Impact of Inquiry-Based Pedagogy on Academic Achievement and Classroom Engagement among Primary School Children

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Abstract

This study quantitatively examines the impact of inquiry-based pedagogy on academic achievement and classroom engagement among primary school children. A quasi-experimental research design was employed, involving 300 pupils selected from eight public primary schools. Pupils were assigned to either an experimental group exposed to inquiry-based pedagogy or a control group taught using conventional teacher-centered methods over a ten-week period. Data were collected using a standardized achievement test and a classroom engagement scale. Descriptive statistics and inferential statistics, including independent samples t-tests and analysis of covariance (ANCOVA), were used for data analysis. Findings revealed that pupils exposed to inquiry-based pedagogy demonstrated significantly higher academic achievement and engagement than their counterparts in the control group. The study concludes that inquiry-based pedagogy is an effective instructional approach for enhancing children's learning outcomes in primary education.

Keywords: inquiry-based pedagogy, children, academic achievement, classroom engagement

1. Introduction

Pedagogical practices adopted in primary schools play a vital role in shaping children's academic performance, engagement, and long-term attitudes toward learning. In recent years, inquiry-based pedagogy has gained prominence due to its emphasis on questioning, exploration, and learner autonomy. Rooted in constructivist learning theory, inquiry-based pedagogy positions children as active participants in the learning process rather than passive recipients of information.

Despite increasing advocacy for inquiry-based pedagogy, empirical quantitative evidence demonstrating its effectiveness at the primary school level remains limited, particularly in developing educational contexts. This study therefore seeks to provide empirical data on the effects of inquiry-based pedagogy on children's academic achievement and classroom engagement.

The study was guided by the following objectives:

1. To determine the effect of inquiry-based pedagogy on pupils' academic achievement.
2. To examine differences in classroom engagement between pupils taught using inquiry-based pedagogy and those taught using conventional methods.

2. Literature Review

2.1 Conceptual Foundations of Inquiry-Based Pedagogy

Inquiry-based pedagogy is grounded in constructivist theories of learning, which posit that knowledge is actively constructed by learners through interaction with their environment rather than passively received from teachers. Piaget's cognitive constructivism emphasizes the role of exploration and discovery in children's intellectual development, while Vygotsky's social constructivism highlights dialogue, collaboration, and guided learning within the Zone of Proximal Development. Inquiry-based pedagogy operationalizes these theories by encouraging pupils to ask questions, investigate problems, and construct meaning through guided inquiry activities.

Dewey (1938) argued that education should be rooted in experience and reflective thinking, asserting that learners develop understanding through purposeful inquiry. Building on Dewey's ideas, modern inquiry-based pedagogy integrates structured questioning, hypothesis testing, and reflective discussion, making it particularly suitable for primary education where curiosity and experiential learning are central to children's development.

2.2 Inquiry-Based Pedagogy in Primary Education

In primary school contexts, inquiry-based pedagogy has been shown to foster curiosity, creativity, and deeper conceptual understanding. According to Bell, Smetana, and Binns (2005), inquiry-oriented classrooms promote scientific reasoning and problem-solving skills among young learners. Similarly, Minner, Levy, and Century (2010) found that inquiry-based instructional practices are positively associated with conceptual learning outcomes in elementary education.

Research further indicates that inquiry-based pedagogy supports differentiated learning by accommodating diverse learning styles and abilities (Hmelo-Silver, Duncan, & Chinn, 2007). Through guided inquiry, teachers can scaffold children's learning while allowing autonomy appropriate to their developmental stage.

2.3 Pedagogical Approaches and Academic Achievement

A substantial body of quantitative research links active and inquiry-oriented pedagogies to improved academic achievement. Alfieri et al. (2011) demonstrated that guided inquiry is more effective than both unguided discovery and traditional direct instruction. Hattie's (2009) synthesis of over 800 meta-analyses reported that instructional strategies emphasizing feedback, questioning, and student engagement yield significant positive effects on achievement.

In primary education, Furtak et al. (2012) found that inquiry-based science instruction produced significantly higher achievement gains than traditional methods. These findings suggest that inquiry-based pedagogy, when appropriately scaffolded, enhances children's understanding and retention of subject matter.

2.4 Classroom Engagement and Inquiry-Based Learning

Classroom engagement is widely recognized as a multidimensional construct comprising behavioral, emotional, and cognitive components (Fredricks, Blumenfeld, & Paris, 2004). Inquiry-based pedagogy has been consistently associated with higher levels of engagement due to its interactive and learner-centered nature. Skinner, Kindermann, and Furrer (2009) argue that autonomy-supportive teaching practices foster intrinsic motivation and sustained engagement among pupils.

Empirical studies show that pupils in inquiry-based classrooms demonstrate increased participation, persistence, and enthusiasm for learning (Reeve, 2012). Engagement, in turn, has been linked to improved academic outcomes and reduced disengagement in school settings.

2.5 Empirical Studies on Inquiry-Based Pedagogy

Numerous empirical studies provide evidence for the effectiveness of inquiry-based pedagogy. A meta-analysis by Lazonder and Harmsen (2016) concluded that inquiry-based learning has a positive effect on learning outcomes, particularly when guidance is provided. Similarly, Akuma and Callaghan (2019) reported significant achievement gains among primary school pupils exposed to inquiry-based instruction in developing country contexts.

Despite these positive findings, some scholars caution that inquiry-based pedagogy requires adequate teacher preparation and instructional support to be effective (Kirschner, Sweller, & Clark, 2006). This underscores the importance of professional development and contextual adaptation in implementing inquiry-based pedagogy in primary schools.

2.6 Research Gap

Although the literature demonstrates the potential benefits of inquiry-based pedagogy, many studies focus on secondary or science education, with limited quantitative evidence at the primary school level across subjects. Furthermore, few studies combine academic achievement and classroom engagement within a single quantitative framework. This study addresses these gaps by providing empirical evidence on the effects of inquiry-based pedagogy on both achievement and engagement among primary school children.

3. Methodology

3.1 Research Design

The study adopted a quasi-experimental pre-test–post-test non-equivalent control group design.

3.2 Participants

Participants consisted of 300 Primary Five pupils (ages 10–11) from eight public primary schools. One hundred and fifty pupils formed the experimental group, while the remaining 150 pupils constituted the control group.

3.3 Instruments

- Academic Achievement Test (AAT): A 40-item multiple-choice test aligned with the primary school curriculum (KR-20 = 0.84).
- Classroom Engagement Scale (CES): A 20-item Likert-type scale measuring behavioral, emotional, and cognitive engagement (Cronbach's alpha = 0.88).

3.4 Procedure

Teachers in the experimental group were trained on inquiry-based instructional strategies, including questioning techniques, guided discovery, and collaborative tasks. The intervention lasted ten weeks.

3.5 Data Analysis

Data were analyzed using means, standard deviations, independent samples t-tests, and ANCOVA at a 0.05 level of significance.

4. Results

Table 1: Descriptive Statistics of Academic Achievement Scores

Group	N	Mean	Standard Deviation
Inquiry-Based Pedagogy	150	72.38	7.46
Conventional Pedagogy	150	64.15	8.02

Table 1 shows that pupils taught using inquiry-based pedagogy recorded a higher mean academic achievement score (M = 72.38) than those taught using conventional teaching methods (M =

64.15). This suggests a positive influence of inquiry-based pedagogy on pupils' academic performance.

Table 2: Independent Samples t-Test of Academic Achievement

Group Comparison	t-value	df	p-value	Decision
Inquiry-based vs Conventional	9.21	298	< .05	Significant

Table 2 shows that there is a statistically significant difference in academic achievement between pupils taught using inquiry-based pedagogy and those taught using conventional methods ($t = 9.21$, $p < .05$).

Table 3: Descriptive Statistics of Classroom Engagement Scores

Group	N	Mean	Standard Deviation
Inquiry-Based Pedagogy	150	3.34	0.39
Conventional Pedagogy	150	2.71	0.44

Table 3 shows that pupils exposed to inquiry-based pedagogy demonstrated higher classroom engagement than those in the conventional pedagogy group.

Table 4: Independent Samples t-Test of Classroom Engagement

Group Comparison	t-value	df	p-value	Decision
Inquiry-based vs Conventional	11.08	298	< .05	Significant

Table 4 shows a statistically significant difference in classroom engagement between pupils taught using inquiry-based pedagogy and those taught using conventional methods.

5. Discussion

The findings of this study indicate that inquiry-based pedagogy significantly improves both academic achievement and classroom engagement among primary school children. The results support constructivist learning theory and align with previous empirical studies emphasizing the effectiveness of inquiry-oriented instruction (Alfieri et al., 2011; Hattie, 2009).

Higher engagement levels observed among pupils in the experimental group suggest that inquiry-based pedagogy creates a more stimulating and interactive learning environment conducive to meaningful learning.

6. Conclusion

This quantitative study provides strong empirical evidence that inquiry-based pedagogy enhances academic achievement and classroom engagement among primary school pupils. The findings underscore the importance of adopting inquiry-based instructional approaches in primary education to promote effective learning.

7. Recommendations

1. Primary school teachers should integrate inquiry-based strategies into daily classroom instruction.
2. Teacher professional development programs should emphasize inquiry-based pedagogy.
3. Education policymakers should support pedagogical reforms that encourage active learning.

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