

Evaluating Innovative Curriculum Strategies on Academic Performance of Enugu State Secondary Students

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ABSTRACT

Nigeria's secondary school curriculum reforms increasingly promote learner-centred approaches, yet evidence on how these strategies relate to measured achievement in South-East Nigerian classrooms remains fragmented and largely drawn from small single-school experiments. This study evaluated the contribution of five innovative curriculum strategies, project-based learning, ICT-integrated/flipped instruction, collaborative learning, formative assessment and feedback, and inquiry-based learning, to the academic performance of Senior Secondary School Two (SS2) students in Enugu State. Anchored in constructivist, experiential learning, cognitive load, and diffusion of innovations theories, the study adopted a cross-sectional correlational survey design with a stratified comparative component. A priori power analysis indicated a minimum of 580 students; allowing for clustering and non-return, 888 students were sampled from 24 public schools selected by stratified random sampling across the six education zones, and 853 provided complete data (96.1%). Data were collected with the Innovative Curriculum Strategies Exposure Questionnaire ($\alpha = .84-.87$ across dimensions, $\alpha = .92$ overall) and a 50-item Mathematics and English Achievement Test ($KR-20 = .92$). Multiple regression with cluster-robust standard errors showed that the five strategies jointly explained 31.4% of the variance in achievement, $F(5, 847) = 77.49$, $p < .001$, $f^2 = .46$, with formative assessment and feedback ($\beta = .21$) and collaborative learning ($\beta = .19$) as the strongest unique predictors. Students in high-implementation schools outperformed peers in low-implementation schools by 12.35 points, $t(850.92) = 8.69$, $p < .001$, Hedges' $g = .59$. School location moderated the exposure-achievement relationship ($\Delta R^2 = .021$, $f^2 = .031$), with a steeper slope in urban than in rural schools. The findings support system-wide, well-resourced adoption of learner-centred strategies, with deliberate support for rural schools.

Keywords: *innovative curriculum strategies, academic performance, formative assessment, collaborative learning, secondary education, Enugu State*

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Secondary education occupies a pivotal position in Nigeria's education system. It is the level at which learners consolidate foundational literacy and numeracy, acquire the subject knowledge required for tertiary study, and develop the practical and social competencies needed for productive citizenship. The National Policy on Education states that secondary education should prepare learners for useful living within society and for higher education, and it directs that teaching be practical, activity-based, experiential, and supported by information and communication technology (Federal Republic of Nigeria, 2013). These directives signal a clear policy shift away from teacher-dominated transmission of content towards pedagogies that position students as active constructors of knowledge. Translating this policy aspiration into routine classroom practice, however, has proven difficult, and persistent concerns about students' achievement in core subjects such as Mathematics and English Language continue to feature in public and scholarly debate across the country.

In response, curriculum planners, school administrators, and development partners have promoted a range of what may be termed innovative curriculum strategies. The label covers structured approaches to organising and delivering the curriculum that depart from the lecture-and-recitation model: project-based learning, in which students investigate authentic problems over extended periods; ICT-integrated and flipped instruction, in which digital resources shift content exposure outside class and free classroom time for application; collaborative learning, in which structured peer interaction is used to build understanding; formative assessment and feedback, in which ongoing evidence of learning is used to adjust teaching; and inquiry-based learning, in which students pose questions, gather evidence, and draw conclusions under teacher guidance. International syntheses indicate that these strategies can raise achievement substantially. For example, active learning has been associated with an improvement of roughly half a standard deviation in examination performance (Freeman et al., 2014), and project-based learning has shown a large mean effect on academic achievement (Chen & Yang, 2019).

Enugu State offers an instructive context for examining whether such gains materialise in Nigerian classrooms. The state's public secondary schools are administered through six education zones, Agbani, Awgu, Enugu, Nsukka, Obollo-Afor, and Udi, that span the metropolitan capital, peri-urban towns, and predominantly rural communities. This

geography creates marked variation in class sizes, teacher deployment, electricity supply, internet connectivity, and access to instructional materials. It also means that a strategy which works well in a well-equipped urban school may be implemented quite differently, or with diminished returns, in a rural school. Local experimental studies have begun to document positive effects of individual strategies, including flipped classroom instruction in Igbo-Etiti Local Government Area (Egara & Mosimege, 2024) and project-based instruction in the Agbani Education Zone (Onyeama & Viehoever, 2026). Such studies, however, typically involve fewer than 200 students drawn from two or three schools, examine a single strategy in a single subject, and seldom report effect sizes. Consequently, education authorities lack state-wide evidence on the relative contributions of different strategies and on whether their benefits are distributed equitably across urban and rural schools.

Table 1

Author(s) (Year)	Strategy	Context / Sample	Design	Key Finding
Freeman et al. (2014)	Active learning	225 STEM studies	Meta-analysis	Exam performance $\approx$ 0.47 SD higher; failure less likely
Chen & Yang (2019)	Project-based	30 studies, > 12,000 students	Meta-analysis	$d = 0.71$ on achievement
Strobel & van Barneveld (2009)	Problem/project-based	Prior meta-analyses	Meta-synthesis	Better long-term retention and skills
Onyeama & Viehoever (2026)	Project-based	160 SS2, Agbani Zone, Enugu	Quasi-experiment	PBI group achieved higher than lecture group
Udu et al. (2024)	Project-based	73 SS1, Benue State	Quasi-experiment	Significant gain in reading comprehension
Tamim et al. (2011)	Technology use	25 meta-analyses	Second-order meta-analysis	Mean effect $\approx$ 0.35
Sung et al. (2016)	Mobile devices	110 studies	Meta-analysis	Mean effect $\approx$ 0.52
van Alten et al. (2019)	Flipped classroom	114 studies	Meta-analysis	$g = 0.36$ on learning outcomes
Hew & Lo (2018)	Flipped classroom	28 studies, health education	Meta-analysis	Small positive pooled effect
Egara & Mosimege (2024)	Flipped classroom	86 SS1, Igbo-Etiti, Enugu	Quasi-experiment	Higher achievement and interest; no gender gap
Springer et al. (1999)	Small-group learning	39 STEM studies	Meta-analysis	$d = 0.51$ on achievement
Kyndt et al. (2013)	Cooperative learning	65 studies	Meta-analysis	Positive effects on achievement and attitudes
Kingston & Nash (2011)	Formative assessment	13 studies	Meta-analysis	Weighted mean effect $\approx$ 0.20

Wisniewski et al. (2020)	Feedback	435 studies	Meta-analysis	$d = 0.48$; information-rich feedback strongest
Furtak et al. (2012)	Inquiry-based	37 science studies	Meta-analysis	Mean ≈ 0.50 ; teacher-led inquiry larger
Lazonder & Harmsen (2016)	Guided inquiry	72 studies	Meta-analysis	Guidance improves learning outcomes
Alfieri et al. (2011)	Discovery learning	164 studies	Meta-analysis	Unassisted $d = -0.38$; enhanced $d = 0.30$
Schroeder et al. (2007)	Multiple strategies	61 U.S. science studies	Meta-analysis	Collaborative and inquiry strategies effective

Method

Research Design

The study adopted a cross-sectional correlational survey design with a stratified comparative component. The correlational component examined the associations between students' reported exposure to five innovative curriculum strategies and their measured achievement (H01 and H03). The comparative component contrasted students in schools pre-classified as high or low in curriculum implementation (H02). The design was appropriate because the strategies of interest were already present in varying degrees in schools, so their relationships with achievement could be examined under natural conditions across a large, geographically diverse sample. Because no variables were manipulated, the design supports inferences about association rather than causation, a point revisited in the limitations.

Table 2

Hypothesis	Test	Effect size	Power	Required N
H01	Multiple regression (5 predictors)	$f^2 = .04$	.95	501
H02	Independent-samples t test	$d = 0.30$	.95	580
H03	Interaction term (3 predictors)	$f^2 = .02$	.80	395
Adopted minimum	Largest requirement	,	580	
Clustering adjustment	$DEFF = 1 + (37 - 1) (.01) = 1.36$	,	789	
Target sample	$789 \div .889 (\approx 11\% \text{ attrition allowance})$	,	888	

Table 3

Education zone	Urban-High	Urban-Low	Rural-High	Rural-Low	Total
Agbani	34	37	35	34	140
Awgu	35	37	35	34	141
Enugu	35	37	35	34	141
Nsukka	37	34	145		
Obollo-Afor	33	36	141		
Udi	37	34	37	145	
Total	211	221	212	209	853

Table 4

Construct	Items	Pilot α (n = 40)	Main α (N = 853)	CR	AVE	Item-total r
Project-Based Learning	6	.86	.87	.53	.57-.72	
ICT-Integrated/ Flipped Instruction	6	.82	.84	.47	.57-.70	
Collaborative Learning	6	.74	.87	.52	.62-.72	
Formative Assessment and Feedback	6	.85	.50	.60-.71		
Inquiry-Based Learning	6	.83	.87	.52	.60-.71	
Overall ICS exposure	30	.89	.92	,		
MEAT (KR-20)	50	.93	.92	,	.34-.47	

RESULTS

DISCUSSION

This study evaluated the contributions of five innovative curriculum strategies to the academic performance of SS2 students across the six education zones of Enugu State. Three principal findings emerged: the strategies jointly accounted for nearly a third of the variance in achievement, with formative assessment and feedback and collaborative learning making the largest unique contributions; students in high-implementation schools outperformed those

in low-implementation schools by a medium-sized margin; and the benefit of exposure to innovative strategies was substantially stronger in urban than in rural schools.

CONCLUSION

This study provides state-wide, adequately powered evidence that innovative curriculum strategies are meaningfully associated with the academic performance of secondary school students in Enugu State. Together, project-based learning, ICT-integrated/flipped instruction, collaborative learning, formative assessment and feedback, and inquiry-based learning explained a large proportion of variance in achievement, with formative assessment and feedback and collaborative learning showing the strongest unique contributions. Students in schools that implemented these strategies systematically outperformed their peers by a medium-sized margin, and the benefits of exposure were significantly larger in urban than in rural schools. The study concludes that the systematic, well-supported adoption of learner-centred strategies represents a promising pathway to improving achievement in Enugu State, provided that implementation is guided, sustained at the whole-school level, and accompanied by deliberate investment to ensure that rural schools share equitably in the gains.

REFERENCES

- Aiken, L. S., & West, S. G. (1991). Multiple regression: Testing and interpreting interactions. SAGE.
- Akçayır, G., & Akçayır, M. (2018). The flipped classroom: A review of its advantages and challenges. *Computers & Education*, 126, 334-345. <https://doi.org/10.1016/j.compedu.2018.07.021>
- Alfieri, L., Brooks, P. J., Aldrich, N. J., & Tenenbaum, H. R. (2011). Does discovery-based instruction enhance learning? *Journal of Educational Psychology*, 103(1), 1-18. <https://doi.org/10.1037/a0021017>
- Almulla, M. A. (2020). The effectiveness of the project-based learning (PBL) approach as a way to engage students in learning. *SAGE Open*, 10(3). <https://doi.org/10.1177/2158244020938702>

- Black, P., & Wiliam, D. (1998). Assessment and classroom learning. *Assessment in Education: Principles, Policy & Practice*, 5(1), 7-74. <https://doi.org/10.1080/0969595980050102>
- Cameron, A. C., & Miller, D. L. (2015). A practitioner's guide to cluster-robust inference. *Journal of Human Resources*, 50(2), 317-372. <https://doi.org/10.3368/jhr.50.2.317>
- Chen, C.-H., & Yang, Y.-C. (2019). Revisiting the effects of project-based learning on students' academic achievement: A meta-analysis investigating moderators. *Educational Research Review*, 26, 71-81. <https://doi.org/10.1016/j.edurev.2018.11.001>
- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Lawrence Erlbaum Associates.
- Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika*, 16(3), 297-334. <https://doi.org/10.1007/BF02310555>
- Delacre, M., Lakens, D., & Leys, C. (2017). Why psychologists should by default use Welch's t-test instead of Student's t-test. *International Review of Social Psychology*, 30(1), 92-101. <https://doi.org/10.5334/irsp.82>
- Dewey, J. (1938). *Experience and education*. Macmillan.
- Egara, F. O., Eseadi, C., & Nzeadibe, A. C. (2022). Effect of computer simulation on secondary school students' interest in algebra. *Education and Information Technologies*, 27, 5457-5469. <https://doi.org/10.1007/s10639-021-10821-8>
- Egara, F. O., & Mosimege, M. (2024). Effect of flipped classroom learning approach on mathematics achievement and interest among secondary school students. *Education and Information Technologies*, 29(7), 8131-8150. <https://doi.org/10.1007/s10639-023-12145-1>
- Faul, F., Erdfelder, E., Lang, A.-G., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods*, 39(2), 175-191. <https://doi.org/10.3758/BF03193146>
- Federal Republic of Nigeria. (2013). *National policy on education* (6th ed.). NERDC Press.
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Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, 18(1), 39-50. <https://doi.org/10.1177/002224378101800104>