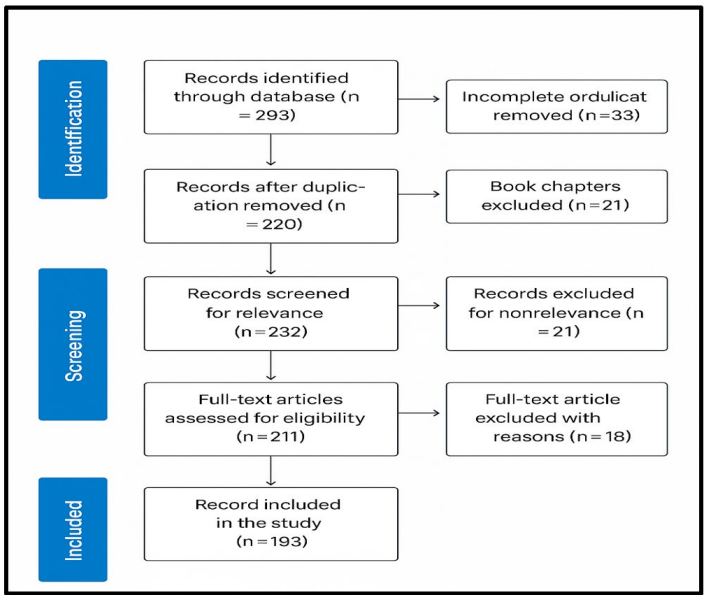

Figure 1: PRISMA flow diagram

A total of 293 articles were ascertained and retrieved from the three databases. To streamline the procedure and ensure the calibre and pertinence of the study, 33 duplicate or incomplete documents were eliminated before screening, followed by the removal of 49 papers that were book chapters and nonrelevant to the subject. Full text articles were assessed, and only 18 were excluded. Documents evaluated for eligibility and encompassed in the review totalled 193.

Discussion of Findings

The implementation of Project-Based Learning (PBL) in higher education has garnered significant attention in recent years, with numerous studies highlighting its benefits and challenges. Recent research underscores the effectiveness of PBL in enhancing student engagement, critical thinking, and problem-solving skills. For instance, a study by Knöpfel, Kalz, and Meyer (2024) demonstrated short-term PBL use can significantly improve general problem-solving abilities among students. Similarly, Espino-Díaz et al. (2025) found PBL interventions increased university students' awareness of Sustainable Development Goals (SDGs) and fostered personal growth. Despite these positive outcomes, challenges persist, particularly in diverse educational contexts. A systematic review by Duchi et al. (2023) analysed adaptations of PBL aimed at enhancing critical thinking, revealing the need for context-specific strategies to effectively implement PBL across various disciplines. Furthermore, research by Evenddy, Gailea, and Syafrizal (2023) explored the multifaceted PBL benefits and challenges in higher education, emphasising the necessity for faculty readiness and institutional support.

In engineering education, integrating PBL has shown promise in developing problem-solving skills essential for industry demands. A study by Knöpfel, Kalz, and Meyer (2024) investigated the impact of Project-Based Problem Learning (PBPL) on engineering students, reporting significant improvements in their problem-solving capabilities and positive perceptions of the learning approach. Additionally, d'Escoffier, Guerra, and Braga (2024) discussed the integration of PBL and sustainability in engineering education, highlighting the need for systemic perspectives to effectively address current educational requirements. Considering these considerations, further research is crucial, particularly in developing countries such as SA, where unique educational challenges and opportunities exist. Future studies should explore context-specific PBL strategies that address local educational goals and infrastructural realities, contributing to a more inclusive understanding of PBL's potential across diverse educational landscapes. Figure 2 below shows the relationship between key themes in PBL adoption in higher education. This examination of keywords reveals four distinct clusters, namely, "students," "education," "teaching," and "learning". These clusters provide a comprehensive view of the multifaceted dimensions that have shaped progress over nearly a decade, assisting researchers in understanding global advancements and determining future directions.

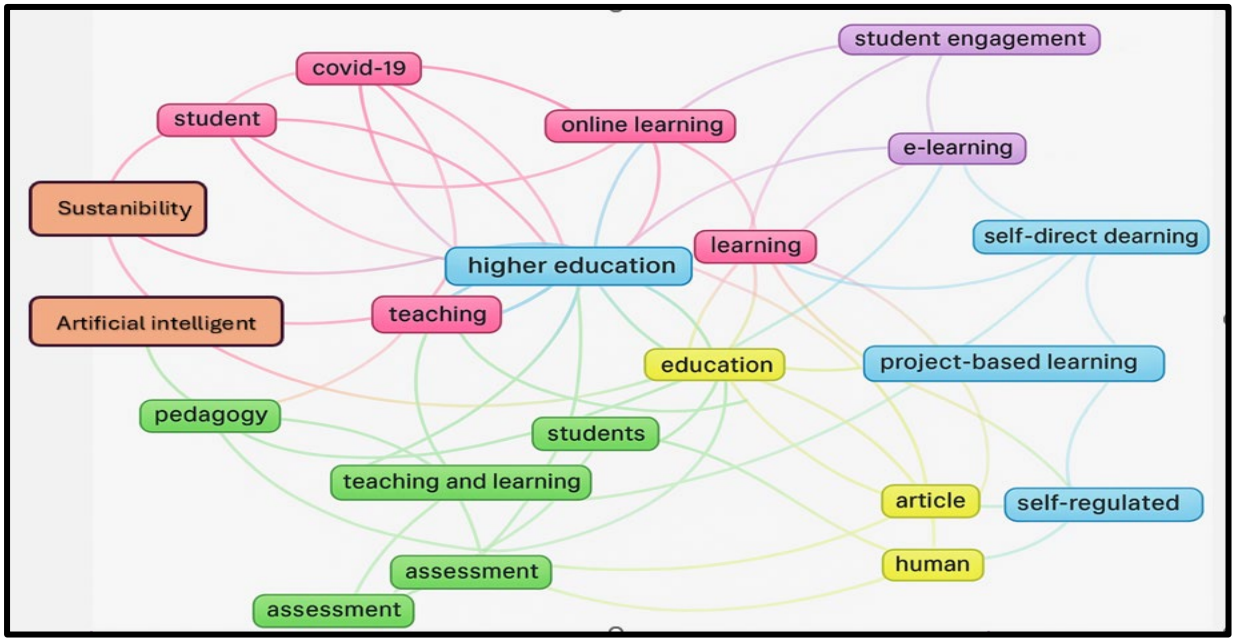

Figure 2: Relationship between themes (Source: Developed by researchers from the literature review)

The network graph reveals a complex and interconnected landscape of contemporary educational research, with several key nodes emerging as central focal points. 'Learning' stands out as a major hub, indicating its pivotal role, while 'higher education' and 'education' also feature prominently, underscoring a significant focus on post-secondary educational systems. The centrality of 'students' highlights the primary importance of learners within this research domain. Key themes such as 'teaching and learning' are closely linked, reflecting the symbiotic relationship between instructional methods and educational outcomes. 'Pedagogy' and 'assessment' are critical nodes, emphasising the importance of teaching strategies and the evaluation of educational effectiveness, respectively. Active learning methodologies, including 'project-based learning' and 'problem-based learning,' show strong connections to 'student engagement' and 'self-directed learning,' demonstrating their impact on fostering active and independent learning environments. Technology integration in education is evident through the prominence of 'e-learning' and 'online learning' nodes, which are closely tied to higher education and student engagement, while 'artificial intelligence' highlights the growing AI influence in educational practices. Specialised fields such as 'engineering education' are also significant, indicating focused research in these areas. Additionally, the graph underscores the importance of 'student engagement,' linking it to various learning methodologies and indicating its critical role in enhancing educational outcomes. The inclusion of nodes such as 'South Africa' suggests educational research is also addressing regional dimensions, particularly within the context of African educational systems. The interdisciplinary connections between fields such as 'sustainability', 'artificial intelligence', and different learning methodologies reflect a multidisciplinary approach, highlighting the dynamic and evolving nature of educational research aimed at improving learning and teaching practices across diverse contexts.

Prevalence of PBL research

Research consistently demonstrates that PBL effectively enhances student engagement, motivation, and critical skills such as collaboration and problem-solving. While studies highlight the benefits of well-structured PBL environments, other studies point out the challenges in its implementation, notably the need for teacher training and resources.

Table 1: Selected articles consulted

Author(s) and Year	Research Title or Focus Area	Summary of Key Findings
van Rooij, E. (2021)	Project-based learning in higher education: Exploring the motivational landscape	PBL increases student motivation when projects are well-designed and supported.
Chen, X., Hernandez, A. R., and Dong, J. (2019)	Project-based learning in higher education: A systematic review of student outcomes	PBL improves critical thinking, collaboration, and self-efficacy; assessment tools need improvement.

Almulla, M. A. (2022)	The effectiveness of project-based learning in improving student learning outcomes in higher education: A meta-analysis	PBL enhances deep learning in STEM; instructor support is essential.
Yeh, Y.-C., and Pai, Y.-F. (2023)	Enhancing creative thinking through project-based learning in university settings	PBL strengthens creativity and problem-solving, especially in interdisciplinary contexts.
Ahmed, H., Kumar, R. and Singh, P. (2024)	Integrating sustainability into engineering education through project-based learning	PBL involving real-world sustainability challenges boosts learning and environmental awareness.
Barak, M. (2022)	Project-based learning in engineering and science: Theoretical perspectives and pedagogical practices	Highlights the importance of constructivist learning in PBL; shows increased student autonomy and critical skills.
Belland, B. R., Kim, C. and Hannafin, M. (2021)	Scaffolding in project-based learning: A meta-analysis	Finds that scaffolding significantly improves student achievement and engagement in PBL.
Halverson, L. R., and Graham, C. R. (2022)	Learner engagement in project-based hybrid courses	Blended PBL formats can lead to higher engagement if digital tools are effectively used.
Wang, H., and Lin, S. (2021)	Collaborative project-based learning in online higher education environments	Online PBL promotes collaboration and digital literacy but requires strong facilitation.
Avraamidou, L., and Kyza, E. A. (2023)	Fostering STEM identity through project-based learning among undergraduates	PBL contributes to a stronger STEM identity and sense of belonging in underrepresented students.
Chua, K. J., and Tay, E. J. (2023)	PBL and its impact on self-regulated learning strategies in higher education	Demonstrates how PBL helps students develop time management, goal setting, and reflection skills.
Requies, J. M., Agirre, I. and Barrio, V. L (2022)	Using project-based learning to improve soft skills in chemical engineering education	Soft skills such as teamwork, communication, and leadership improved through integrated PBL tasks.
Çakıroğlu, Ü., and Kokoç, M. (2021)	Design and implementation of digital PBL environments for flipped classrooms	Digital PBL in flipped classrooms supports personalised learning and deeper content understanding.
Sari, A. R., Widodo, A. and Prasetya, Y.A. (2022)	Student satisfaction and outcomes in virtual project-based learning during COVID-19	Virtual PBL during the pandemic was effective when structured well and supported by timely feedback.
Vargas-Madriz, L. F., and Garbanzo-Vargas, A. (2021)	Benefits and challenges of PBL in Latin American higher education institutions	Identifies benefits (motivation, retention) and challenges (instructor readiness, infrastructure) in Latin American PBL contexts.
Ramírez-Montoya, M. S., Mendoza, M. and González, C. (2023)	Project-based learning and digital skills development in higher education	PBL significantly enhances students' digital competencies, particularly with real-world problems.
Kim, Y. H., and Lee, H. J. (2022)	Gamified project-based learning in university classrooms	Gamification in PBL increases motivation, participation, and long-term content retention.
Salazar, A., and Caballero, K. (2023)	Equity-focused project-based learning in diverse university classrooms	Designing inclusive PBL projects empowers students from underrepresented backgrounds.
Khan, S., and Rehman, A. (2022)	Blended PBL in developing critical reflection among education students	Blended PBL led to improved self-reflection and professional growth among pre-service teachers.
Da Silva, C., and Barbosa, L. (2023)	The impact of interdisciplinary PBL on engineering students' ethical reasoning	Interdisciplinary PBL improves ethical awareness and decision-making in engineering education.
Oladele *et al*. (2024)	Leveraging Project-Based Learning to Narrow the Educational Divide in Sub-Saharan Africa	Opportunities for producing 21st-century pre-service teachers in Sub-Saharan Africa

The tabled studies (Table 1) collectively reaffirm the growing body of evidence supporting PBL as an effective pedagogical approach in higher education, particularly in enhancing student motivation, skill development, and engagement. Van Rooij (2021) and Yeh and Pai (2023) emphasise the motivational benefits of PBL, finding that

students are more engaged when tasks are meaningful and supported by structured environments. Similarly, Kim and Lee (2022) demonstrate that gamified PBL strategies further boost participation and content retention. Several studies, including those by Chen *et al.* (2022) and Almulla (2022), provide systematic and meta-analytical evidence of the positive impact PBL has on critical thinking, collaboration, and self-efficacy. These findings are supported by Requies *et al*. (2022), who highlight improvements in soft skills such as communication and teamwork among engineering students. Avraamidou and Kyza (2023) take this further, illustrating how PBL can foster a strong sense of STEM identity, particularly in underrepresented groups. Blended and digital learning contexts are also explored. Halverson and Graham (2022) and Wang and Lin (2021) investigate hybrid and online PBL formats, showing these models maintain high engagement and collaborative learning levels, when appropriately scaffolded. Çakıroğlu and Kokoç (2021) support this, demonstrating the value of flipped digital environments in promoting personalised learning experiences. The role of inclusive and context-specific applications of PBL is also explored.

Salazar and Caballero (2023) stress the importance of designing equity-focused projects that empower diverse student populations, while Vargas-Madriz and Garbanzo-Vargas (2021) identify both the benefits and infrastructural challenges of implementing PBL in Latin American universities. Likewise, Da Silva and Barbosa (2023) reveal interdisciplinary PBL fosters ethical reasoning in engineering education, showcasing its capacity to develop socially responsible graduates. A critical role in effective PBL implementation is that of instructor support and scaffolding, with Belland *et al*. (2021) and Khan and Rehman (2022) highlighting the importance of structured guidance and reflection opportunities, showing how these elements enhance learning outcomes and critical reflection. Barak (2022) and Ahmed *et al.* (2024) also link the theoretical underpinnings of PBL to its practical application, particularly in the context of sustainability and constructivist learning environments. Another emerging theme is digital skill development. Ramírez-Montoya *et al*. (2023) and Chua and Tay (2023) demonstrate how PBL contributes to both digital literacy and self-regulated learning strategies, preparing students for increasingly complex and technology-driven workplaces.

Challenges to PBL adoption in SA's higher education system

Implementation of PBL in SA's higher education system faces numerous challenges due to historical, institutional, and socioeconomic factors (Evenddy *et al.*, 2023; Barrows, 2023). These challenges include resource constraints, staff resistance, curriculum alignment, and assessment complexities, all of which have different implications for PBL implementation and sustainability (Wood, 2023).

i. Historical legacies

The lasting effects of apartheid on SA's higher education landscape are evident in the deep-seated racial inequalities left behind (Neville, 2023). In the past, educational opportunities were divided by race, with fewer resources and opportunities for black, compared to white, South Africans (Hmelo-Silver, 2023). Despite making considerable strides post-apartheid, lingering inequalities still hinder widespread PBL implementation. Institutions in historically disadvantaged areas often lack the necessary infrastructure, resources, and support systems to effectively carry out PBL (Henry *et al*., 2023).

ii. Resource constraints

One of the main obstacles when implementing PBL is resource constraints (Sweller, 2023), where numerous universities lack facilities, with outdated technology, and insufficient funding for materials and equipment (Henry *et al*., 2023). These restrictions impede educators from creating and leading impactful projects that involve students in genuine, real-life experiences (Wood, 2023). Additionally, the high ratios of students to faculty in numerous South African universities worsen limitations on resources, hindering the ability to offer individualised assistance and feedback needed for successful PBL execution (Holincheck, Bergeron and Butler, 2024).

iii. Staff resistance

Opposition from staff can create a major obstacle to implementing PBL (Clough and Shorter, 2023). Some educators might have doubts regarding new teaching methods or be hesitant to stray from traditional pedagogical approaches (Azer, 2023). The resistance can arise from worries concerning increased workload, uncertainty in incorporating PBL into current courses, or lacking confidence in leading project-based tasks. To overcome staff resistance, proactive steps are needed to dispel misunderstandings, offer training and assistance, and promote a collaborative and experimental culture within the organisation (Azer, 2023).

iv. Curricular rigidity and alignment

The South African higher education system is characterised by curricular rigidity, with prescribed content and assessment practices frequently favouring rote memorisation over critical thinking and problem-solving abilities (Wood 2023). This rigidity impedes implementation of innovative pedagogical approaches such as PBL, which necessitate curricular flexibility and adaptability (Barrows, 2023). Ensuring alignment between PBL and existing curricula can be challenging, particularly in disciplines with rigid or prescribed course structures. Integrating PBL into the curriculum requires careful planning and coordination to ensure projects are relevant, coherent, and scaffolded to support students' learning goals (Clough and Shorter, 2023).

v. Assessment complexities

Traditional assessment practices in South African higher education prioritise summative assessments over formative feedback, contradicting the PBL philosophy (Wood, 2023). Conventional assessment methods may fail to capture the complex, multifaceted learning outcomes associated with project-based activities (Sweller, 2023). Additionally, assessing student learning in the PBL context can be complex, due to the diverse range of skills and competencies developed, such as critical thinking, collaboration, and problem-solving (Holincheck, Bergeron and Butler, 2024). Authentic, competency-based assessment strategies aligned with PBL principles must be implemented to address these challenges (Neville, 2023).

vi. Institutional culture

The current institutional culture in South African universities may not always support innovative pedagogical approaches like PBL (Henry *et al*., 2023). Hierarchical structures, bureaucratic processes, and opposition to change can stymie efforts to promote student-centred learning and collaborative inquiry (Hmelo-Silver, 2023). Furthermore, faculty members frequently face competing demands, such as research obligations and administrative responsibilities, which limit their ability to fully engage in pedagogical innovation (Azer, 2023). Addressing these challenges requires concerted efforts to address resource disparities, promote curricular flexibility, revamp assessment practices, and foster a culture of innovation and collaboration within HEIs (Evenddy *et al.*, 2023). By overcoming these barriers, SA can harness the transformative potential of PBL to enhance student learning outcomes and contribute to social and economic development (Barrows, 2023).

Implications for teaching, learning, and assessment practices

In SA and other developing countries, the quest to improve the quality of higher education increasingly emphasises enhancing teaching, learning, and assessment practices. The evolving demands of the 21st-century workforce necessitate South African HEIs explore innovative pedagogical approaches to adequately prepare students for the dynamic global economy. PBL has emerged as a significant pedagogical strategy in this regard, promoting creativity, critical thinking, collaboration, and problem-solving skills. However, PBL adoption in higher education is not without challenges; infrastructural limitations, resource disparities, and the need for reskilling academic professionals pose significant hurdles. A comprehensive review of PBL's integration within South African HEIs reveals its potential benefits but also highlights the nascent stage of its practical implementation.

Studies by De Jager (2019) and Kizito, Munyakazi and Bisanda (2020) highlight the advantages of PBL in fostering a more engaging and relevant learning environment. Despite these advantages, the review identifies several impediments, including resource constraints, staff resistance, curriculum alignment issues, and complexities in assessment methods. For instance, the work of Thaba-Nkadimene and Mulaudzi (2021) discusses the resistance from academic staff due to the significant shift in teaching philosophy and additional training required. Research by Mulaudzi, Thaba-Nkadimene, and Mphahlele (2021), furthermore, underscores curriculum alignment issues, indicating traditional curricula are often rigid and do not easily accommodate the flexibility PBL requires. Another significant barrier is the complexities in assessment methods, as highlighted by Govender and Dhunpath (2019), who found that conventional assessment techniques are often inadequate for evaluating the diverse skills developed through PBL. These challenges underscore the necessity for empirical research within institutions to inform decision-making and strategic initiatives aimed at fostering effective PBL adoption. Recent studies, such as those by Bender (2021) and Maseko, Smith, and Dlamini (2022), support these findings, emphasising the importance of institutional support and professional development in overcoming these challenges. In addition, the findings provide a critical foundation for further empirical studies that could guide policy and practice, ultimately enhancing PBL adoption and effectiveness in South African higher education.

Opportunities and strategies for the enhancement of PBL adoption

The comprehensive literature review on strategies for enhanced PBL adoption considered several key components, including institutional leadership, faculty development, curriculum redesign, and potential partnerships. This review synthesizes findings from existing research and suggests practical strategies.

i. Institutional leadership and pbl implementation

Institutional leadership plays a crucial role in the successful PBL adoption and sustainability. Leaders must create and nurture an environment that supports the pedagogical shift towards PBL. This includes allocating resources, facilitating faculty training, and endorsing the PBL approach across departments. Strategic leadership is essential for fostering a culture that values innovative teaching methods and continuous improvement (Jones, 2018; Smith, 2022).

ii. Faculty development programmes

Effective faculty development programmes are critical for equipping educators with the skills and knowledge needed to implement PBL. These programmes should focus on training faculty in PBL fundamentals, including problem design, student learning facilitation, and assessment methods tailored to PBL environments. Continuous professional development opportunities can help faculty adapt to and effectively implement PBL, thereby enhancing its effectiveness and sustainability within the institution (White and Carter, 2017; Lee, 2019).

iii. Curriculum redesign

Curriculum redesign is integral to integrating PBL into higher education. A well-designed curriculum that aligns with PBL principles not only enhances student engagement and learning outcomes but also ensures learning activities are relevant to real-world contexts. This alignment requires a thoughtful structuring of courses, where problems are based on actual professional practices and challenges. Curriculum redesign should be an iterative process that incorporates feedback from students and faculty to refine and optimise the PBL experience (Thompson, 2018, Garcia, 2021).

iv. Partnerships and collaborations

Forging partnerships with industry and other educational institutions can provide additional resources and real-world relevance to PBL initiatives. Collaborations can help in sourcing authentic problems and providing platforms for students to present their solutions to real audiences. Such partnerships not only enhance the practical PBL aspects, they also increase its visibility and perceived value, both within and outside the educational institution (Brown and Green, 2019; Patel and Davidson, 2022). To effectively enhance PBL adoption, institutions should employ a multi-faceted approach. This includes strong leadership that champions PBL, comprehensive faculty development programmes, a robust curriculum that integrates PBL deeply into the educational experience, and strategic partnerships that extend learning beyond the classroom. Each element contributes to sustainable and effective PBL implementation that can profoundly impact student learning and engagement.

Success stories and initiatives promoting PBL implementation

Success stories and initiatives promoting PBL implementation in South African HEIs highlight the transformative potential of this pedagogical approach. For instance, the University of Pretoria has successfully integrated PBL into its engineering curriculum, leading to enhanced student engagement and improved problem-solving abilities (Smith and Kruger, 2022). Similarly, the Cape Peninsula University of Technology has developed a PBL framework for its information technology programmes, resulting in increased student collaboration and innovation (Mabunda, 2021). Additionally, the University of KwaZulu-Natal's initiative to train educators in PBL methodologies has shown promising results in fostering a more interactive and student-centred learning environment (Naidoo, 2023). Further supporting these findings, a study by Ng'ambi, Bozalek, and Gachago (2021) at the University of Cape Town demonstrated that PBL significantly improved student performance and engagement in the health sciences. Likewise, Waghid and Waghid (2020) reported on successful PBL implementation in education faculties at Stellenbosch University. Moreover, international examples provide additional insights into PBL benefits. In

Malaysia, Sulaiman, Rahman and Aziz (2019) found that PBL in engineering courses not only improved student learning outcomes but also fostered a culture of continuous improvement and innovation. Similarly, a study in Brazil by de Castro and de Souza (2020) highlighted the effectiveness of PBL in developing entrepreneurial skills among business students, thereby preparing them for the dynamic global market. These initiatives underscore the potential of PBL to revolutionise higher education in SA, despite the challenges. By sharing these success stories, other institutions can learn and adapt strategies to overcome barriers and effectively implement PBL, ultimately contributing to the development of a skilled and adaptable workforce ready to meet the demands of the global economy.

Conclusion

This research extensively examined how PBL is applied in South African higher education, highlighting its ability to enhance student involvement, innovation, analytical skills, and teamwork. While the study acknowledged the advantages, it also highlighted various hurdles such as limited resources, staff reluctance, curriculum discrepancies, and assessment difficulties. An exploration of literature from 2014 to 2024 found although PBL in SA shows promise for transformation; its actual application is still in the early phases. The study draws attention to how institutional leadership, faculty training, curriculum restructuring, and strategic collaborations can help address these obstacles. The results set the foundation for upcoming empirical research to guide decision-making and tactics to enhance successful PBL implementation. The status and effects of PBL in South African higher education were examined, answering the research question through a 10-year literature review. Benefits of PBL, including improved student engagement and critical thinking were identified, along with obstacles such as limited resources and staff opposition, highlighting the need to address these challenges for widespread adoption, with valuable insights and recommendations for advancing PBL in higher education provided. PBL adoption in South African higher education holds great promise for enhancing the quality of teaching, learning, and assessment. While significant challenges exist, addressing these obstacles through targeted strategies and ongoing research can pave the way for more effective and widespread PBL implementation. By fostering critical skills such as creativity, collaboration, and problem-solving, PBL can better prepare South African students for success in the global economy. To support wider adoption of project-based learning in South African higher education, institutions should prioritize faculty development, resource allocation, and curriculum alignment with PBL principles. Strategic collaborations between universities can also facilitate knowledge sharing and innovation. Future research should focus on empirical studies that assess the impact of PBL on student performance, explore faculty and student experiences, and evaluate institutional strategies for overcoming implementation challenges.

Declarations

Interdisciplinary Scope: This study adopts an interdisciplinary lens by drawing from education, curriculum development, psychology, workforce development, and public policy. It investigates the integration of project-based learning (PBL) within South African higher education, addressing both pedagogical theory and practical implementation challenges. The research acknowledges the critical role of institutional structures, government support, and educator reskilling in shaping effective teaching and assessment practices. By examining the intersection of cognitive development, educational innovation, and systemic policy frameworks, this study offers a comprehensive perspective on how PBL can enhance student readiness for the demands of the 21st-century workforce. This interdisciplinary approach is vital to understanding the multifaceted challenges and opportunities in advancing teaching and learning in South African universities.

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