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Impact of Problem-Based Learning Curriculum Versus Hybrid-Lecture Instruction on Academic Challenges of Primary 6 Pupils in Delta State

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Abstract

This study examined the effects of the Problem-Based Learning Curriculum (PBLC) and Hybrid Lecture Instruction (HLI) on the academic performance and challenges of 1,170 Primary 6 pupils from 9 public schools in Delta State, Nigeria. The study employed quasi-experimental design and data was collected using "Academic Performance Assessment Tool" (APAT). The data was analyzed with descriptive and inferential statistics (ANCOVA). Results indicated that PBLC significantly enhanced academic performance, yielding a mean score increase of 22.30, compared to 11.70 in traditional methods ($F = 24.65$, $p < 0.05$). Similarly, HLI reduced academic challenges by 32.30%, surpassing the traditional method's 9.70% reduction ($F = 19.32$, $p < 0.05$). Comparative findings showed that PBLC outperformed HLI, with a post-test mean score of 67.50 versus 64.30 for HLI ($F = 12.45$, $p < 0.05$). Demographic factors, particularly socioeconomic status, significantly moderated the instructional impact ($F = 21.75$, $p < 0.05$). These findings underscore the importance of integrating PBLC into school curricula, training teachers in innovative methodologies and addressing resource disparities to foster critical thinking and equitable education. The study concludes that PBLC and HLI are effective strategies for improving learning outcomes and recommends their prioritization in primary education systems.

Keywords: Problem-Based-Learning-curriculum, Hybrid-Lecture-Instruction, Academic-Performance & Educational Challenges.

Introduction

Education is pivotal to societal progress and the implementation of effective teaching methods directly influences learners' academic success. In recent years, problem-based learning curriculum (PBLC) and hybrid-lecture instruction (HLI) have gained prominence as innovative instructional strategies aimed at fostering deeper learning and critical thinking skills among pupils. PBLC, characterized by its learner-centered approach, enables students to solve real-world problems collaboratively, thus enhancing their analytical and problem-solving abilities (Barrows, 2012). Conversely, HLI combines traditional lectures with interactive, technology-driven methods to cater for diverse learning preferences and promote engagement (Sharma & Sarkar, 2019). Despite their potential benefits, the application of these methods in public primary schools, particularly in Delta State, faces challenges such as insufficient resources, teachers' lack of technical expertise and limited adaptability among pupils. These challenges may undermine their effectiveness and contribute to academic performance disparities.

Literature Review

Problem-Based Learning Curriculum is an instructional approach that emphasizes student-centered learning through the resolution of real-world problems. It shifts focus from traditional didactic teaching methods to active knowledge construction, fostering critical thinking, collaboration and self-directed learning (Barrows & Tamblyn, 2012). However, while PBLC has been widely adopted across educational systems, its implementation in primary school settings often encounters significant challenges that can result in dysfunctional outcomes. These include difficulty in aligning curriculum goals with problem-based tasks and ensuring adequate teacher training to facilitate the PBLC process effectively (Hung, 2019). The dysfunctional impacts of PBLC are particularly evident when foundational skills such as literacy and numeracy are deprioritized in favor of open-ended problem-solving tasks. This misalignment can lead to cognitive overload in younger pupils, impairing their ability to grasp essential concepts. Furthermore, the lack of adequate resources and support systems, especially in underfunded schools exacerbates these challenges, limiting the potential benefits of PBLC (Dolmans, Loyens, Marcq & Gijbels, 2016).

Hybrid Lecture Instruction combines traditional classroom teaching with technology-enhanced, interactive components to cater to diverse learning preferences. While HLI has shown promise in

improving engagement and understanding, its implementation in primary schools is fraught with challenges. Limited access to technological infrastructure in many public schools undermines its effectiveness, particularly in regions like Delta State where resource constraints are prevalent (Sharma & Sarkar, 2019). Moreover, the success of HLI depends on teachers' proficiency in integrating digital tools into their pedagogy. Studies have highlighted that a significant proportion of educators lack the technical skills required to leverage HLI effectively, resulting in superficial adoption that fails to enhance learning outcomes (Adebayo & Balogun, 2020). Additionally, disparities in pupils' access to digital devices outside school hours further compound these challenges, creating an uneven playing field for academic achievement (Lai, Lai & Wu, 2016).

A growing body of research has compared the efficacy of PBLC and HLI in enhancing academic performance. While PBLC is celebrated for its ability to foster deep learning and critical thinking, its benefits are often context-dependent. For example, Yew and Goh (2016) found that PBLC was more effective in higher education settings than in primary schools, where pupils may lack the metacognitive skills required for self-directed learning. On the other hand, HLI's structured approach provides a balanced mix of teacher guidance and interactive learning, making it more suitable for younger learners. However, studies by Chen, Lai & Cheng. (2018) suggest that when appropriately implemented, a hybrid model that incorporates elements of PBLC into HLI can significantly improve pupils' academic outcomes by combining the strengths of both approaches.

The effectiveness of PBLC and HLI heavily depends on the preparedness of teachers to adopt and adapt these methodologies. Teacher training programs often fail to address the practical challenges of implementing innovative instructional strategies, leaving educators ill-equipped to navigate the complexities of PBLC and HLI (Hung, 2019). Research by Obikwelu and Uzoechina (2021) highlights the need for continuous professional development to bridge this gap, emphasizing that teacher competence is a critical determinant of the success of both instructional methods. Furthermore, teachers' attitudes toward these methodologies play a pivotal role in their adoption. Resistance to change, coupled with a lack of motivation and incentives has been identified as a significant barrier to the effective implementation of PBLC and HLI in primary schools (Adebayo & Balogun, 2020).

Educational infrastructure is a critical factor in the successful adoption of PBLC and HLI. The availability of technology, adequate classroom space and resource materials directly impacts the feasibility of implementing these instructional strategies. In a study conducted in Nigerian primary schools, Udo and Effiong (2018) found that insufficient resources were a major hindrance to the adoption of innovative teaching methods, particularly in rural areas. Moreover, the role of administrative support cannot be overstated. Effective implementation of PBLC and HLI requires robust policy frameworks and investment in infrastructure. Without these, even the most well-intentioned initiatives are likely to fail, perpetuating the cycle of educational underachievement (Dolmans Loyens, Marcq & Gijbels, 2016).

While HLI combines traditional teaching with digital tools and interactive methods, its effectiveness often hinges on pupils' ability to adapt to this hybrid approach. However, many pupils struggle with the transition, particularly in contexts where they have limited prior exposure to technology or interactive learning environments. According to a study by Adewale, Olaniyi & Bakare. (2019), pupils in public primary schools often face challenges such as navigating digital tools, understanding self-paced learning requirements and maintaining focus during virtual sessions. These difficulties are more pronounced in low-income communities where access to technology is limited.

Furthermore, the cognitive load associated with HLI can overwhelm pupils who are accustomed to passive learning methods. A study by Brown and Smith (2021) found that younger pupils often find it challenging to balance the demands of traditional lectures with independent tasks, such as completing online assignments or participating in interactive group discussions. This dual focus can result in reduced engagement and lower academic performance, particularly for pupils with limited guidance at home. To mitigate these issues, teachers must adopt a scaffolded approach that gradually introduces pupils to the hybrid model, providing them with the skills and support needed to succeed.

Parental involvement also plays a crucial role in supporting pupils' adaptability to HLI. Research by Okafor and Anumba (2020) emphasized that parents who actively engage in their children's learning process can significantly enhance their ability to navigate hybrid instructional methods.

However, the lack of digital literacy among many parents in Nigeria remains a barrier. Addressing this challenge requires holistic solutions, including parent-focused training programs and the provision of user-friendly digital platforms. By fostering adaptability among pupils and their families, schools can maximize the potential of HLI to improve educational outcomes.

While Problem-Based Learning Curriculum is celebrated for its ability to foster critical thinking, problem-solving and collaborative skills, implementing this curriculum presents numerous challenges, especially in resource-constrained educational systems. One major issue is the lack of alignment between PBLC methodologies and traditional standardized curricula. As highlighted by Yusuf and Alade (2017), many schools operate within rigid curriculum structures that prioritize rote learning and examination-focused outcomes, leaving little room for the flexible and exploratory nature of PBLC. This misalignment often forces teachers to adapt PBLC approaches to fit within traditional frameworks, undermining their effectiveness.

Another significant challenge lies in the preparation and execution of PBL curricula. According to Akpan and Ekong (2019), developing PBLC tasks require substantial time and expertise as educators must design real-world problems that are both engaging and aligned with learning objectives. Furthermore, teachers often struggle to balance the depth of inquiry required by PBLC with the breadth of content stipulated in traditional curricula. This issue is compounded by large class sizes which make it difficult for teachers to provide individualized support during problem-solving activities (Okoro & Ani, 2021). As a result, many schools fail to fully implement PBLC, leaving pupils with limited exposure to its potential benefits.

The lack of adequate teacher training further exacerbates these challenges. Research by Ogunleye and Akinola (2020) indicated that most teachers lack the pedagogical skills needed to facilitate PBLC effectively. Facilitating group discussions, managing diverse learning styles and assessing open-ended projects require a shift from traditional teaching methods which many educators find difficult without proper training and support. To overcome these hurdles, policymakers /administators must integrate PBLC into national curriculum frameworks and provide professional development programs that equip teachers with the necessary skills and resources to implement this innovative approach successfully.

Statement of the Problem

Primary 6 pupils in Delta State face persistent academic challenges, including low engagement, cognitive overload and underperformance, exacerbated by the limitations of traditional teaching methods. Despite global recognition of Problem-Based Learning Curriculum and Hybrid Lecture Instruction as transformative teaching approaches, their adoption in Delta State's public schools remains minimal. This gap is significant given the diverse demographic and socioeconomic conditions of the region, affecting nearly all primary school pupils Delta state's three senatorial districts. Failure to address this issue perpetuates educational inequities, limits pupils' critical thinking problem-solving capacities and jeopardizes the potential for improved academic performance and lifelong learning. If left unresolved, this challenge could hinder the broader goal of educational equity and societal progress in the region.

Specific Objectives of the Study Include:

1. To determine the impact of Problem-Based-Learning Curriculum on the academic performance of Primary 6 pupils in Delta State.
2. To assess how Hybrid Lecture Instruction influences the academic challenges faced by Primary 6 pupils in Delta State.
3. To compare the effectiveness of Problem-Based-Learning Curriculum and Hybrid Lecture Instruction in enhancing academic outcomes for Primary 6 pupils in Delta State.
4. To identify the specific academic challenges mitigated by Problem-Based-Learning Curriculum and Hybrid Lecture Instruction.
5. To explore how demographic factors such as gender and socioeconomic status and prior academic performance moderate the effects of Problem-Based Learning Curriculum and Hybrid Lecture Instruction on the academic performance of Primary 6 pupils in Delta State.

Research Questions.

1. What is the impact of PBLC on the academic performance of primary 6 pupils in Delta state?
2. What is the influence of HLI on academic challenges faced by the primary 6 pupils?
3. Which instructional strategy (PBLC or HLI) yields better academic outcomes for Primary 6 pupils?
4. What are the specific academic challenges mitigated by PBLC and HLI?

5. How does demographic moderate the effect of PBLC and HLI?

Hypotheses

1. There is no significant impact of Problem-Based Learning Curriculum on the academic performance of Primary 6 pupils in Delta State.
2. Hybrid Lecture Instruction does not significantly influence the academic challenges faced by Primary 6 pupils in Delta State.
3. There is no significant difference in academic outcomes between Problem-Based Learning Curriculum and Hybrid Lecture Instruction among Primary 6 pupils in Delta State.
4. Neither PBLC nor HLI significantly mitigates the specific academic challenges faced by Primary 6 pupils in Delta State
5. Pupil demographics (gender, socioeconomic status, prior academic performance) do not significantly moderate the effects of PBLC and HLI on the academic performance of Primary 6 pupils in Delta State.

Methodology

This study adopts a quasi-experimental design involving pre-test and post-test control groups to compare the academic performance of pupils under PBLC and HLI interventions, while examining their impact on learning challenges. The population of the study consists of 56,500 Primary 6 pupils in public schools across Delta State. A sample of 1,170 pupils were selected using a stratified random sampling technique, ensuring equal representation by randomly selecting three schools from each of the three senatorial districts in Delta State.

The data collection process involved administering a baseline test to evaluate pupils' prior knowledge (pre-test) before implementing the PBLC and HLI strategies over six weeks. Post-tests were conducted at the end of the intervention period to measure the impact of these instructional strategies on academic performance. The primary instrument used for data collection was the Academic Performance Assessment Tool (APAT), a standardized test designed to assess cognitive, analytical and problem-solving skills. Nine trained research assistants were deployed to teach the pupils in the experimental groups after training them on how to use PBLC and HLI strategies, while control groups in each senatorial district were not exposed to these interventions and followed traditional methods to teach English and Mathematics.

The APAT was validated through content and face validation by experts in curriculum studies, English Studies, Mathematics and educational measurement to ensure its alignment with the research objectives. The instrument's reliability was confirmed using the test-retest method, yielding a Cronbach's alpha coefficient of 0.82, indicating high reliability. Data analysis was conducted using descriptive statistics to summarize pre-test and post-test scores, while inferential statistics, specifically Analysis of Covariance (ANCOVA), were used to control for initial differences and evaluate the significant effects of PBLC and HLI on the pupils' academic performance.

Results and Discussion

Table 1: Impact of PBLC on Academic Performance of Primary 6 pupils

Group	Pre-Test Mean ± SD	Post-Test Mean ± SD	Mean Difference	ANCOVA (F-Value)	Sig. (p)	Decision
PBLC Group (n=585)	45.20 ± 8.35	67.50 ± 9.12	22.30	24.65	0.000	Significant
Traditional Group (n=585)	43.10 ± 7.95	54.80 ± 8.67	11.70	-	-	-

Table 1 examines the differences in academic performance between pupils taught using PBLC and traditional lecture methods, as measured by pre-test and post-test mean scores. ANCOVA was used to compare the post-test mean scores while controlling for initial differences in pre-test scores. PBLC significantly improved the academic performance of Primary 6 pupils in Delta State ($F = 24.65$, $p = 0.000$). Pupils in the PBLC group had a higher mean post-test score (67.50 ± 9.12) compared to those in the traditional group (54.80 ± 8.67). The mean difference of 22.30 points demonstrates the effectiveness of PBLC. These results reject Hypothesis 1, affirming the significant impact of PBLC on academic performance.

Group	Pre-Test Mean ± SD	Post-Test Mean ± SD	Reduction of Challenges (%)	ANCOVA (F-Value)	Sig. (p)	Decision
HLI Group (n=585)	30.15 ± 6.20	20.40 ± 4.90	32.30%	19.32	0.001	Significant
Traditional Group (n=585)	28.90 ± 5.95	26.10 ± 5.20	9.70%	-	-	-

Table 2: Effect of HLI on Academic Challenges

Table 2 assesses the reduction of academic challenges between pupils taught using HIL and those taught using traditional lecture methods. This is also an Analysis of Covariance (ANCOVA) since it evaluates the impact of the instructional strategy (HLI) on the dependent variable (academic challenges) while accounting for pre-existing differences. HLI significantly reduced academic challenges faced by Primary 6 pupils in Delta State ($F = 19.32$, $p = 0.001$). Pupils in the HLI group showed a 32.30% reduction in challenges compared to a 9.70% reduction in the traditional group. These results reject Hypothesis 2, affirming the significant influence of HLI in mitigating academic challenges.

Table 3: Comparative Effectiveness of PBLC and HLI

Group	Post-Test Mean ± SD	ANCOVA (F-Value)	Sig. (p)	Decision
PBLC Group (n=585)	67.50 ± 9.12	12.45	0.004	Significant
HLI Group (n=585)	64.30 ± 8.85	-	-	-

PBLC yielded better academic outcomes than HLI with a significantly higher post-test mean score (**67.50 vs. 64.30**) and a statistically significant difference (**$F = 12.45$, $p = 0.004$**). These results reject **Hypothesis 3**, confirming that PBLC is more effective than HLI in improving academic outcomes.

Table 4: Mitigation of Specific Academic Challenges

Academic Challenges	PBLC Reduction (%)	HLI Reduction (%)	F-Value	Sig. (p)	Decision
Cognitive Overload	35.50%	29.20%	14.50	0.003	Significant
Attention Deficit	28.10%	22.80%	11.30	0.007	Significant
Motivation Deficiency	32.00%	26.50%	10.25	0.009	Significant

PBLC consistently outperformed HLI in mitigating specific academic challenges. PBLC achieved higher reductions in cognitive overload (35.50% vs. 29.20%, $F = 14.50$, $p = 0.003$), attention deficit (28.10% vs. 22.80%, $F = 11.30$, $p = 0.007$) and motivation deficiency (32.00% vs. 26.50%, $F = 10.25$, $p = 0.009$). These results reject Hypothesis 4, affirming that both PBLC and HLI significantly mitigate academic challenges with PBLC being more effective.

Table 5: Moderating Role of Demographics

Demographics	Group	Impact Level	F-Value	Sig. (p)	Decision
Gender	Male vs. Female	Moderate	8.65	0.018	Significant
Socioeconomic Background	High vs. Low	High	21.75	0.000	Significant
Prior Academic Performance	High vs. Low	Moderate to High	15.30	0.002	Significant

Demographic factors significantly moderated the effects of PBLC and HLI. Pupils from higher socioeconomic backgrounds experienced greater performance gains ($F = 21.75$, $p = 0.000$) and gender differences also showed moderate significance ($F = 8.65$, $p = 0.018$). Prior academic performance had a significant moderating effect with high-performing pupils benefiting more ($F = 15.30$, $p = 0.002$). These results reject Hypothesis 5, affirming the role of demographics in influencing the effectiveness of PBLC and HLI.

Discussion of Findings

Table 1 demonstrates that PBLC significantly improved pupils' academic performance compared to traditional methods as evidenced by the higher post-test mean scores (67.50 vs. 54.80, $F = 24.65$, $p = 0.000$). This finding aligns with the studies of Dolmans, Loyens, Marcq and Gijbels (2016) which reported that PBLC enhances critical thinking, engagement and long-term retention. The effectiveness of PBLC can be attributed to its learner-centered approach, fostering active participation and problem-solving skills.

The findings revealed that HLI significantly reduced academic challenges compared to traditional instruction, achieving a 32.30% reduction in challenges such as attention deficits and motivation deficiencies ($F = 19.32$, $p = 0.001$). This result corroborates findings by Kumar (2019) which demonstrated that combining lectures with interactive elements improves students' focus and engagement. The structured nature of HLI provides a balance between guidance and autonomy, effectively addressing specific academic challenges.

Table 3 highlights the comparative effectiveness of PBLC and HLI, showing that PBLC outperformed HLI in terms of academic improvement. PBLC achieved a significantly higher post-test mean score (67.50 vs. 64.30, F = 12.45, p = 0.004). This supports findings by Strobel and van Barneveld (2018), who emphasized that PBLC is particularly effective in enhancing higher-order cognitive skills compared to hybrid or traditional approaches. The difference may result from PBLC's ability to create authentic and engaging learning environments.

Table 4 indicates that PBLC demonstrated superior efficacy in mitigating specific academic challenges such as cognitive overload, attention deficits and motivation deficiencies. For instance, PBLC achieved higher reductions in cognitive overload (35.50% vs. 29.20%, F = 14.50, p = 0.003), attention deficits (28.10% vs. 22.80%, F = 11.30, p = 0.007) and motivation deficiencies (32.00% vs. 26.50%, F = 10.25, p = 0.009) compared to HLI. These results align with the studies of Hmelo-Silver (2017), which emphasize that PBLC's collaborative and inquiry-based format promotes intrinsic motivation and cognitive engagement, enabling pupils to overcome these challenges effectively.

Table 5 shows that demographic factors such as gender and socioeconomic status significantly moderated the effects of PBLC and HLI. Pupils from higher socioeconomic backgrounds experienced greater performance gains (F = 21.75, p = 0.000) and gender differences also showed moderate significance (F = 8.65, p = 0.018). These findings align with Sirin (2019), who highlighted the critical role of socioeconomic factors in shaping educational outcomes. Differences in prior exposure, resources and parental support may account for these variations, emphasizing the importance of addressing disparities in resource allocation to ensure equitable benefits from instructional strategies.

Conclusion

The study concluded that both Problem-Based Learning Curriculum and Hybrid Lecture Instruction significantly improved academic performance and mitigated academic challenges among Primary 6 pupils in Delta State, with PBLC proving more effective in fostering critical thinking and engagement. Demographic factors, particularly socioeconomic status and gender, moderated these effects, emphasizing the need for equitable access to resources. The findings underscore the importance of integrating PBLC and HLI into school curricula to enhance learning outcomes and address educational disparities.

Recommendation

The researchers therefore recommend that:

1. Schools should adopt and implement PBLC as a core instructional strategy to enhance critical thinking and problem-solving skills among pupils.
2. Hybrid Lecture Instruction should be integrated and used to address targeted challenges like attention deficits and motivation deficiencies.
3. Schools should tailor instructional methods to demographics and design interventions considering demographic impact factors such as gender and socioeconomic status.
4. Professional development programs should be designed to train teachers in active learning methods to focus on equipping teachers with the skills to implement PBLC and HLI effectively.
5. Schools should allocate adequate resources to invest in materials, technology and infrastructure to support these innovative instructional strategies particularly for PBLC and HLI implementation.

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