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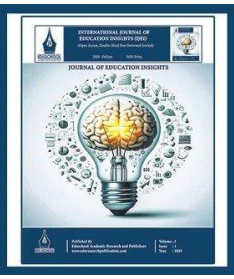

Effects of Differentiated Instruction on Learner Achievement in Mixed-Ability Classrooms: A Quasi-Experimental Study

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Abstract

The diversity of learners in contemporary classrooms has placed increasing pressure on teachers to adapt instruction to varied readiness levels, interests, and learning profiles. Differentiated instruction has been widely advocated as a pedagogical response, yet rigorous experimental evidence of its effectiveness in mixed-ability classrooms remains limited, particularly in mainstream public-school settings. This study examined the effect of differentiated instruction on learner achievement in mixed-ability classrooms in junior secondary schools. A quasi-experimental, non-equivalent control group design with pre-test and post-test measures was employed. Two intact Grade 8 classes ($N = 78$) were assigned to an experimental group exposed to a six-week differentiated instruction program and a control group taught through conventional whole-class instruction. Achievement was measured using a researcher-constructed test validated by experts and pilot-tested for reliability. Independent-samples t tests, analysis of covariance (ANCOVA), and effect-size estimation were used to analyze the data. The experimental group recorded significantly higher post-test scores than the control group ($F(1, 75) = 28.41$, $p < .001$, partial $\eta^2 = .27$, $d = 0.94$), indicating a large practical effect. Gains were strongest among low-achieving learners, suggesting that differentiated instruction narrows performance gaps in mixed-ability classrooms. Implications for instructional planning, teacher preparation, and curriculum policy are discussed.

Keywords: - Differentiated Instruction, Learner Achievement, Mixed-Ability Classrooms, Quasi-Experimental Design, Secondary Education

I. INTRODUCTION

Classrooms today are characterized by increasing diversity in learners' academic readiness, interests, language backgrounds, and learning profiles (Tomlinson, 2017). The persistent challenge for teachers is to deliver instruction that is responsive to this diversity without compromising the curriculum's depth or rigor. Traditional one-size-fits-all instruction has been widely criticized for under-serving both struggling and high-achieving learners, as it tends to pace lessons to the perceived middle of the class while leaving students at the extremes either bored or overwhelmed (Subban, 2006).

Differentiated instruction has emerged as a leading pedagogical response to this challenge. Tomlinson (2017) defines it as a teacher's proactive response to learners' needs, expressed through systematic variation in content, process, product, and learning environment, in order to meet learners at their respective readiness levels. The approach is grounded in Vygotsky's (1978) zone of proximal development, which highlights the importance of pitching instruction within the range where learners can succeed with appropriate support, and in Gardner's (1983) theory of multiple intelligences, which acknowledges the variety of ways in which learners process and demonstrate understanding.

Empirical studies have generally supported the effectiveness of differentiated instruction in raising achievement and engagement (Bondie et al., 2019; Pozas et al., 2020). Hattie's (2009) syntheses suggest that strategies aligned with differentiation, such as formative assessment, flexible grouping, and feedback, exert moderate to large effects on learning outcomes. However, several reviews caution that differentiated instruction is conceptually broad, complex to implement consistently, and demanding of teacher expertise, time, and institutional support (Smale-Jacobse et al., 2019). Many teachers

report difficulty translating the principle of differentiation into daily classroom routines, particularly in large or under-resourced classes.

Within South and Southeast Asian educational contexts, evidence on differentiated instruction at the secondary school level remains comparatively limited, although policy reforms increasingly emphasize learner-centered pedagogy. The present study contributes to this body of evidence by testing the effect of a structured differentiated-instruction program on learner achievement in mixed-ability junior secondary classrooms, while also examining whether the approach narrows performance gaps among learners of different initial achievement levels. The study is anchored on Tomlinson's (2017) framework of differentiated instruction and informed by Vygotsky's (1978) sociocultural theory and Gardner's (1983) multiple intelligences theory.

II. OBJECTIVES OF THE STUDY

The general objective of the study was to determine the effect of differentiated instruction on learner achievement in mixed-ability classrooms, and to examine whether the approach yields equitable gains across achievement levels. Specifically, the study sought to:

- Determine the pre-test and post-test achievement levels of learners in the experimental and control groups.
- Compare the post-test achievement of learners exposed to differentiated instruction with that of learners taught through conventional whole-class instruction.
- Estimate the magnitude of the effect of differentiated instruction on learner achievement.
- Determine whether the effect of differentiated instruction differs across high-achieving, average, and low-achieving learners.
- Identify pedagogical practices within differentiated instruction that contribute most to observed learning gains.

III. METHODOLOGY

This study employed a quasi-experimental, non-equivalent control group design with pre-test and post-test measures. The design was deemed appropriate because random assignment of learners to groups was not feasible in an authentic school setting, where intact classes are administratively fixed (Creswell & Creswell, 2018). The design nonetheless permitted controlled comparison between groups while preserving ecological validity.

The study was conducted in a public junior secondary school selected through purposive sampling on the basis of its mixed-ability enrolment and the principal's willingness to host the intervention. Two intact Grade 8 classes participated, with one randomly designated as the experimental group ($n = 39$) and the other as the control group ($n = 39$). The two classes were comparable in age, gender distribution, and prior academic performance, as confirmed by an independent-samples t test on baseline grades ($t(76) = 0.43$, $p = .67$). Both classes were taught the same English Language unit on reading comprehension and grammar by teachers with comparable qualifications and experience, who were trained by the researcher prior to the intervention.

Two main instruments were used to gather data. The first was the Reading and Language Achievement Test, a 40-item researcher-constructed instrument aligned with the curriculum learning competencies, comprising multiple-choice and short-response items distributed across the cognitive domains of remembering, understanding, applying, and analyzing in line with Anderson and Krathwohl's (2001) revised Bloom's taxonomy. The second was a structured observation checklist used by the researcher to monitor fidelity of implementation in the experimental class. The achievement test was content-validated by a panel of three teachers and one curriculum specialist, and was pilot-tested with a non-participating Grade 8 class of 30 learners. The pilot data yielded a Kuder-Richardson 20 reliability coefficient of .84, indicating high internal consistency, and item analysis confirmed acceptable difficulty and discrimination indices.

The intervention lasted six weeks, with five 40-minute sessions per week. The experimental group was taught through differentiated instruction, in which content was tiered to three readiness levels, processes included flexible grouping and choice boards, and products allowed varied modes of demonstrating mastery, including written, oral, and visual outputs. The classroom environment incorporated routines for self-pacing and peer support. The control group received conventional whole-class instruction with uniform tasks, pacing, and outputs, taught by the same lesson sequence and using the same materials minus the differentiation features. Both groups completed the achievement test as a pre-test in the week preceding the intervention and again as a post-test in the week immediately after.

The study followed the ethical guidelines of the American Psychological Association (2017). Institutional ethical clearance, school administrative approval, parental informed consent, and learner assent were obtained prior to data collection. Confidentiality was maintained through the use of code numbers, and the control group received an abridged differentiated-instruction unit at the conclusion of the study to ensure equity of educational opportunity.

Quantitative data were analyzed using IBM SPSS Statistics Version 27. Descriptive statistics summarized pre-test and post-test scores. Independent-samples t tests examined baseline equivalence and post-test differences between groups. Analysis of covariance (ANCOVA), with pre-test scores as the covariate, was used to test the main hypothesis while controlling for any residual baseline differences. Effect sizes were estimated using partial eta squared and Cohen's d, interpreted in line with Cohen's (1988) conventions. To examine whether gains differed across achievement levels, learners were classified into low, average, and high achievers based on pre-test scores, and a two-way analysis of variance was conducted with group and achievement level as factors. Assumptions of normality, homogeneity of variance, and homogeneity of regression slopes were tested and met. Statistical significance was set at $p < .05$.

IV. RESULTS

Pre-test scores indicated baseline equivalence between the experimental and control groups, with mean scores of 19.74 (SD = 5.21) and 19.36 (SD = 5.04) respectively, and no statistically significant difference ($t(76) = 0.33$, $p = .74$). Following the six-week intervention, post-test scores diverged considerably. The experimental group recorded a mean post-test score of 30.92 (SD = 5.74), compared with 24.10 (SD = 5.39) for the control group.

Independent-samples t test confirmed that the post-test difference was statistically significant ($t(76) = 5.42$, $p < .001$). Analysis of covariance, controlling for pre-test scores, similarly indicated a significant main effect of instructional approach on post-test achievement ($F(1, 75) = 28.41$, $p < .001$, partial $\eta^2 = .27$). Cohen's d of 0.94 indicated a large practical effect.

Two-way analysis of variance revealed a significant interaction between instructional approach and prior achievement level ($F(2, 72) = 4.62$, $p = .013$, partial $\eta^2 = .11$). Low-achieving learners in the experimental group showed the largest mean gain (Mgain = 13.21), followed by average achievers (Mgain = 11.07) and high achievers (Mgain = 9.82). In the control group, gains were comparatively modest and least pronounced among low achievers. These patterns suggest that differentiated instruction not only produced higher overall gains but also narrowed the performance gap among learners of different readiness levels.

The implementation fidelity checklist confirmed that 92% of the planned differentiation components were enacted as intended. Practices most frequently associated with high-quality lessons, as recorded in the observation logs, were tiered tasks aligned with readiness levels, flexible grouping for guided practice, and varied product options for the assessment of understanding.

V. DISCUSSION

The findings demonstrate that differentiated instruction produced significantly higher learning gains than conventional whole-class instruction in a mixed-ability junior secondary classroom. The large effect size, d = 0.94, exceeds the typical effects reported in educational interventions, which average around d = 0.40 (Hattie, 2009), and aligns with the more focused effects reported in recent reviews of differentiation (Bondie et al., 2019; Smale-Jacobse et al., 2019). The result supports Tomlinson's (2017) assertion that responsive instruction, when grounded in clear learning goals and ongoing formative assessment, can yield substantial improvements in achievement.

The strongest gains observed among low-achieving learners are pedagogically and ethically significant. They suggest that differentiated instruction operates not merely as an enrichment strategy but as an equity strategy capable of closing performance gaps in mixed-ability classrooms. This pattern is consistent with Vygotsky's (1978) zone of proximal development, in that tiered tasks and scaffolded support pitched instruction within the reach of struggling learners while continuing to challenge those at higher readiness levels. The varied product options also align with Gardner's (1983) thesis that learners demonstrate understanding through multiple modalities, broadening the avenues through which competence can be exhibited.

The finding that high achievers gained less than low achievers should not be interpreted as a ceiling effect against advanced learners but rather as the natural result of the test's difficulty range and the substantial distance lower-achieving learners had to travel. Future studies might use achievement tests with greater discrimination at the upper range to more sensitively detect gains among high achievers.

This study has several limitations. First, the use of intact classes, although necessary in school settings, limits the strength of causal inference. Second, the intervention period of six weeks captured short-term effects; longer interventions and follow-up assessments are needed to determine retention. Third, the study was conducted in a single subject area in one school, which limits generalizability. Fourth, although fidelity of implementation was monitored, the influence of teacher quality cannot be entirely ruled out. Future research could employ randomized cluster designs, broader subject coverage, and multiple sites to extend these findings.

VI. CONCLUSION

Differentiated instruction significantly improves learner achievement in mixed-ability classrooms and offers particular promise as a strategy for narrowing performance gaps among learners of different readiness levels. The combination of tiered tasks, flexible grouping, and varied products allows teachers to address the diversity of their learners while maintaining curricular integrity. Schools and teacher-education programs should therefore prioritize structured training in differentiated instruction, supported by adequate planning time, instructional resources, and school leadership. Future research should explore the long-term effects of differentiated instruction across subjects, grade levels, and contexts, and should examine how teacher development, class size, and school culture mediate its successful implementation.

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