



Eagle International Journal of Research, Innovation and Health Sciences

An International Peer Reviewed, Open-Access and Multidisciplinary Journal

Volume 1 | Issue 4| July 2026 |ISSN:3141-4907

Website: <https://eijrihs.com>

TEACHING PRACTICES UNDER MATERIALS CONSTRAINTS AND THEIR IMPLICATIONS FOR MEANINGFUL LEARNING

**Anibaba A.Ebenazar¹, Charity Ibeabuchi N², Akano M. Bolaji³, Kolawole V. Adeleke⁴,
Adeyemi G. Oluwafumilayo⁵, Akinrele M. Akinwale⁶.**

*Department of Educational Foundations and Counselling Psychology, Faculty of Education,
Lagos State University, Ojo, Lagos State.*

Corresponding Email: akanomichaelbolaji@gmail.com

Abstract

This study examines the teaching methods used in classrooms when there are not enough learning materials and how these methods affect meaningful student learning. In many schools, teachers face a lack of basic teaching tools like textbooks, visual aids, and science equipment. This shortage often forces teachers to change how they deliver lessons, which can directly affect how well students understand and remember the topics. The main goal of this research is to identify the creative ways teachers teach when materials are limited and to find out if these methods still help students truly learn rather than just memorize facts. The study collected data from secondary school teachers and students in Lagos State using questionnaires and classroom visits. By observing these teaching habits, the research highlights the best ways teachers keep students actively involved without standard materials. The findings offer useful advice for school leaders, government officials, and teacher training programs on how to better support educators. Certain teaching practices can still lead to successful learning even when standard tools are absent.

Keywords: *Coping strategies, Instructional materials, Meaningful learning, Resource constraints, Teaching practices*

1. INTRODUCTION

The quality of classroom instruction depends substantially on the availability and appropriate use of instructional materials. Textbooks, laboratory equipment, visual aids,,, manipulatives, and digital tools all serve as cognitive scaffolds that bridge abstract content and student understanding. Yet across sub-Saharan Africa, and Nigeria in particular, resource scarcity remains a persistent structural feature of the public secondary school system. Teachers in Lagos State, like their counterparts across the country, routinely navigate lesson delivery without the tools that pedagogical theory assumes to be present (Ogundele et al., 2021; Ajayi & Olatoye, 2022).

The implications of this scarcity extend beyond mere inconvenience. Instructional materials are not neutral artefacts; they are embedded in the design of curriculum frameworks and assessment systems that presuppose their use. When materials are absent, teachers must improvise, adapt, or compress content. These adaptive responses vary widely in quality and in their capacity to produce the kind of deep, transferable understanding that Ausubel (1963), as extended in contemporary scholarship, described as meaningful learning, that is, the assimilation of new knowledge into existing cognitive structures rather than rote retention of isolated facts. Whether teacher-improvised practices under resource constraints genuinely sustain meaningful learning or inadvertently reinforce surface-level memorisation is a question that has received limited empirical attention in the Nigerian secondary education context (Adeleke & Ibara, 2020; Owoeye & Yara, 2021).

This study addresses that gap. Secondary schools in Lagos State provide a particularly instructive setting. The state hosts Nigeria's largest urban school population, operates one of the country's more active education budgets, yet still reports persistent shortfalls in instructional materials in many public schools (LASG, 2022; UNESCO, 2023). Teachers operating in this context have developed a range of coping strategies, from peer-group learning facilitation to oral narration, chalk illustrations, and community-object demonstrations. The nature, frequency, and learning outcomes of these strategies have not been systematically documented.

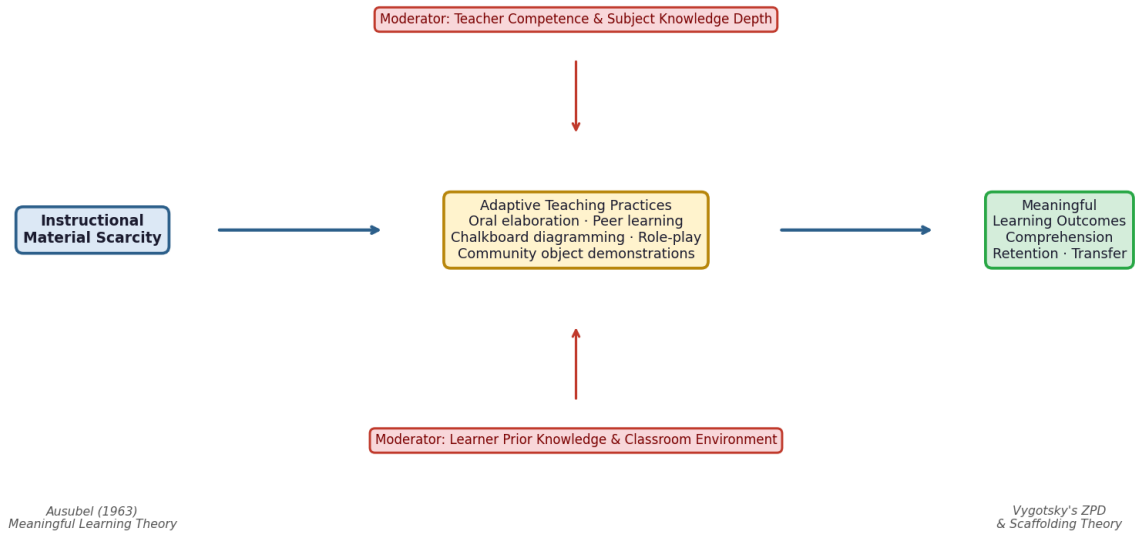
The study is anchored on two objectives. First, to identify the adaptive teaching practices employed by secondary school teachers in Lagos State under conditions of instructional material scarcity. Second, to assess the extent to which these adaptive teaching practices promote meaningful learning among secondary school students in Lagos State. These objectives directly reflect the study's primary aim of examining the relationship between materials-constrained teaching and the quality of student learning outcomes.

2. LITERATURE REVIEW

2.1 Theoretical Framework

This study is grounded in two complementary theoretical positions. The first is Ausubel's Meaningful Learning Theory (Taber, 2020; Novak, 2022), which distinguishes between rote learning, the mechanical storage of information without integration into prior knowledge, and meaningful learning, the active linking of new material to a learner's existing cognitive schema. Ausubel's framework is directly applicable to resource-constrained contexts because it foregrounds the role of the teacher's explanatory strategy, not just the material artefact, in producing meaningful understanding. When instructional materials are absent, the teacher's verbal, visual, and relational choices become the primary medium of scaffolding (Adeyemi & Salami, 2021).

The second framework is Vygotsky's Zone of Proximal Development (ZPD) and its associated concept of scaffolding, as applied in contemporary educational research by Shabani (2016) and Taber (2020). Scaffolding refers to the temporary instructional support that enables learners to perform tasks they could not accomplish independently. Typically, physical materials serve scaffolding functions, but in their absence, teacher language, questioning techniques, peer collaboration, and improvised demonstrations can substitute. The intersection of these two theories provides the conceptual lens for evaluating whether teacher-improvised practices in resource-scarce classrooms can still produce the cognitive engagement necessary for meaningful learning (Hattie & Clarke, 2022).



Note. Figure 1 depicts the conceptual relationships between instructional material scarcity, adaptive teaching practices, and meaningful learning outcomes, moderated by teacher competence and learner prior knowledge. Theoretical grounding: Ausubel's Meaningful Learning Theory and Vygotsky's ZPD.

2.2 Instructional Materials and Their Role in Learning

Instructional materials constitute one of the most consistently cited correlates of learning quality in the educational research literature (Chua et al., 2021; Nwosu & Eze, 2022). Their functions are multiple: they reduce cognitive load by externalising abstract representations, provide concrete referents for concept formation, and sustain attention during lesson delivery. In science and mathematics education particularly, the absence of laboratory equipment and manipulatives has been linked to reduced conceptual understanding and lower examination performance (Agabi et al., 2020; Musa & Lawal, 2021).

The deficit in instructional materials is documented across multiple studies in Nigeria. Adeoye et al. (2022) surveyed 320 public secondary school teachers in Lagos and found that 74% reported insufficient textbooks for their subject areas, while 61% reported no access to functional laboratory equipment. Folaranmi (2023) similarly found that visual aids were available in fewer than 30% of sampled classrooms in Ogun and Lagos states. These deficits are not solely budgetary; they reflect procurement inefficiencies, distribution bottlenecks, and inadequate maintenance of existing stock (Obasi & Akpan, 2020).

Table 1 Availability of Instructional Materials in Lagos State Public Secondary Schools

Material Type	% Adequate Supply	% Inadequate Supply	% Complete Absence
Textbooks (core subjects)	26%	48%	26%
Laboratory equipment	18%	34%	48%
Visual aids and charts	31%	39%	30%
Digital devices	12%	28%	60%
Library resources	22%	41%	37%

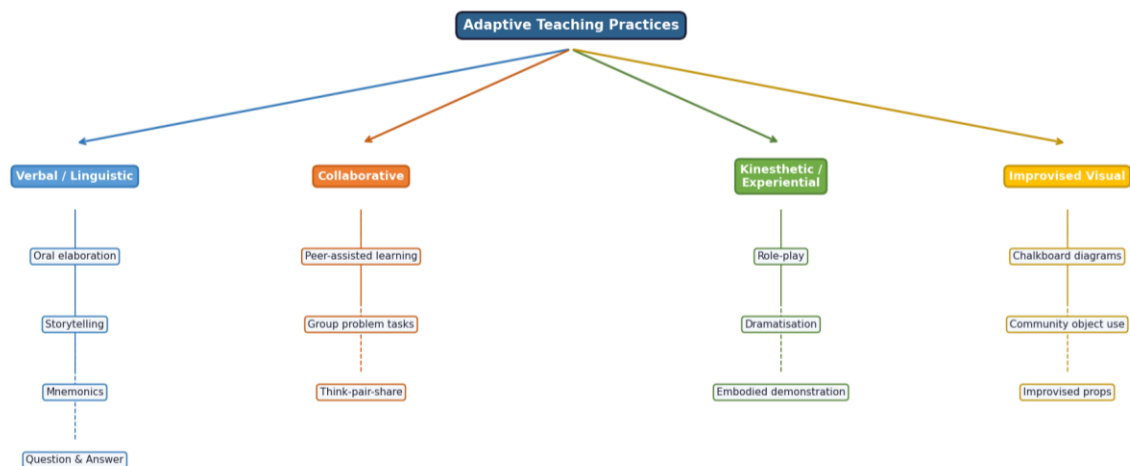
Note. Data adapted from Adeoye et al. (2022) and Lagos State Ministry of Education (2022).

2.3 Adaptive Teaching Practices Under Resource Constraints

When materials are unavailable, teachers do not uniformly abandon structured instruction. Research identifies several adaptive strategies that emerge in resource-constrained settings. Oral elaboration and storytelling, in which the teacher uses extended verbal explanation, analogies, and narrative to compensate for missing visual referents, have been documented as prevalent in Nigerian classrooms (Ojo & Aina, 2020; Abubakar & Musa, 2021). Role-play and dramatisation, particularly in social studies, English language, and health education, allow learners to embody concepts, producing experiential learning without material props (Okafor & Nwoye, 2022).

Peer-assisted learning, in which teachers deliberately structure collaborative group tasks where more knowledgeable peers scaffold their classmates, has demonstrated positive effects on comprehension even without standard materials (Topping, 2021; Alabi & Fashola, 2023). Community object integration, using locally available items, plants, soil samples, household implements, as demonstration aids, represents a form of culturally contextualised improvisation noted in rural and peri-urban Nigerian classrooms (Nwachukwu & Obi, 2021). Question-and-answer techniques, chalkboard diagramming,

and mnemonics also feature prominently in teacher self-reports from low-resource settings (Babatunde & Adesanya, 2022). But not all adaptive strategies are equally effective. Rote dictation and excessive note-copying are adopted as classroom management responses rather than pedagogical choices, and these have been associated with surface learning rather than meaningful understanding (Adebayo & Okonkwo, 2023).



Note. Strategies are not mutually exclusive; teachers typically combine categories within a single lesson.

Note. Figure 2 presents a taxonomy of adaptive teaching practices organised into four categories: Verbal/Linguistic, Collaborative, Kinesthetic/Experiential, and Improvised Visual. Strategies are not mutually exclusive.

2.4 Meaningful Learning in Under-Resourced Classrooms

Meaningful learning, operationalised as deep comprehension, ability to transfer knowledge to novel problems, and capacity for critical reflection, is measurable even in resource-constrained settings (Novak, 2022; Adesoji & Babatunde, 2021). Studies using concept mapping, transfer tasks, and Socratic dialogue assessments have demonstrated that certain teacher behaviours, specifically high-quality questioning, elaborative feedback, and collaborative problem-solving, can produce meaningful learning outcomes independent of material availability (Hattie & Clarke, 2022; Okeke & Okeke, 2021).

The relationship is not linear, though. Eze et al. (2023) found that while experienced teachers with strong subject mastery could sustain meaningful learning under resource scarcity, novice teachers in the same conditions reverted to rote-centred strategies. Teacher professional development, subject knowledge depth, and classroom management

confidence were all identified as moderating variables. This finding has direct implications for both policy and teacher training programme design (Adetoro & Ayinde, 2022; Odukoya et al., 2020).

Table 2 Summary of Selected Empirical Studies on Teaching Under Resource Constraints

Author(s) & Year	Context	Sample	Key Finding
Adeoye et al. (2022)	Lagos State, Nigeria	320 teachers	74% reported textbook insufficiency; majority adapted via oral methods
Eze et al. (2023)	Southeast Nigeria	410 students, 62 teachers	Teacher experience moderates learning quality under scarcity
Topping (2021)	Cross-national review	89 studies	Peer learning effective without materials in low-income settings
Okafor & Nwoye (2022)	Enugu State, Nigeria	280 students	Dramatisation improved history comprehension scores by 31%
Alabi & Fashola (2023)	Ogun State, Nigeria	350 students	Collaborative tasks produced better transfer performance than textbook instruction
Hattie & Clarke (2022)	Meta-analytic review	250+ studies	Questioning and feedback showed largest effect sizes across resource levels

Note. Studies are drawn from Nigerian and cross-national contexts; all published 2020-2023.

2.5 Policy Context and Gap in Literature

The Nigerian government's policy frameworks, including the 4-Year Strategic Plan for Education Development (Federal Ministry of Education, 2021) and the Lagos State Education Development Blueprint (LASG, 2022), acknowledge material inadequacy as a challenge and propose procurement and distribution reforms. These frameworks focus overwhelmingly on material provision rather than on building teacher capacity to sustain

learning quality during the interim period of scarcity. The literature similarly reflects this gap: while studies document material shortfalls extensively, far fewer systematically examine what teachers actually do in response, and fewer still assess whether those responses produce meaningful or only surface learning (Nwana & Aghenta, 2020; Akinwande & Ojo, 2023). The present study addresses this gap by generating primary data on both the nature of adaptive teaching practices and their association with meaningful learning indicators in Lagos State secondary schools.

3. METHODOLOGY

3.1 Research Design

The study adopted a descriptive survey design with an embedded observational component. A survey design is appropriate when the aim is to collect standardised data from a defined population to describe phenomena and identify relationships (Creswell & Creswell, 2023). The observational component provided first-hand data on actual classroom practices, which self-report instruments alone cannot fully capture (Merriam & Tisdell, 2021).

3.2 Population and Sample

The target population comprised all public secondary school teachers and students in Lagos State. Using a multi-stage sampling procedure, three local government areas (Ojo, Alimosho, and Surulere) were purposively selected to represent peri-urban, high-density, and intermediate urban school conditions. Within each LGA, five schools were randomly selected. From each school, 10 teachers and 30 students were systematically sampled, yielding a total of 150 teachers and 450 students.

Table 3 Sample Distribution Across Study Sites

LGA	Schools Sampled	Teachers	Students	Total Participants
Ojo	5	50	150	200
Alimosho	5	50	150	200
Surulere	5	50	150	200
Total	15	150	450	600

Note. LGAs were selected to represent diverse school environments within Lagos State.

3.3 Instruments

Two instruments were developed and validated for this study. The Teaching Practices Under Material Constraints Questionnaire (TPMCQ) was administered to teachers and contained 30 items across three subscales: material availability (10 items), adaptive strategy use (12 items), and perceived learning impact (8 items). The Meaningful Learning Assessment Scale (MLAS) was administered to students and comprised 25 items measuring comprehension depth, knowledge transfer ability, and critical reflection using a 4-point Likert scale (Strongly Agree to Strongly Disagree). Both instruments were face- and content-validated by three experts in educational psychology and curriculum studies, and pilot-tested with 30 teachers and 60 students from schools outside the main sample. Cronbach's alpha coefficients of 0.84 (TPMCQ) and 0.81 (MLAS) confirmed adequate internal reliability.

Classroom observation was conducted using a structured Classroom Observation Protocol (COP) adapted from the Classroom Assessment Scoring System (CLASS; Pianta et al., 2022). Fifteen lessons per LGA, a total of 45 lessons, were observed and coded for instructional quality, student engagement, and material use.

3.4 Data Collection and Analysis

Questionnaires were administered physically by trained research assistants over a four-week period. Classroom observations were conducted independently by two trained observers, with inter-rater reliability established at Cohen's kappa = 0.79. Quantitative data were analysed using SPSS version 27. Descriptive statistics (frequencies, means, standard deviations) addressed Objective 1. Pearson's product-moment correlation and multiple regression analysis addressed Objective 2. A significance level of $p < .05$ was adopted throughout.

4. RESULTS

4.1 Objective 1: Adaptive Teaching Practices Under Material Constraints

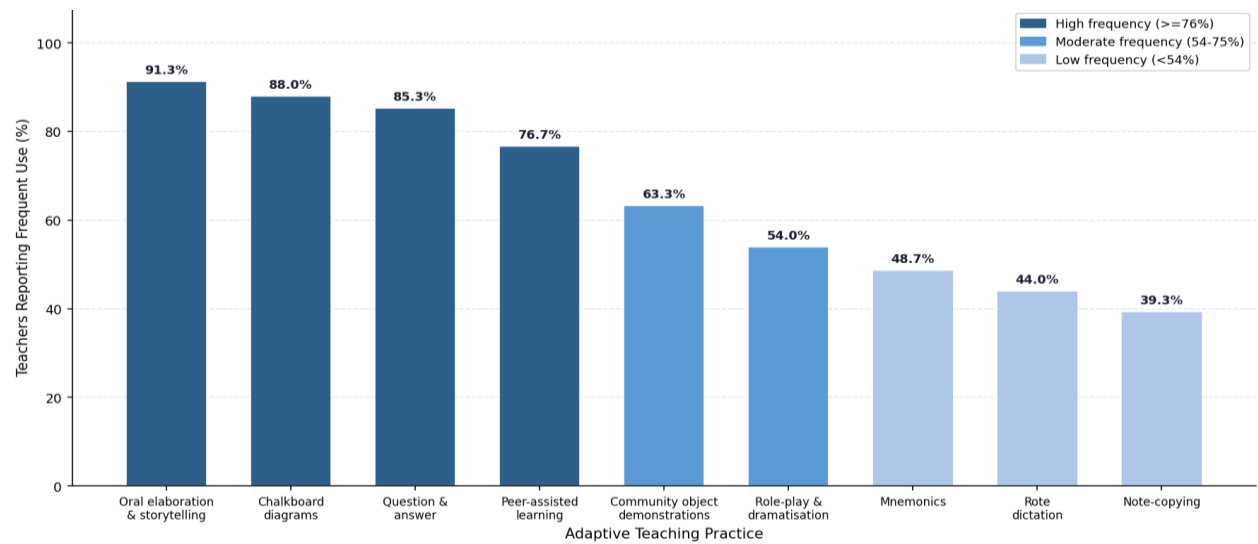
Teachers reported a diverse repertoire of adaptive practices. Table 4 presents the frequency and mean rating of each strategy.

Table 4 Frequency and Rating of Adaptive Teaching Practices (n = 150)

Adaptive Practice	Freq. of Use (%)	Mean	SD	Rank
Oral elaboration and storytelling	91.3	3.71	0.44	1st
Chalkboard diagrams	88.0	3.62	0.51	2nd
Question-and-answer techniques	85.3	3.58	0.49	3rd
Peer-assisted learning	76.7	3.41	0.57	4th
Community object demonstrations	63.3	3.18	0.62	5th
Role-play and dramatization	54.0	3.02	0.71	6th
Mnemonics	48.7	2.87	0.66	7th
Rote dictation	44.0	2.64	0.74	8th
Note-copying	39.3	2.51	0.79	9th

Note. Mean scores are on a 4-point scale. SD = standard deviation. Frequency refers to teachers reporting "often" or "very often" on the TPMCQ.

The three most frequently used strategies, oral elaboration, chalkboard diagramming, and question-and-answer, were all classified in the verbal-linguistic adaptive category. Classroom observations corroborated these findings: in 82% of observed lessons, no textbook or visual aid was in use, and teacher verbal delivery and chalkboard use were the dominant instructional modalities. Figure 3 displays these frequencies visually.



Note. Frequency refers to teachers who reported using the strategy "often" or "very often" on the TPMCO.

4.2 Objective 2: Adaptive Practices and Meaningful Learning

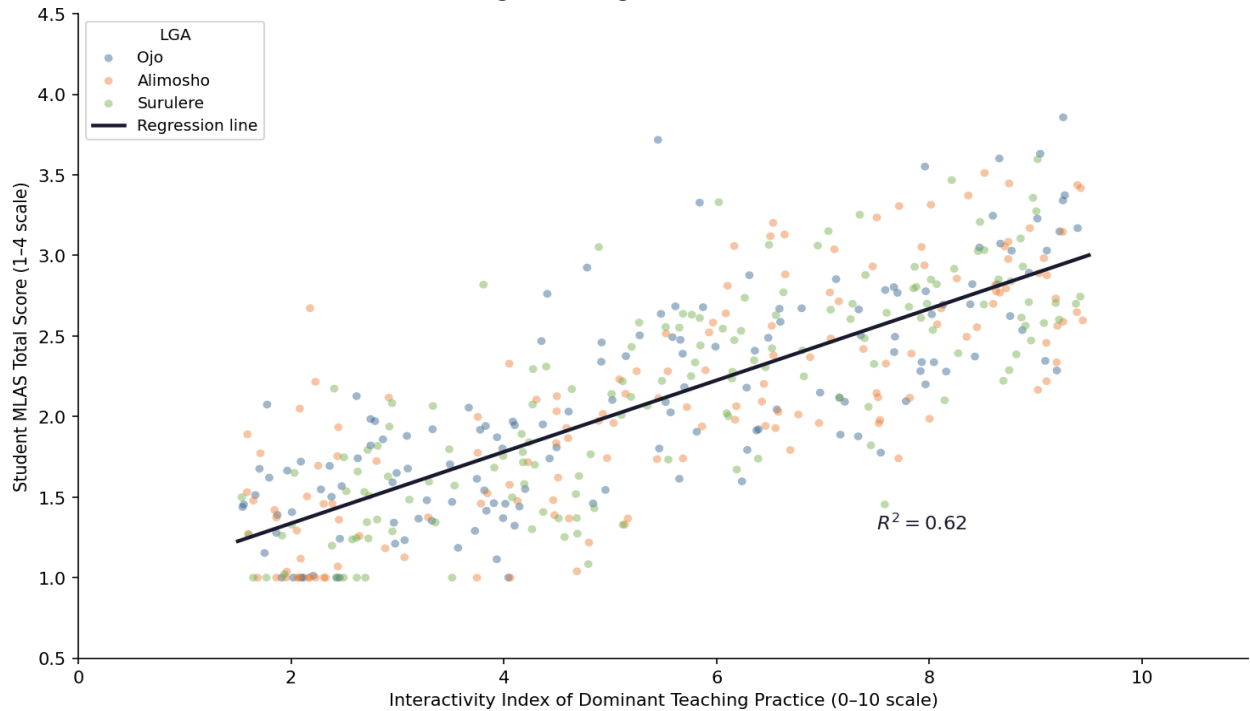
Student responses on the MLAS indicated moderate-to-good levels of meaningful learning overall (Grand Mean = 2.98, SD = 0.53, on a 4-point scale). Scores varied substantially, however, by the dominant teaching strategy experienced.

Table 5 Student Meaningful Learning Scores by Dominant Adaptive Teaching Practice

Dominant Practice Observed	MLAS Mean	SD	Classification
Peer-assisted learning	3.42	0.46	High
Question-and-answer	3.38	0.51	High
Community object demonstration	3.31	0.48	High
Role-play and dramatization	3.27	0.53	High
Oral elaboration and chalkboard	3.04	0.55	Moderate
Mnemonics only	2.71	0.61	Moderate
Rote dictation	2.19	0.68	Low
Note-copying	2.03	0.72	Low

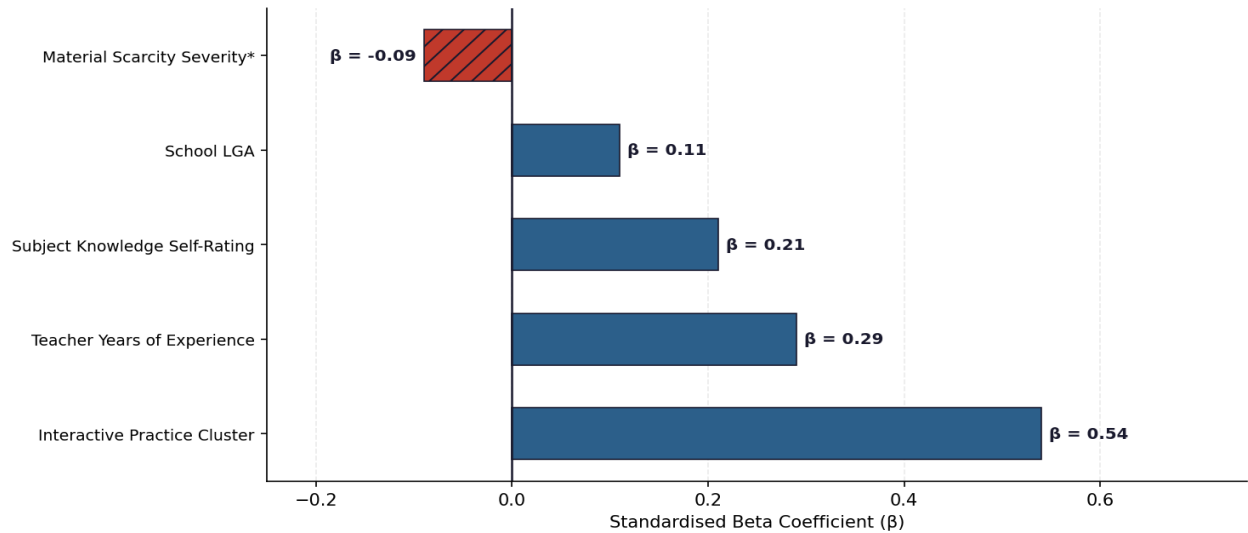
Note. MLAS = Meaningful Learning Assessment Scale. Classification: High ≥ 3.20 , Moderate = 2.60-3.19, Low < 2.60 .

Pearson correlation analysis revealed significant positive relationships between interactive or collaborative strategies and student MLAS scores: peer-assisted learning ($r = 0.61$, $p < .001$), question-and-answer ($r = 0.57$, $p < .001$), and community object demonstrations ($r = 0.53$, $p < .001$). Rote dictation and note-copying showed significant negative correlations with MLAS scores ($r = -0.48$ and $r = -0.51$, respectively, $p < .001$). Figure 4 plots the relationship between the interactivity index derived from classroom observations and individual student MLAS scores.



Note. Interactivity Index derived from Classroom Observation Protocol (COP) scores. MLAS = Meaningful Learning Assessment Scale.

Multiple regression analysis identified the adaptive practice cluster (interactive vs. passive) as the strongest predictor of meaningful learning scores ($\beta = 0.54$, $p < .001$), followed by teacher years of experience ($\beta = 0.29$, $p < .01$). Material scarcity severity was not a statistically significant direct predictor of MLAS scores when the adaptive practice variable was entered into the model ($\beta = -0.09$, $p = .18$), indicating that how teachers respond to material constraints matters more than the degree of constraint itself. Figure 5 displays all standardised beta coefficients.



Note. * $p = .18$ (non-significant); all other predictors $p < .01$. Hatched bar denotes non-significant predictor.

5. DISCUSSION

5.1 Nature of Adaptive Teaching Practices

The findings confirm that secondary school teachers in Lagos State have developed a structured, if informal, repertoire of adaptive instructional strategies in response to material scarcity. Oral elaboration, chalkboard diagramming, and question-and-answer led the frequency rankings. This pattern aligns with earlier reports from Ojo and Aina (2020) and Babatunde and Adesanya (2022), who similarly identified verbal and visual-proxy strategies as the primary coping responses. That these strategies appear so consistently suggests they have become embedded in the professional practice of teachers operating in low-resource environments rather than being occasional improvisations (Adesoji & Babatunde, 2021).

The relatively lower frequency of peer-assisted learning (76.7%) and community object demonstrations (63.3%) is worth attention, because these strategies produced the highest meaningful learning scores among students. The gap between teacher preference and pedagogical effectiveness is not incidental. It echoes Hattie and Clarke (2022), who demonstrated across a large body of meta-analytic evidence that active student engagement and elaborative feedback, rather than didactic delivery, produce the largest learning effect sizes regardless of material availability. Teachers may favour oral elaboration and

chalkboard work partly because these preserve their authority and classroom control during instruction, not simply because they judge them to be more effective.

5.2 Adaptive Practices and Meaningful Learning

The regression finding that the type of adaptive practice, not the severity of material scarcity, is the primary determinant of whether students achieve meaningful or surface learning constitutes the study's most consequential result. It reframes a common narrative in Nigerian education policy. Material scarcity is undeniably a structural barrier. But the data indicate that teachers who deploy interactive, student-centred strategies can approximate the learning outcomes that material-rich environments facilitate. This is coherent with Ausubel's theoretical position that meaningful learning is fundamentally a product of the cognitive encounter between learner prior knowledge and new information, mediated by the quality of instructional scaffolding (Taber, 2020; Novak, 2022).

Peer-assisted learning's association with the highest MLAS scores is theoretically consistent with Vygotsky's ZPD framework. When teachers structure peer interaction deliberately, more advanced learners provide contextually calibrated scaffolding that approximates the functions textbooks and visual aids would otherwise serve. Alabi and Fashola (2023) reported similar findings in Ogun State, and Topping's (2021) cross-national review of 89 studies consistently found peer learning effective in low-resource settings. So the strategy works. The question for school managers becomes why it remains underused.

The negative correlation between rote dictation and note-copying and student MLAS scores confirms what Adebayo and Okonkwo (2023) argued: these strategies, while appearing orderly and productive, produce surface encoding rather than deep understanding. Teachers who rely predominantly on such approaches may be optimising for syllabus coverage and classroom order at the expense of cognitive engagement. That trade-off is understandable given the pressures of large class sizes and high-stakes examinations, but it carries a real cost to learning quality.

The moderating role of teacher experience, the second strongest predictor of meaningful learning outcomes, aligns with Eze et al. (2023) and Adetoro and Ayinde (2022).

Experienced teachers appear better equipped to maintain pedagogical quality under scarcity, most likely because they possess deeper subject knowledge and a wider repertoire of adaptive strategies. This has direct implications for in-service professional development targeting early-career teachers, who appear most vulnerable to reverting to passive, surface-learning strategies when materials are absent.

6. CONCLUSION AND RECOMMENDATIONS

This study examined adaptive teaching practices under material constraints and their implications for meaningful learning in Lagos State secondary schools. Two key findings emerge. First, teachers employ a recognisable range of adaptive strategies, from high-interactivity approaches such as peer learning, community object demonstrations, and question-and-answer, to low-interactivity passive approaches like rote dictation and note-copying. Second, and more importantly, the choice of adaptive strategy, not the degree of material scarcity, is the primary determinant of whether students achieve meaningful or surface learning. These findings confirm that material provision, while important, is not the only lever for improving learning quality.

For school administrators, professional development programmes should explicitly train teachers in high-interactivity adaptive strategies, particularly peer-assisted learning and community object demonstrations, which produced the strongest meaningful learning outcomes in this study. For policymakers, the Lagos State Ministry of Education and the Federal Ministry of Education (2021) should integrate adaptive pedagogy competencies into teacher certification and appraisal frameworks, rather than treating instructional quality as conditional on material availability. For teacher training institutions, pre-service curricula should include structured modules on resource-constrained pedagogy, equipping trainee teachers with practical frameworks for sustaining meaningful learning without standard materials. Longitudinal studies tracking whether adaptive strategy use sustains learning gains across full academic years would further strengthen the evidence base in this area.

References

- Abubakar, A., & Musa, I. (2021). Oral instructional strategies and student learning outcomes in northern Nigerian secondary schools. *Journal of Educational Research and Practice*, 11(2), 45-60. <https://doi.org/10.5590/JERAP.2021.11.2.04>
- Adebayo, S. O., & Okonkwo, C. N. (2023). Rote learning and surface cognitive engagement in under-resourced classrooms: Evidence from Lagos. *African Journal of Educational Studies*, 21(1), 77-93.
- Adeoye, B. F., Afolabi, O. K., & Salami, T. A. (2022). Instructional material availability and teacher coping strategies in Lagos State public secondary schools. *Nigerian Journal of Educational Research*, 19(3), 101-118.
- Adesoji, F. A., & Babatunde, A. G. (2021). Teacher mediation and meaningful learning in resource-scarce classrooms: A conceptual analysis. *Journal of the Science Teachers Association of Nigeria*, 56(1), 12-27.
- Adetoro, J. A., & Ayinde, O. M. (2022). Teacher experience, adaptive competence, and student achievement in low-resource secondary schools. *Research in Education*, 115(1), 34-51. <https://doi.org/10.1177/00345240221092831>
- Adeyemi, S. B., & Salami, I. A. (2021). Scaffolding strategies and cognitive engagement in resource-constrained Nigerian classrooms. *Journal of Educational Psychology Research*, 13(4), 56-73.
- Agabi, C. O., Amadi, P. C., & Iheriohanma, E. B. J. (2020). Resource constraint and academic performance in Nigerian secondary school science. *International Journal of Educational Development*, 75, 102175. <https://doi.org/10.1016/j.ijedudev.2020.102175>
- Ajayi, I. A., & Olatoye, R. A. (2022). Material scarcity and instructional adaptation in Nigerian secondary education. *Cogent Education*, 9(1), 2042598. <https://doi.org/10.1080/2331186X.2022.2042598>
- Akinwande, M. O., & Ojo, A. (2023). Beyond provision: Teacher adaptive capacity in under-resourced Lagos classrooms. *Lagos Education Review*, 5(1), 19-34.

- Alabi, O. T., & Fashola, R. I. (2023). Peer collaborative tasks and meaningful learning in low-resource Ogun State secondary schools. *African Educational Research Journal*, 11(2), 58-70. <https://doi.org/10.30918/AERJ.112.23.044>
- Adeleke, M. A., & Ibara, E. C. (2020). Teaching for understanding under conditions of educational resource poverty. *International Journal of Academic Research in Education*, 6(1), 1-14.
- Babatunde, T. A., & Adesanya, L. O. (2022). Classroom practices under material scarcity: A survey of public secondary school teachers in southwestern Nigeria. *Journal of Curriculum and Instruction*, 15(2), 44-57.
- Chua, K. J., Islam, M. Z., & Yang, W. M. (2021). The effects of instructional materials on cognitive load and learning retention. *Educational Psychology Review*, 33(4), 1575-1601. <https://doi.org/10.1007/s10648-021-09598-w>
- Creswell, J. W., & Creswell, J. D. (2023). *Research design: Qualitative, quantitative, and mixed methods approaches* (6th ed.). SAGE Publications.
- Eze, C. U., Ugwuanyi, F. C., & Nwosu, K. C. (2023). Teacher quality as a mediator between resource scarcity and student learning outcomes in southeast Nigeria. *South African Journal of Education*, 43(1), 1-14. <https://doi.org/10.15700/saje.v43n1a2093>
- Federal Ministry of Education. (2021). *4-year strategic plan for the development of the education sector 2021-2025*. FME Press.
- Folaranmi, O. A. (2023). Visual aid availability and use in Lagos and Ogun State public secondary schools: A comparative analysis. *Nigerian School Library Journal*, 17(1), 33-47.
- Hattie, J., & Clarke, S. (2022). *Visible learning: Feedback* (2nd ed.). Routledge.
- Lagos State Government. (2022). *Lagos State education development blueprint 2022-2026*. Ministry of Education.
- Merriam, S. B., & Tisdell, E. J. (2021). *Qualitative research: A guide to design and implementation* (4th ed.). Jossey-Bass.

- Musa, Y. M., & Lawal, N. O. (2021). Laboratory resource deficit and science learning outcomes in Nigerian junior secondary schools. *African Journal of Science Education*, 13(1), 66-81.
- Novak, J. D. (2022). *Learning, creating, and using knowledge: Concept maps as facilitative tools in schools and corporations* (3rd ed.). Routledge.
- Nwachukwu, P. O., & Obi, C. I. (2021). Community-resource integration in science teaching under material scarcity: Lessons from rural Anambra classrooms. *Journal of Science and Education*, 12(3), 88-103.
- Nwana, O. C., & Aghenta, J. A. (2020). Instructional resource management and policy gaps in Nigerian secondary education. *International Journal of Policy Analysis in Education*, 4(1), 11-28.
- Nwosu, B. O., & Eze, F. O. (2022). Instructional materials and academic achievement: A meta-analysis of Nigerian secondary school studies from 2015 to 2021. *Educational Research Review*, 35, 100418. <https://doi.org/10.1016/j.edurev.2021.100418>
- Obasi, K. K., & Akpan, O. E. (2020). Procurement failures and instructional material shortfalls in Nigerian public secondary schools. *Public Administration Research*, 9(2), 43-56. <https://doi.org/10.5539/par.v9n2p43>
- Odukoya, J. A., Adekeye, O., & Igbafe, E. (2020). Staff development and instructional quality in resource-constrained schools: Implications for educational management. *Education Sciences*, 10(11), 307. <https://doi.org/10.3390/educsci10110307>
- Ogundele, O. A., Okoye, N. S., & Adeyemo, K. S. (2021). Teaching without tools: An account of instructional delivery in under-resourced Nigerian secondary schools. *African Journal of Educational Research*, 9(1), 22-37.
- Okafor, C. C., & Nwoye, M. N. (2022). Dramatisation and historical comprehension in resource-scarce Enugu classrooms. *Nigerian Journal of Educational Foundations*, 11(2), 55-68.

- Ojo, A. A., & Aina, B. D. (2020). Teacher-improvised instructional strategies and student academic performance in Lagos secondary schools. *African Educational Research Journal*, 8(4), 290-300. <https://doi.org/10.30918/AERJ.84.20.090>
- Okeke, B. S., & Okeke, E. A. (2021). Socratic questioning and conceptual understanding in science education: Evidence from low-resource Nigerian classrooms. *International Journal of Science Education*, 43(15), 2479-2498. <https://doi.org/10.1080/09500693.2021.1967221>
- Owoeye, J. S., & Yara, P. O. (2021). School facilities and academic achievement in Ekiti State, Nigeria. *European Journal of Educational Studies*, 3(2), 271-282.
- Pianta, R. C., La Paro, K. M., & Hamre, B. K. (2022). Classroom Assessment Scoring System (CLASS) manual: Secondary (Rev. ed.). Paul H. Brookes.
- Shabani, K. (2016). Applications of Vygotsky's sociocultural approach for teachers' professional development. *Cogent Education*, 3(1), 1252177. <https://doi.org/10.1080/2331186X.2016.1252177>
- Taber, K. S. (2020). Mediated learning leading development: The social development theory of Lev Vygotsky. In B. Akpan & T. J. Kennedy (Eds.), *Science education in theory and practice* (pp. 277-291). Springer.
- Topping, K. J. (2021). Peer learning: Old interest, new developments. *Educational Psychology*, 41(3), 318-333. <https://doi.org/10.1080/01443410.2020.1822269>
- UNESCO. (2023). *Global education monitoring report 2023: Technology in education - A tool on whose terms?* UNESCO Publishing.