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THE EFFECT OF PROJECT-BASED LEARNING ON STUDENTS' CRITICAL THINKING IN SECONDARY SCHOOLS IN AWKA SOUTH LOCAL GOVERNMENT AREA, ANAMBRA STATE.

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Abstract

This study investigated the effect of project-based learning (PBL) on the development of critical thinking skills among senior secondary school students in Awka South Local Government Area, Anambra State. The research design of the study was a descriptive survey. The sampling technique involved a multi-stage procedure. The sample comprised teachers drawn from public secondary schools in the study area. The instrument used was a structured questionnaire, the Project-Based Learning and Critical Thinking Questionnaire (**PBLCTQ**), validated by experts in Measurement and Evaluation and Curriculum Studies. The instrument was subjected to a pilot test using Cronbach's alpha to establish its reliability. The criterion mean of 2.50 was used to analyze the data collected using mean and standard deviation. The results revealed that project-based learning is utilized to a moderate extent in the schools studied and that teachers perceive it as exerting a positive influence on students' critical thinking, particularly in argumentation and evidence-based reasoning. The main barriers to the effective implementation of PBL were Large class sizes, insufficient time, inadequate instructional materials and inadequate training of teachers. It was recommended among others that education authorities should organize regular in-service training for teachers on the design and facilitation of project-based learning in order to enable students to develop critical thinking skills.

Keywords: *Project-Based Learning, Critical Thinking, Secondary Education, Instructional Strategy*

1. INTRODUCTION

In today's world, educational systems are under growing pressure to do more than just transmit information; they must also provide students with the ability to think their way through situations they haven't encountered before, to assess conflicting information and to make informed judgments. Alongside collaboration, communication and creativity, which are frequently cited in tandem as the 4Cs of twenty-first century learning (Chu et al., 2021), critical thinking has been identified as key area for curriculum reform (Saimon et al., 2023). This shift in the direction of curriculum has been echoed in Nigeria which has over the years directed curriculum reviews toward a pedagogy that will shift students from being passive recipients of notes to being active participants in real problems (Adeyemi, 2023).

One of the teaching methods consistently identified with this type of active learning is project-based learning (PBL). In general, it is considered a student-centered instructional model where the learning process is structured around a driving question or a problem that does not have a single answer, and students are encouraged to plan, investigate, collaborate and generate a tangible and concrete product (Botella & Ramos, 2022). In PBL, instead of being focused on teaching topics that need to be learned and remembered for exams, the teacher will take on the role of a facilitator, who will design the inquiry and provide scaffolding for students to direct and do their inquiries (Saad & Zainudin, 2022). Project based learning is believed to be a suitable medium for developing learners' critical thinking skills as it requires learners to identify problems, test the proposed solutions, and explain the results of the decision making process.

Critical thinking, in turn, is frequently recognized as a deliberate and systematic thought process that involves analysing, evaluating and combining information to make a reasoned decision or judgement. Adu-Gyamfi and Gyamfi (2021) define it as the ability to challenge assumptions, analyse the strength of evidence and consider alternative viewpoints before accepting/rejecting a claim, while Berhanu and Tilahun (2021) interpret it as involving interpretation, analysis, evaluation, inference and explanation. This is a capacity that project-based learning has been shown to strengthen in studies taking place across a variety of settings: Learners who work on extended projects demonstrate better skills in analysing information, supporting their arguments with evidence and modifying their thinking based on new evidence (Aprillia et al., 2022; Garcia et al., 2022). The collaborative structures within PBL also seem to be important as students have to explain their thinking to others, defend their thinking, and reconcile differences, they are pushed towards more disciplined and reflective thinking (Cortazar et al., 2021), and feedback loops in project-based tasks are also associated with increased metacognitive awareness and more intentional thinking (Schaller et al., 2023).

Research in various contexts demonstrates that project-based learning fosters students' analysis of information, can help them support their ideas with evidence, and helps them

to update their thinking based on new information (Aprillia et al., 2022; Garcia et al., 2022). The collaborative organizations within PBL seem to have an impact: PBL tasks that require students to explain their reasoning to their peers, defend their explanation, and resolve disagreements lead students to think more systematically and reflectively (Hussein, 2021; Cortazar et al., 2021). Project work with embedded feedback loops has also been associated with increased metacognitive awareness and purposeful thinking (Liu et al., 2021; Schaller et al., 2023; Wijnia et al., 2024).

In the Nigerian secondary school system, however, there is more of a lecture-centred teaching and examination-centred learning, which several researchers have attributed to the large classes, the scarcity of teaching aids, and the assessment culture which focusses on memory recall than on application of reasoning (Emennu & Yiiloo, 2022; Ndidi, 2023). There have been recent reports of deficits in instructional materials and teachers' training to sustain innovative teacher-centred approaches in Anambra State like project work (Enemuo & Muogbo, 2023; Ndidi, 2023). This background leads to the present study which examines the use of project based learning in secondary schools in Awka South Local Government Area and the correlation between the use of project based learning and critical thinking of the secondary school students.

Statement of the Problem

Despite policy statements that call for skills-based instruction, classroom practice in many Nigerian secondary schools continues to privilege note dictation, rote memorization and drilling for objective examinations. Students frequently perform creditably on recall-based questions but struggle when confronted with unfamiliar problems that require them to reason independently, weigh evidence or construct an argument.

Project-based learning is one of the few instructional strategies that directly targets this gap yet its adoption in Nigerian secondary classrooms appears inconsistent and, in many schools, largely absent. Where it is attempted, teachers often report difficulty designing manageable projects, assessing them fairly and fitting them into an already congested scheme of work (Botella & Ramos, 2022; Abdullahi et al., 2023). Furthermore, from the review of previous studies on project-based learning, it is noted that existing empirical literature is dominated by studies conducted in Asia, Europe and North America, with comparatively few situated in Nigerian secondary schools, and fewer still focused specifically on Awka South Local Government Area of Anambra State. The researcher therefore seeks to find the extent and effect of this instructional approach on students' critical thinking in secondary schools in Awka South Local Government Area.

Purpose of the Study

Guided by this problem, the study set out to find out how project-based learning is being used in secondary schools in Awka South Local Government Area, Anambra State and what bearing this has on students' capacity to think critically. In particular, the study aimed to:

1. assess how widely and how deeply teachers incorporate project-based learning strategies into their teaching of secondary school students.
2. establish teachers' views on whether, and how, project-based learning shapes the growth of students' critical thinking skills.
3. uncover the obstacles that stand in the way of implementing project-based learning effectively.
4. identify practical measures that could help teachers implement project-based learning more effectively to strengthen students' critical thinking.

Research Questions

To achieve these aims, the study was guided by the following questions:

1. How widely do teachers incorporate project-based learning strategies into the teaching of secondary school students in Awka South Local Government Area?
2. In teachers' judgement, what bearing does project-based learning have on the growth of students' critical thinking skills?
3. What obstacles hinder the effective implementation of project-based learning in secondary schools in Awka South Local Government Area?
4. Which measures could help strengthen the implementation of project-based learning to improve students' critical thinking?

2.0 LITERATURE

2.1 Conceptual Framework

2.1.1 Concept of Project-Based Learning

Project-based learning is typically viewed as a student-centred pedagogical approach in which learning is structured around a driving question or problem with multiple, non-unique answers, and demands that students design, explore, co-construct, and create a tangible product (Botella & Ramos, 2022). In addition to the teacher's role in conventional lesson delivery as the principal source and transmitter of knowledge, the teacher in PBL assumes the role of a facilitator who is responsible for organizing the inquiry, giving scaffolding and providing feedback while the students are responsible for directing and qualitying their work (Saad & Zainudin, 2022). The same approach, in which learners seek information, assess it, and combine it, is closely related to developing twenty-first century skills, as mentioned by Chu et al. (2021).

Project-based learning is frequently confused with problem-based learning, but they have family resemblances. While PBL is usually focused on solving a problem in one lesson or series of lessons, PBL projects tend to be longer and end with a real-world product,

presentation or performance that is presented to others, other than the teacher (Saimon et al., 2023). This extends the common structure of project-based learning to one that focuses on outcomes, for it allows students to sustain and revise an argument or process over many parts of a project, instead of providing them with only one question to answer.

2.1.2 Concept of Critical Thinking

Critical thinking is known as the serious thinking method in which analysis, evaluation, and synthesis of information are used to reach a logical conclusion or decision. According to Adu-Gyamfi and Gyamfi (2021), it is the ability to think critically, evaluate evidence, and to investigate other points of view in order to either accept or reject a statement. Berhanu and Tilahun (2021) also describe critical thinking as having four abilities: interpretation, analysis, evaluation, inference, and explanation, plus the attitude of using the critical thinking abilities when necessary and not merely when called upon.

Critical thinking is often defined as observable behaviors in the secondary school context, such as a student's ability to identify the main problem in a task, to determine which information is relevant and which is irrelevant, to construct an argument based on evidence and to reflect on the strengths and weaknesses of their own argument. Such actions are exactly what project work – such as extended, open-ended activities – is supposed to invoke, hence the repeated investigations of the two constructs combined (Aprillia et al., 2022; Garcia et al., 2022).

2.2 Theoretical Framework

This study is grounded in social constructivist theory which underlines that the learning process is an active process in which learners form knowledge themselves in the process of experiencing, interacting with others, and reflecting on things. Constructivist theory, as discussed by Taconis and Bekker (2023) for Secondary school projects, implies that learning will be deeper and more lasting when they are asked to struggle with genuine problems, to negotiate with each other, and to have to produce their own explanations. This theory is directly operationalised in project-based learning: students are given authentic problems to solve, and the social nature of project-based learning, especially when involving group negotiation and group critique, is similar to the socio-constructive meaning-making that is identified as crucial to the learning process by constructivist theory (Cortazar et al., 2021).

Constructivist theory also emphasizes feedback and reflection in the process of acquiring higher-order thinking skills. Structured feedback in project work encourages students to reflect on their beliefs and adjust their thinking, which is similar to the process of critical thinking itself being a reflective and self-correcting process, as Wijnia et al. (2024) and Schaller et al. (2023) explain. This theoretical foundation serves as the foundation for

predicting that good project-based learning with sustained facilitation should be correlated with measurable improvements in students' critical thinking.

2.3 Empirical Review

2.3.1 Project-Based Learning and Critical Thinking Skills

There are now more studies that suggest project-based learning is positively related to the development of critical thinking. Project-based learning, with appropriate teacher scaffolding, is a deliberately designed instruction method that has been acknowledged as one of the effective learning methods that stimulates students to develop critical thinking skills, as illustrated in the need to identify a problem, examining solutions, and concluding with a solution. The use of project-based learning was investigated in the context of upper basic students in different perspectives by teachers and Aprillia et al. (2022) found that teachers were always in agreement that the use of project-based learning facilitated the improvement of reasoning skills and independent problem solving of learners. In another study, with high school students from diverse socioeconomic backgrounds, Garcia et al. (2022) found similar gains in critical thinking skills for students who used project-based learning.

The results of this study align fairly well with the evidence gathered by researchers who have conducted meta-analyses of project-based learning's impact on student outcomes in general. Project-based learning is consistently identified as one of the pedagogical models most suited for higher-order thinking skills that must be developed for a complex and changing world, since project-based learning is grounded in authentic and real world problems, as opposed to abstracted content (Ma & Yang, as cited in the broader project-based learning literature). This section focuses on collaboration, feedback, and critical thinking. In this section, collaboration, feedback and critical thinking are emphasized.

2.3.2 Collaboration, Feedback, and the Development of Critical Thinking

One of the major mechanisms that have been identified for how critical thinking develops in project-based learning is collaboration. Collaborative learning settings in project contexts are conducive to critical dialogue, where opinions need to be expressed, explained and sometimes adjusted to other students' perspectives (Cortazar et al., 2021, Hussein, 2021). In this process of public reasoning, students seem to become more discerning, both in evaluating arguments themselves as well as those of others. The kind of group work that sets out to express and reflect opinions instead of stifling them has actually been found to be positively correlated with critical-thinking outcomes.

Feedback has also proven to be a crucial mechanism. Feedback during project work helps students go beyond superficial engagement and into critical reflection and more-metacognitive awareness (Schaller et al., 2023). Wijnia et al. (2024), Liu et al. (2021), both

add that such feedback triggers self-evaluation and contributes to increased awareness of one's own thinking processes, both of which are deemed essential to the development of critical thinking beyond the classroom into adulthood.

2.3.3 Project-based learning and 21st Century skills

Project-based learning is often examined in the context of the larger collection of 21st-century skills, and sometimes referred to as the 4Cs: critical thinking, communication, collaboration, and creativity. In the research conducted by Saimon et al. (2023), it was found that a project-based learning model had an improvement in the 4Cs among college students, and critical thinking was one of the most prominent improvements. Developing AI literacy for senior secondary students was also reported by Kong et al. (2024), who found that the project-based learning method developed learners' analytical and evaluative skills in addition to their technical skills. These findings are in line with those of Phan and Watson (2022) and Biazus and Mahtari (2022), who found similar improvements in students' creative and critical thinking in secondary structured project-based learning. This section presents some of the challenges involved in implementing PBL. This module introduces some of the implementation challenges for PBL.

2.3.4 Challenges in the Implementation of Project-Based Learning

Despite these well documented advantages, there are a number of implementation issues reported. Botella and Ramos (2022) explored some of the challenges that teachers face with the implementation of PBL in secondary education, including time required to create an authentic project, group management and the assessment of open-ended project results in a fair manner. In the review by Mahtari (2022), similarly cited by Comber and colleagues, lesson design and time allocation and scaffolding student inquiry are consistently challenging tasks for teachers trying to implement the approach.

In Nigeria, pedagogical problems are compounded by structural constraints. Emennu and Yiiloo (2022) highlighted some of the instructional materials gaps in practical and activity-based subjects in secondary schools in Nigeria, and Abdullahi et al. (2023) found that the lack of adequate funding and poor facilities are among the major problems hindering the implementation of innovative teaching strategies in secondary schools in Nigeria generally. The resourcing considerations are particularly important for PL as a pedagogical practice where resources, space and time requirements are greater than in a traditional lecture-based lesson.

2.3.5 Project-Based Learning and Critical Thinking in the African and Nigerian Context

. In the Ghanaian secondary schools, Adu-Gyamfi and Gyamfi (2021) discovered that critical thinking can be effectively fostered by intentional teaching practices and that the rigidity of the curriculum along with inadequate teacher preparation are ongoing challenges. In Ethiopia, Berhanu and Tilahun (2021) found that the same could be said for students' critical thinking in secondary schools, as they stated that curriculum development and the continuous training of teachers are essential foundations for any improvements in critical thinking skills.

Adeyemi (2023) looked at teachers' attitudes towards the integration of twenty first century skills in classroom and curriculum, and reported that the teachers were generally positive about using project-based learning to explain the rationale behind the implementation of skills-based curriculum with concerns of class size, time constraints due to an examination-based scheme of work and lack of exposure to project design technique during teacher training. For example, Ndidi (2023) found that capacity building is correlated with instructional effectiveness in public secondary schools in Anambra State, and Enemu and Muogbo (2023) reported that teachers in the state were less interested in the adoption of newer instructional approaches. The overall findings of this work reveal that the theoretical and international empirical evidence for project learning is sound, but the implementation of a consistent project-based learning practice in the classroom of the Anambra State and Awka South Local Government Area in particular has not been well documented.

2.4 Summary of Literature Review

The literature reviewed converges on two broad points. First, project-based learning is consistently associated with gains in students' critical thinking, largely through the mechanisms of authentic problem engagement, collaborative reasoning and structured feedback. Second, the effective implementation of project-based learning is not automatic; it depends on adequate teacher preparation, manageable class sizes, sufficient instructional materials and curriculum structures flexible enough to accommodate extended, open-ended work. While a reasonable body of international literature and an emerging body of African literature, addresses both points, very little of this work has been situated specifically within Awka South Local Government Area of Anambra State. This study addresses that gap by examining the extent of project-based learning use, its perceived relationship with students' critical thinking and the challenges and strategies relevant to its implementation within this specific local context.

3. METHODOLOGY

3.1 Research Design

This study was of descriptive-survey type. It was deemed valid due to the research's focus on describing the existing practice, or the level of teacher use of project-based learning and how teachers think that this links to students' critical thinking, and not to condition the teachers' practice, as would occur in an experiment. Information was obtained from a representative sample of teachers and generalised, with due precautions, to the larger population of teachers in secondary schools in the study area.

3.2 Population of the Study

The subject of this study were all the teachers and Senior Secondary Two (SS2) students in the public secondary schools of Awka South Local Government Area. The main respondents for the questionnaire items were teachers, as they are directly involved with the implementation of project based learning strategies in the classroom and they know the use of project based learning strategies.

3.2.1 Inclusion Criteria

Teachers who worked in public secondary schools in Awka South Local Government Area were included in the study. The teachers were classroom teachers who agreed to participate in the study at the time of the study.

3.2.2 Exclusion Criteria

The study did not include teachers in private secondary schools, non-teaching staff, teachers on leave during the period of data collection and teachers who refused to participate.

3.3 Sample and Sampling Technique

A multi-stage sampling technique was used. The first stage involved the selection of a sample of public secondary schools in Awka South Local Government Area, through simple random sampling. The second stage was purposive sampling of teachers across core subject areas in the selected schools with a view to ensuring that the respondents had first-hand classroom experiences relevant to the study. The procedure did produce a sample large enough to support the description provided in this study as is more typical of the type of survey research.

3.4 Instrument for Data Collection

The Project-Based Learning and Critical Thinking Questionnaire (PBLCTQ) was used to gather data with a structured questionnaire. The instrument was segmented into four parts corresponding to the four research questions in the study: Part A: teachers' demographic information, Part B: teachers' uses of project-based learning strategies, Part C: teachers' perceptions of the effects of project-based learning on student critical thinking, and Part D: challenges and strategies in implementation. The items in Sections B to D were set up as a four point likert-type scale — Strongly Agree (4), Agree (3), Disagree (2), Strongly Disagree (1). Content and face validity was done by experts in Measurement and Evaluation and Curriculum Studies. A pilot study was done outside the study area and the instrument was given Cronbach's alpha to determine its reliability.

3.5 Method of Data Analysis

The data obtained were analysed with descriptive statistics (mean score and standard deviation). The criterion mean of 2.50 was used to interpret the four-point Likert-type items, where the mean of 2.50 or higher was considered to represent an agreement with the statement and the mean of less than 2.50 was considered to represent a disagreement with the statement. This descriptive approach was deemed adequate for answering the research questions that guided this study and no inferential hypothesis testing was conducted, which reflected the descriptive and non-experimental nature of the design.

3.6 Ethical Consideration

Prior to the data collection, ethical approval was obtained from the appropriate school management. All participants were informed of the purpose of the study and they all gave informed consent. It was done on a voluntary basis and the information shared was to be kept with total confidentiality and would be used only for academic purposes. The anonymity of all participants was respected during the study.

4.0 RESULTS AND DISCUSSION

4.1 Results

1. How widely do teachers incorporate project-based learning strategies into the teaching of secondary school students in Awka South Local Government Area?

S/N	Item	Mean	SD	Decision
1	Teachers assign students group projects that run over several weeks.	2.61	0.71	Agree
2	Students are required to investigate real-life problems as part of classroom tasks.	2.55	0.68	Agree
3	Project outcomes are presented or displayed for peer review.	2.38	0.79	Disagree
4	Teachers provide structured guidance while students plan projects.	2.70	0.65	Agree
5	Assessment includes rubrics for evaluating project work.	2.30	0.74	Disagree
	Grand Mean	2.51		Agree

Table 1 shows a grand mean of **2.51**, indicating that project-based learning strategies are utilized to a moderate extent in the schools studied.

2. In teachers' judgement, what bearing does project-based learning have on the growth of students' critical thinking skills?

S/N	Item	Mean	SD	Decision
1	Students who engage in project work ask more probing questions.	2.78	0.60	Agree
2	Project work improves students' ability to defend an argument with evidence.	2.82	0.58	Agree
3	Students become better at identifying the core problem in a task.	2.69	0.63	Agree
4	Project-based learning helps students consider alternative solutions.	2.74	0.61	Agree
5	Students show improved reflection on their own reasoning after project work.	2.60	0.66	Agree
	Grand Mean	2.73		Agree

Table 2 shows a grand mean of **2.73**, indicating that teachers generally perceive project-based learning as exerting a positive influence on students' critical thinking, particularly in argumentation and evidence-based reasoning.

3. What obstacles hinder the effective implementation of project-based learning in secondary schools in Awka South Local Government Area?

S/N	Item	Mean	SD	Decision
1	Large class sizes make project supervision difficult.	2.91	0.55	Agree
2	There is insufficient time within the scheme of work for extended projects.	2.88	0.57	Agree
3	Instructional materials for project work are inadequate.	2.80	0.62	Agree
4	Teachers lack sufficient training in designing and assessing projects.	2.76	0.64	Agree
5	Examination pressure discourages the use of project-based approaches.	2.72	0.66	Agree
	Grand Mean	2.81		Agree

Table 3 shows a grand mean of **2.81**, indicating that teachers face substantial challenges in implementing project-based learning, with class size and time constraints emerging as the most pressing concerns.

4. Which measures could help strengthen the implementation of project-based learning to improve students' critical thinking?

S/N	Item	Mean	SD	Decision
1	Regular in-service training on project design would improve implementation.	2.89	0.54	Agree
2	Provision of instructional materials would support project-based teaching.	2.85	0.57	Agree
3	Reducing class sizes would make project supervision more manageable.	2.80	0.60	Agree
4	Incorporating project work into the official scheme of work would help.	2.77	0.62	Agree
5	Peer mentoring among teachers would strengthen project-based practice.	2.65	0.65	Agree
	Grand Mean	2.79		Agree

Table 4 shows a grand mean of **2.79**, indicating that teachers agreed that in-service training, provision of materials, manageable class sizes, formal integration into the scheme of work and peer mentoring would each strengthen implementation.

4.2 Discussion of Findings

The results showed that teachers' use of project-based learning seemed to be only partial instead of complete. Extended group activities seem to be assigned with ease, and guidance given during planning, but teachers are not as consistent in implementing structured assessment rubrics, or formal peer feedback on projects. This result is consistent with the result of Botella and Ramos (2022) finding that teachers tend to use what they are comfortable with in PBL, rather than what they are less familiar with: designing criterion-referenced, fair assessments for open-ended work.

The result is that project-based learning is significantly related to teachers' perception of students' critical thinking, especially in argumentation and using evidence, is in line with the finding of Mahtari (2022) which, when applied with appropriate scaffolding, intentionally nurtured the critical-thinking skill of the students. The finding also aligns with those of Cortazar et al. (2021) and Schaller et al. (2023), who discovered that collaborative conversation and feedback within a project enhances students' reasoning capabilities and their eagerness to consider different options.

The problems highlighted include large class size, time constraint, lack of adequate materials, lack of teacher training and examination pressure which are similar to those reported in the international literature and the Nigerian literature (Abdullahi et al., 2023; Emennu & Yiiloo, 2022; Adeyemi, 2023). The result was in line with the assertion of Ndidi (2023) that the capacity problem is still a major challenge for adopting innovative teaching strategies in Anambra State.

The strategies that teachers identified as being more likely to improve the implementation of project-based learning are similar to those identified in the literature reviewed (Adu-Gyamfi & Gyamfi, 2021; Berhanu & Tilahun, 2021; Ndidi, 2023) which further reinforces that if these strategies are taken up deliberately with intentional focus they will have an impact on the consistency of project-based learning implementation.

5. CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

It can be concluded from the findings of the study that project-based learning is a valuable instructional strategy for enhancing students' critical thinking in secondary schools in Awka South Local Government Area, although its use remains moderate and constrained by structural and professional obstacles. The use of project-based learning helps students engage actively in the learning process, exposing them to experiences that strengthen their reasoning, argumentation and problem-solving abilities.

5.2 Recommendations

Based on the findings of the study, the following recommendations are proposed:

1. Education authorities should provide regular, practical in-service training for teachers on the design, conduction, and assessment of project-based learning activities.
2. School administrators should strive for smaller class sizes in project-based learning areas, especially in subjects that need extended project supervision.
3. Government and school management should ensure that adequate instructional materials are available for project-based learning.
4. Curriculum planners should consider formally incorporating project-based components into the scheme of work.
5. Teachers should be encouraged to share experiences and mentor one another to improve classroom practice.

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