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Bridging Basic Science Technology and English Language Education: Students' Perceptions on Learner-Centered Pedagogical Approaches

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Abstract

The general purpose of this study was to investigate students' perceptions of learner-centered pedagogical approaches as applied in both Basic Science and Technology (BST) and English Language (EL) within junior secondary schools (JSS) in Nsukka Educational Zone of Enugu State. Specifically, the study determined various ways JSS III students perceived interactive, independent and experimental pedagogical approaches used for instruction in BST and EL. Survey research design was adopted. Population comprised 3,796 JSS students from area of the study. Data were collected using questionnaire. Data were analyzed using mean and t-test at 0.05 level of significance. Findings include that students generally perceived interactive instructional approaches as fairly effective, with a grand mean of 3.17. There is no significant difference between urban ($\bar{X}$ = 3.24, SD = 1.02) and rural ($\bar{X}$ = 3.09), students' perceptions (t = –1.93, p = 0.054). For independent approaches, perceptions were also fairly effective, yielding a grand mean of 2.69. However, a significant difference emerged in favor of rural students (t = –2.08, p = 0.039). In contrast, experiential approaches were rated as the most effective overall, with a grand mean of 3.80, and a statistically significant rural–urban difference (t = –2.11, p = 0.036) indicating stronger positive perceptions among rural students. Five recommendations were made.

Keywords: Learner-centered, Science, Technology, English, Pedagogy, Interactive, Independent, Experimental, Approaches.

Introduction

The shift from conventional teacher-led instruction to learner-centered pedagogy marks a significant transformation in education. This change is driven by the need to design engaging, responsive, and developmentally appropriate learning experiences that reflect learners' individual needs. Within this context, Basic Science and Technology (BST) and English Language (EL) are key pillars of Nigeria's junior secondary school curriculum. According to the Nigerian Educational Research and Development Council (NERDC, 2012a; 2012b) and the Federal Ministry of Education (FME, 2013), both subjects are classified as core subjects in the 9-Year Basic Education Curriculum and taught consistently from JSS1 to JSS3 in both public and private

schools. Understanding BST and EL role in promoting scientific literacy and communicative competence is central to appreciating how learner-centered pedagogy operates in the classrooms.

BST aims to cultivate creativity, scientific inquiry, and technological competence, while serving as a foundation for advanced studies in Physics, Chemistry, and Technical Drawing (FME, 2012). It also equips students to apply scientific reasoning to social challenges such as climate change and entrepreneurship (FME, 2012). EL, in contrast, develops proficiency in reading, writing, speaking, and listening while functioning as the medium of instruction for other subjects. In this role, it enables students to interpret texts, prepare reports, and present findings, all of which are crucial for both academic success and effective communication in broader contexts (Offorma, 2018; Mitchell et al., 2019; Schmitt & Schmitt, 2020). Taken together, BST and EL promote analytical reasoning, problem-solving, and effective communication, which highlights their potential for interdisciplinary learning.

The integration of BST and EL creates opportunities for students to connect language use with scientific reasoning. For example, reporting on a science experiment in EL strengthens writing and vocabulary while reinforcing scientific thinking (Offorma, 2018; Curelaru et al., 2022; Buehl, 2023). Such overlap reflects curriculum goals but contrasts sharply with classroom realities. Persistent underperformance in BST, as indicated by Basic Education Certificate Examination (BECE) results, points to weaknesses in how pedagogy addresses learner needs (Enugu State Post Primary Schools Management Board [PPSMB], 2019). Similarly, varied levels of English proficiency often affect students' ability to engage with subject matter (Schmitt & Schmitt, 2020). These concerns direct attention to the kinds of teaching methods being used in Nsukka educational zone and, more importantly, how students themselves experience them.

While curriculum policy emphasizes learner-centered methods (NERDC, 2012a; FME, 2013), much of the research still privileges teacher perspectives, leaving students' voices underrepresented. This gap undermines the design of effective classroom strategies (Adefuye et al., 2023; Ihekwoaba et al., 2024). Learner-centered pedagogy is rooted in constructivist learning theory, which emphasizes the learner's active role in constructing knowledge through exploration, interaction, and real-life problem-solving (Piaget, 1972; Herranen et al., 2018). It adapts instruction to students' prior knowledge, interests, and learning preferences (An & Mindrila, 2020; Ahmed & Dakhiel, 2019). Within this framework, instructional practices can be grouped into interactive, independent, and experiential approaches.

Interactive approaches, such as group work, debates, and peer instruction, are recognized for promoting collaboration and higher-order thinking (NERDC, 2012a; FME, 2013). Research affirms their value in boosting participation and comprehension (Emeasoba & Igwe, 2016; Al-Nofaie, 2020). Techniques like think-pair-share and collaborative problem-solving encourage inquiry and autonomy (Chen, 2019; McPherson-Geyser et al., 2020). These methods have also proven

effective in online and hybrid environments, though challenges remain when more vocal students dominate discussions, which necessitates intentional facilitation (Agung et al., 2020; Kohnke et al., 2023). To complement interaction, learner-centered pedagogy also relies on independent learning strategies.

Independent approaches build self-discipline and initiative through tasks such as note-taking, reading, and individual assignments (Ellis, 2021). Reports from Nsukka schools confirm their common use, particularly in assessment and review activities. The pandemic further demonstrated the relevance of digital tools like Moodle and Google Classroom in enabling students to manage their own learning (Almahasees et al., 2021; Sari & Oktaviani, 2021). However, differences in access, motivation, and teacher support affect outcomes, particularly in low-resource contexts. These limitations suggest the need for methods that combine autonomy with practical experience, which brings attention to experiential learning.

Experiential learning enhances understanding by immersing students in hands-on activities. In BST, this includes laboratory experiments, model-building, and fieldwork, while in EL it involves storytelling, role play, and collaborative performance tasks (NERDC, 2012a; 2012b). Studies confirm that these approaches increase retention and engagement, particularly when they integrate content across disciplines, such as writing a science experiment report in EL (Matriano, 2020; Buehl, 2023). Despite these benefits, research still emphasizes teacher implementation rather than learners' evaluations of these methods.

Available literature demonstrates the promise of interactive, independent, and experiential approaches, but it also reveals a persistent gap in incorporating student perspectives (Gericke et al., 2023; Venter et al., 2021). This omission is particularly troubling in the Nsukka educational zone, where evidence of underperformance in BST and variable proficiency in EL point to a disconnect between pedagogy and student needs (Enugu State Post Primary School Management Board, 2019), hence the need for this study.

Purpose of the Study

The general purpose of this study was to investigate students' perceptions of learner-centered pedagogical approaches as applied in both BST and EL within junior secondary schools in Nsukka Educational Zone of Enugu State. Specifically, the study determined various ways JSS III students perceived the following learner-centered pedagogical approaches (PA) to instruction of BST and EL;

1. interactive PA.
2. independent PA.
3. experimental PA.

Hypotheses (HOs)

The following hypotheses were tested at 0.05 level of significance. There is no significant difference between mean responses of rural and urban JSS III students' perceptions of the following pedagogical approaches (PA) used in the teaching of BST and EL:

HO_1: interactive PA

HO_2: independent PA

HO_3: experiential PA

Methodology

***Design of the Study*:** This study adopted a descriptive survey research design

***Area of the Study*:** The study was conducted in Nsukka Educational Zone of Enugu State. This zone was selected because it has a large concentration of junior secondary schools. It also represents both urban and rural school settings, providing a balanced view of educational experiences within the state. According to records from the Enugu State Post Primary Schools Management Board (ESPPSMB, 2023), there are 59 public secondary schools in the zone, comprising 30 in Nsukka Local Government Area, 15 in Igbo-Etiti, and 14 in Uzo-Uwani.

***Population for the Study*:** The study population comprised 3,796 JSS III students enrolled in BST and EL classes in the 59 junior secondary schools in Nsukka Education Zone (ESPPSMB, 2023). These students were considered appropriate for the study because they had completed at least two years of instruction in both Basic Science and Technology as well as English Language. Being in their final year of junior secondary school, the students had gained substantial exposure to the pedagogical approaches under study. At this level, students are typically preparing for the Basic Education Certificate Examination (BECE), which assesses applied knowledge across subjects. Based on Piaget's theory of cognitive development, learners in this age group (approximately 14–15 years) are expected to be in the formal operational stage, where they can reason abstractly, evaluate experiences, and respond meaningfully to reflective questions (Piaget, 1972).

***Sample for the Study*:** Multi-stage sampling technique was adopted. In the first stage, 12 public secondary schools were purposively selected from the Nsukka Educational Zone, comprising six urban and six rural schools. Only schools with active JSS III classes in both BST and EL and accessible were selected. In the second stage, students were proportionately drawn from the selected schools using simple random sampling. From the six urban schools, 348 students were sampled, while 449 students were drawn from the six rural schools. The higher number of rural students reflects the actual enrolment structure of the population, where rural schools account for a larger share of the 3,796 JSS III students in the zone. Altogether, the sample comprised 797 JSS III students.

***Instrument for Data Collection*:** Instrument for data collection was a structured questionnaire, developed through literature review and based on the specific purposes. It had two main parts: Part I collected demographic information, while Part II covered the three a 5-point response scale of Very Effective (VE) = 5, Effective (E) = 4, Moderately Effective (ME) = 3, Ineffective (I) = 2, and Very Ineffective (VI) = 1. The instrument was validated by three experts in Technical education, English language education, and measurement and evaluation. To determine the reliability coefficient of the instrument; 20 copies were administered to JSS III students outside the area of the study. The reliability coefficient of the instrument was determined using Cronbach Alpha and it yielded 0.89.

***Data Collection Methods*:** Data were collected by hand with the help of two trained assistants over a period of two weeks. A total of 797 copies of the questionnaire were distributed, 348 and 449 copies to students in urban and rural schools respectively. A total of 741 copies (325 and 416 from urban and rural respectively) were retrieved. The overall retrieval rate was 93 percent.

***Data Analysis Techniques*:** Data were analyzed using mean and standard deviation for the specific purposes, while t-test was employed to test the null hypotheses at the 0.05 level of significance. Based on the 5-point response scale, the following means (real limits) were adopted: 4.50–5.00 (very effective), 3.50–4.49 (effective), 2.50–3.49 (fairly effective), 1.50–2.49 (ineffective), and 1.00–1.49 (very ineffective). For the hypotheses, the decision rule was that a null hypothesis would be rejected if the p-value was less than 0.05, and accepted if the p-value was equal to or greater than 0.05.

Results

Table 1: Mean Responses, Standard Deviations, and t-test, Results of Urban and Rural Students' Perceptions of Interactive Instructional Approaches in BST and EL

S/N	Perception Indicators	$\bar{X}_1$	SD_1	$\bar{X}_2$	SD_2	$\bar{X}_g$	R	t-v	p-v	Dec.
1	Class discussions help me learn better because I can hear other students' ideas.	3.60	1.20	3.70	1.02	3.65	FE	-1.15	0.251	NS
2	Debates in class help me understand different sides of a topic.	3.50	1.45	3.65	1.33	3.57	FE	-1.52	0.129	NS
3	Storytelling by the teacher improves my understanding.	3.35	1.05	3.50	0.89	3.42	FE	-1.76	0.079	NS
4	Role-playing helps me remember and understand.	2.65	1.25	2.85	1.09	2.74	FE	-2.03	0.043	Sig
5	Group learning improves understanding.	2.35	1.05	2.50	0.89	2.42	FE	-1.84	0.067	NS
6	Team-based problem-solving enhances learning.	3.80	0.75	3.90	0.63	3.85	FE	-1.42	0.156	NS
7	Question and answers (Q&A) helps me focus and understand better.	3.35	1.35	3.50	1.19	3.42	FE	-1.54	0.124	NS
8	Conversations with teachers and classmates aid understanding.	2.75	1.40	2.95	1.28	2.85	FE	-2.01	0.045	Sig
9	Think–pair–share improves learning.	2.50	1.05	2.65	0.89	2.57	FE	-1.68	0.094	NS
	Cluster Mean	3.09	1.17	3.24	1.02	3.17	FE	-1.93	0.054	NS

$\bar{X}_1$= Mean of Rural Students; $\bar{X}_2$ = Mean of Urban Students; SD_1= Standard Deviation of Rural Students; SD_2= Standard Deviation of Urban Students, $\bar{X}_g$ = Grand mean, Sig = Significant at $p < 0.05$; NS = Not

Significant, Dec. = Decision, R = Remark; t-v = t-value; p-v = p-value; VE = Very Effective; E = Effective; FE = Fairly Effective; I = Ineffective; VI = Very Ineffective

Table 1 shows that students generally perceived interactive instructional approaches as *fairly effective*, with a cluster mean of 3.17. Activities such as class discussions, debates, and Q&A sessions received relatively high ratings, while group learning and think–pair–share were rated lower. This suggests that although students value interaction, some collaborative strategies are not as strongly appreciated. In terms of hypothesis testing, most items revealed no significant difference between urban and rural students ($p > 0.05$). However, role-playing and teacher–student conversations showed significant differences. At the cluster level, the difference was not statistically significant. Therefore, the null hypothesis of no significant difference in perceptions between urban and rural students was retained for interactive approaches.

Table 2: Mean Responses, Standard Deviations, and t-test Results of Urban and Rural Students' Perceptions of Independent Instructional Approaches in BST and EL

S/N	Perception Indicators	X_1	SD_1	X_2	SD_2	Xg	R	t-value	p-value	Dec.
1	Thinking deeply about problems on my own helps me understand lessons better.	2.20	0.80	2.35	0.70	2.28	FE	-1.95	0.052	NS
2	Solving problems on my own helps me learn better.	2.35	0.85	2.50	0.71	2.42	FE	-2.06	0.041	Sig
3	Doing class projects helps me learn more about the topic.	3.10	0.75	3.18	0.63	3.14	FE	-1.25	0.211	NS
4	Answering questions given by the teacher helps me understand the topic.	3.35	0.85	3.50	0.71	3.42	FE	-2.01	0.045	Sig
5	Finding answers on my own with teacher's help improves understanding.	2.10	1.10	2.18	1.02	2.14	FE	-0.88	0.379	NS
6	Exploring new ideas by myself helps me learn.	2.65	1.20	2.78	1.02	2.71	FE	-1.64	0.102	NS
7	Reading from textbooks helps me understand lessons better.	2.50	1.20	2.65	1.06	2.57	FE	-1.72	0.086	NS
8	Writing my own notes helps me remember what I learned.	2.75	1.15	2.95	0.97	2.85	FE	-2.14	0.034	Sig
	Cluster Mean	2.62	0.99	2.76	0.85	2.69	FE	-2.08	0.039	Sig

Key: *X_1= Mean of Rural Students, X_2 = Mean of Urban Students; SD_1= Standard Deviation of Rural Students, SD_2= Standard Deviation of Urban Students, Xg = Grand mean, Sig = Significant at $p < 0.05$; NS = Not*

Significant, Dec. = Decision, R = Remark, VE = Very Effective, E = Effective, FE = Fairly Effective, I = Ineffective, VI = Very Ineffective

Table 2 shows that students' perceptions of independent instructional approaches were only *fairly effective*, with a cluster mean of 2.69. While activities such as class projects (3.14) and note-taking (2.85) were moderately valued, other strategies like deep thinking (2.28) and independent searching for answers (2.14) attracted weaker ratings, showing that students are less confident working entirely on their own. For hypothesis testing, significant differences emerged between urban and rural students in three areas: solving problems independently ($p = 0.041$), answering teacher-assigned questions ($p = 0.045$), and note-taking ($p = 0.034$). At the cluster level, the overall difference was significant ($p = 0.039$). Thus, the null hypothesis was rejected, indicating that urban and rural students differed significantly in their perceptions of independent learning approaches.

Table 3: Mean Responses, Standard Deviations, and t-test Results of Urban and Rural Students' Perceptions of Experiential Instructional Approaches in BST and EL

S/N	Perception Indicators	X_1	SD_1	X_2	SD_2	Xg	R	t-value	p-value	Dec.
1	Going on school trips or excursions helps me understand lessons better.	4.35	0.80	4.47	0.72	4.41	E	-1.68	0.094	NS
2	Learning through workshop practice helps me gain useful skills.	4.35	1.70	4.50	1.54	4.43	E	-1.95	0.052	NS
3	Interviewing people outside school helps me learn from their experiences.	4.40	1.45	4.55	1.35	4.48	E	-2.04	0.042	Sig
4	Visiting offices or workplaces helps me understand real-life jobs.	4.40	1.45	4.52	1.33	4.46	E	-1.83	0.068	NS
5	Playing educational games helps me learn in a fun way.	3.35	1.45	3.50	1.31	3.43	FE	-1.92	0.055	NS
6	Drill and practice improves memory of lessons.	3.05	1.65	3.23	1.49	3.14	FE	-1.77	0.078	NS
7	Listening to real-life stories/examples aids understanding.	3.20	1.55	3.38	1.45	3.29	FE	-1.88	0.061	NS
8	Visiting career-related places helps me know more about jobs.	4.40	1.40	4.52	1.30	4.46	E	-1.81	0.071	NS
9	Observing real-life activities outside class helps me learn.	3.20	1.00	3.38	0.90	3.29	FE	-2.09	0.037	Sig
10	Filling out real-life forms helps me know how to use them.	2.50	1.10	2.65	0.94	2.57	FE	-1.72	0.086	NS
	Cluster Mean	3.72	1.35	3.87	1.23	3.80	E	-2.11	0.036	Sig

Key: *X_1= Mean of Rural Students, X_2 = Mean of Urban Students; SD_1= Standard Deviation of Rural Students, SD_2= Standard Deviation of Urban Students, Xg = Grand mean, Sig = Significant at $p < 0.05$; NS = Not Significant, Dec. = Decision, R = Remark, VE = Very Effective, E = Effective, FE = Fairly Effective, I = Ineffective, VI = Very Ineffective*

Table 3 indicates that experiential instructional approaches were rated as *effective*, with a cluster mean of 3.80. Excursions (4.41), workshops (4.43), and interviews (4.48) received high ratings, reflecting students' strong preference for practical and hands-on learning. On the other hand, activities like educational games (3.43), drills (3.14), and form-filling (2.57) were rated less positively. Regarding hypothesis testing, significant differences were found for interviewing people outside school ($p = 0.042$) and observing real-life activities ($p = 0.037$). The cluster-level difference was also significant ($p = 0.036$). Consequently, the null hypothesis was rejected, showing that urban and rural students' perceptions of experiential approaches differed significantly

Discussion of Findings

The study provided important insights into how students perceive learner-centered instructional approaches in Basic Science and Technology (BST) and English Language (EL) at the junior secondary level. Interactive methods such as class discussions, debates, and team-based learning were generally viewed positively. These approaches encouraged participation, collaboration, and peer-to-peer learning, giving students opportunities to ask questions, exchange ideas, and deepen understanding through shared activities. This observation is consistent with the findings of Emeasoba and Igwe (2016) and Al-Nofaie (2020), who stressed that interactive teaching enhances creativity and critical thinking. Results from the hypotheses further indicated that urban and rural students did not differ significantly in their overall perceptions of interactive strategies, though differences were noted in specific practices like role-playing and class conversations. This points to the importance of context and facilitation in determining the effectiveness of interactive methods. McKenney and Reeves (2018) similarly reported that cooperative strategies benefit diverse learners but often depend on how they are implemented. The study also noted that students were less enthusiastic about activities such as think–pair–share and group learning, suggesting that without careful management, dominant voices may overshadow quieter participants. Agung et al. (2020) highlighted a similar concern, noting that group learning only succeeds when teachers actively ensure inclusive participation.

Independent approaches were also rated as useful, though students' views were more mixed. Activities such as project work and teacher-guided assignments were appreciated for providing structure and clarity, while approaches that demanded more autonomy, such as guided discovery, were received with less confidence. These findings align with Almahasees et al. (2021) and Putri and Sari (2020), who argued that independent learning is effective when accompanied by scaffolding and adapted to learners' readiness. Hypothesis testing revealed significant urban–rural differences, with urban students expressing more positive views of independent learning. This difference may be explained by greater access to resources and prior exposure in urban schools, which Putri and Sari (2020) also emphasized as critical for supporting self-directed learning.

Experiential approaches emerged as the most highly valued overall. Students responded strongly to activities like field trips, practical workshops, and real-world interviews, noting their relevance and capacity to link classroom concepts with real-life applications. These strategies appeared to enhance both engagement and retention of knowledge. The findings support Matriano (2020), who stressed the value of direct experience in reinforcing learning, especially in science-related subjects. Venter et al. (2021) and Gericke et al. (2023) also emphasized the cross-curricular benefits of experiential learning, showing how it strengthens reasoning skills and language proficiency simultaneously. Hypothesis testing confirmed that students generally preferred experiential approaches, though urban students rated them more highly, particularly for activities such as field interviews and real-world observations. This difference may reflect disparities in opportunity and exposure between urban and rural settings, an issue also highlighted by Quaye, Kissi, and Hagan (2025), who observed that experiential teaching is appreciated in both contexts but is often better supported where resources are more available. Taken together, the findings show that while interactive, independent, and experiential methods all hold value, their success depends on both the instructional context and how teachers apply them. The observed urban–rural differences further suggest that instructional strategies should be adapted to the learning environment. For policymakers and teachers, this underscores the importance of ensuring that methods are varied, inclusive, and responsive to students' needs while also taking into account disparities in access and resources.

Conclusion

This study showed that junior secondary school students in both rural and urban areas viewed interactive, independent, and experiential teaching approaches as effective in learning Basic Science and Technology (BST) and English Language (EL). The hypothesis testing, however, revealed some variations across contexts. Perceptions of interactive approaches did not differ significantly between rural and urban students, suggesting that strategies such as discussions, debates, and teamwork are valued consistently across settings. By contrast, significant differences emerged in the perception of independent and experiential approaches, with rural students often rating these methods more positively. This indicates that learner-centered strategies are generally effective, but their impact is shaped by school location and learning conditions. It can therefore be concluded that teachers of BST and EL should make balanced use of interactive, independent, and experiential methods, adapting them to the needs of their learners. Such practice is likely to strengthen performance, sustain motivation, and promote skills that prepare students for future work and lifelong learning, thereby contributing to a more functional and responsive education system.

Recommendations

Based on the study's findings, the following recommendations are offered:

1. Teachers of BST and EL should adopt interactive, independent, and experiential methods, applying them in

ways that reflect differences in how students from rural and urban schools respond to each approach.

2. School administrators should provide adequate instructional time for BST and EL in the timetable to allow proper use of learner-centered strategies and ensure meaningful skill development.
3. Teachers should be encouraged and supported to apply diverse teaching approaches, with attention to how each method meets the needs of students in different learning contexts.
4. Regular professional development should be organized for teachers, with emphasis on practical training in innovative, learner-centered practices, particularly those that enhance independent and experiential learning.
5. Government and policymakers should provide schools with adequate instructional materials and resources to support the effective use of these pedagogical approaches, ensuring that both rural and urban students benefit equitably.

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