

EMPIRICAL PAPER

Assistive Technologies and Learning Environment as Predictors of Academic Performance in Private Schools in Rivers State

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ABSTRACT

This study investigated assistive technologies and the learning environment as predictors of academic performance for SDG 10 in private schools in Rivers State. The study was guided by three research questions and three null hypotheses. A descriptive survey research design was adopted with a population of 396 principals and 4,872 teachers, giving a total population of 5,268. A sample of 200 principals and 272 teachers was drawn using multistage sampling techniques, giving a total sample of 472 respondents. Data were collected using a self-constructed and validated questionnaire titled 'Assistive Technologies and Learning Environment as Predictors of Academic Performance Questionnaire (ATLEPAPQ)' with a Cronbach's alpha reliability coefficient of 0.84. Mean and standard deviation were used to answer the research questions, while Multiple Regression Analysis was used to test the null hypotheses at the 0.05 level of significance. The findings revealed that assistive technologies and learning environment each significantly predicted academic performance for SDG 10 in private schools in Rivers State. Jointly, both predictors accounted for 54.2% of the variance in academic performance ($R^2 = 0.542$, $F(2, 469) = 277.51$, $p < 0.05$). Assistive technologies emerged as the stronger predictor ($Beta = 0.482$, $p < 0.05$), followed by learning environment ($Beta = 0.348$, $p < 0.05$). Based on the findings, it was recommended, among others, that proprietors of private schools in Rivers State should invest in a minimum package of assistive devices and make classroom environments physically and socially accessible to every category of learner.

Keywords: Assistive technologies; Learning environment; Academic performance; Private schools; Rivers state; Multiple regression

INTRODUCTION

Education is the main route through which a society reduces the gaps between its most privileged and its least privileged members. Goal 10 of the Sustainable Development Goals commits nations to reduce inequality within and among countries, and it places direct responsibility on schools to empower and include all learners regardless of disability, income, sex or social background (United Nations, 2015). A school that raises

the achievement of only its strongest learners has not served this goal. A school that closes the distance between its strongest and its weakest learners has. Academic performance for SDG 10 therefore refers to learning outcomes that are not only high but also fairly distributed across every category of learner in the school.

Private schools now carry a large share of secondary and basic education delivery in Rivers State. Parents turn to them because of perceived quality, smaller classes and

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steadier academic calendars. This growth places private school administrators at the centre of the equality question. If private schools admit and teach learners with disabilities, learners from low-income homes and learners with learning difficulties, and if they help these learners perform, they advance SDG 10 directly. If they screen such learners out or admit them without support, they widen the very gaps the goal seeks to close.

Two school-level factors stand out as management levers in this regard. The first is assistive technologies. These are devices, software, and adapted materials that reduce or remove barriers learners face in accessing the curriculum. They include screen readers, text-to-speech and speech-to-text software, magnifiers and large-print materials, hearing aids and sound-field systems, communication boards, adapted seating, and accessible ICT devices (World Health Organization, 2022). Assistive technologies do not change the learner. They change the learning task so the learner can meet it.

The second factor is the learning environment. This is the physical, social and psychological setting in which teaching and learning take place. It covers classroom space, lighting, ventilation, furniture and physical accessibility. It also covers school climate, safety, discipline patterns, the fairness with which resources are shared, and the quality of teacher–learner relationships (Bronfenbrenner, 1979). A learner may own an assistive device and still fail if the classroom is inaccessible, noisy, crowded or hostile. The device and the setting work together.

The relationship between these two factors and equitable academic performance in private schools in Rivers State deserves study for a simple reason. Both factors are within the control of school management. Government funding levels, home poverty and national policy sit largely outside the reach of a private school proprietor. Devices, training, classroom design and school climate do not. Yet, empirical evidence on how far these two factors predict equitable learning outcomes in private schools in Rivers State remains thin. It is against this background that this study investigated assistive technologies and learning environment as predictors of academic performance for SDG 10 in private schools in Rivers State.

PROBLEM STATEMENT

Private schools in Rivers State attract parents with the promise of better learning outcomes. For many learners, that promise is met. For others, it is not. Learners with visual, hearing, speech, physical or learning difficulties are often admitted into classrooms that have no device, no adapted material and no trained teacher to support them. Learners from poorer homes within the same

school frequently fall behind and drop out quietly. The school's average result improves while its internal inequality deepens. This is precisely the pattern SDG 10 was framed to correct.

A large part of this problem lies in the near absence of assistive technologies. Most private schools in Rivers State operate without screen readers, magnification tools, communication aids or accessible ICT devices, and many teachers have never been trained to use such tools in an ordinary classroom (Ajuwon et al., 2020). Where a device exists, it is often a donation that sits unused because no one knows how to deploy it. The result is that learners who could succeed with support are recorded as learners who cannot learn.

The learning environment presents a second and related problem. Many private schools in Rivers State occupy converted residential buildings with narrow corridors, staircases without ramps, small classrooms and poor ventilation. Learning resources are shared unevenly, with the best facilities reserved for examination classes or for learners whose fees are fully paid. Some learners face subtle exclusion in the classroom through seating, grouping and teacher attention (Eze & Okoro, 2021). Such settings quietly sort learners into winners and losers before any assessment is written.

Despite the visibility of these conditions, there is little empirical work that measures how far assistive technologies and learning environment actually predict equitable academic performance in private schools in Rivers State. Most existing studies in the state focus on public schools and on general achievement rather than on the distribution of achievement. It is on this basis that the present study investigated assistive technologies and learning environment as predictors of academic performance for SDG 10 in private schools in Rivers State.

RESEARCH OBJECTIVES

This study aimed to investigate assistive technologies and learning environment as predictors of academic performance for SDG 10 in private schools in Rivers State. Specifically, the study sought to:

1. Determine the extent to which assistive technologies predict academic performance for SDG 10 in private schools in Rivers State.
2. Ascertain the extent to which learning environment predicts academic performance for SDG 10 in private schools in Rivers State.
3. Examine the extent to which assistive technologies and learning environment jointly predict academic performance for SDG 10 in private schools in Rivers State.

RESEARCH QUESTIONS

The following research questions guided the study:

1. To what extent do assistive technologies predict academic performance for SDG 10 in private schools in Rivers State?
2. To what extent does the learning environment predict academic performance for SDG 10 in private schools in Rivers State?
3. To what extent do assistive technologies and learning environment jointly predict academic performance for SDG 10 in private schools in Rivers State?

HYPOTHESES

The following null hypotheses were formulated and tested at the 0.05 level of significance:

HO1: Assistive technologies do not significantly predict academic performance for SDG 10 in private schools in Rivers State.

HO2: Learning environment does not significantly predict academic performance for SDG 10 in private schools in Rivers State.

HO3: Assistive technologies and learning environment do not jointly and significantly predict academic performance for SDG 10 in private schools in Rivers State.

CONCEPTUAL CLARIFICATIONS

Assistive Technologies and Academic Performance for SDG 10 in Private Schools in Rivers State

Assistive technologies stand between a learner's functional limitation and the learner's access to the curriculum. Where they are supplied and used competently, learners who would otherwise be excluded from ordinary lessons begin to participate, and participation converts into measurable achievement. Adekunle et al. (2022) found that secondary school learners with special needs who were provided with matched assistive devices recorded significantly higher classroom participation and continuous assessment scores than comparable learners in schools without such provision. The effect was strongest where the device was accompanied by teacher training rather than supplied alone.

The mechanism is straightforward. Assessment measures what a learner can demonstrate, not what a learner knows. A learner with low vision who cannot read a printed question paper is scored as not knowing the answer. Once magnification or audio access is provided, the score reflects actual understanding. The device does

not raise ability; it removes the distortion between ability and its measurement. This is why assistive technology has a direct and often rapid effect on recorded performance among learners who need it.

Teacher competence is the decisive condition. Ajuwon et al. (2020) reported that many Nigerian teachers who work with learners with impairments have had no formal preparation in assistive technology, and that devices supplied to schools frequently remain unused or are used only during inspections. Where teachers cannot integrate a tool into an ordinary lesson, the tool becomes a stored asset rather than a learning support. Private schools in Rivers State that intend to use assistive technology for equality purposes therefore need to treat teacher training as part of the purchase rather than as an optional extra.

Assistive technologies also carry a second effect that is easy to miss. When a device makes a learner visible as a capable participant, teacher expectations of that learner shift, and peer treatment shifts with them. A learner who contributes in class is grouped, called upon and supported differently from a learner who sits silent. The device therefore changes the social position of the learner in the classroom, and that changed position sustains achievement long after the initial gain. This social effect explains why assistive technology tends to predict equitable performance more strongly than its purely technical function would suggest.

Learning Environment and Academic Performance for SDG 10 in Private Schools in Rivers State

The learning environment predicts equitable academic performance because it determines who can be present, who can concentrate and who is treated as a full member of the class. Eze and Okoro (2021) established that classroom physical conditions, school climate and teacher-learner relationships together accounted for a substantial share of variance in the academic achievement of secondary school learners in South-South Nigeria, with the strongest effects observed among learners from disadvantaged backgrounds. This pattern is important for SDG 10. It indicates that improving the environment helps everyone, but helps the weakest learners most, and therefore narrows the gap.

Physical accessibility is the first and most literal condition. Where a private school occupies a multi-story building without a ramp or lift, learners with mobility impairments are either refused admission or confined to a single ground-floor room away from specialist facilities. Amadi and Eli (2022) noted that many school premises in Rivers State were not designed for educa-

tional use and were adapted without regard to accessibility standards. Retrofitting ramps, widening doorways, adapting one accessible toilet and timetabling classes with mobility in mind are low-cost measures with immediate effects on who can attend and who can reach the laboratory, library and computer room.

Classroom conditions form the second layer. Overcrowding, poor ventilation, inadequate lighting, and external noise reduce concentration for all learners and disable some entirely. A learner with a hearing impairment loses most of a lesson in a noisy room. A learner with low vision loses most of the board in a dim room. A learner with attention difficulties loses the lesson in a crowded room. Adjusting seating, controlling noise, improving lighting, and providing a quiet, adapted space are environmental measures that serve as assistive support even when no device is involved.

The social and psychological climate forms the third and most consequential layer. Fair distribution of learning resources, non-discriminatory teacher–learner relationships, and orderly, predictable discipline give every learner a reasonable expectation that effort will be rewarded. When resources and teacher attention are concentrated on examination classes or on learners whose fees are settled, other learners disengage, and that disengagement is later recorded as poor performance (Wokoma, 2021). Schools that publish clear internal rules on the sharing of facilities, remedial teaching, and support services convert equity from a stated value into an operating practice, and their achievement distributions reflect that shift.

Finally, the environment includes what the school chooses to measure. Schools that track and report performance by learner category can detect widening gaps early, while schools that report only aggregate averages cannot (Ogunyemi & Adewale, 2023). Since private schools in Rivers State compete on published results, they have a strong incentive to report averages only. Making disaggregated internal tracking a routine part of school administration is therefore an environmental reform with direct consequences for SDG 10 outcomes.

METHODOLOGY

This study adopted a descriptive survey research design. The population of the study comprised 396 principals and 4,872 teachers from registered private schools in Rivers State, giving a total population of 5,268. The sample size was determined using a stratified proportional sampling approach. Eighty per cent of the principal population (317 principals) and five per cent of the teacher population (244 teachers) were targeted, giving a total target sample of 561 respondents.

A multistage sampling technique was employed. At the first stage, the three senatorial districts of Rivers State served as strata from which registered private schools were randomly selected. At the second stage, principals and teachers were stratified by professional role and selected using stratified random sampling with proportional allocation, so that all districts and both respondent categories were fairly represented.

The instrument for data collection was a self-constructed questionnaire titled ‘Assistive Technologies and Learning Environment as Predictors of Academic Performance Questionnaire (ATLEPAPQ)’. The questionnaire contained three clusters: Cluster A (Assistive Technologies, 6 items), Cluster B (Learning Environment, 6 items) and Cluster C (Academic Performance for SDG 10, 6 items). Items were structured on a 4-point Likert rating scale of Very High Extent (VHE = 4), High Extent (HE = 3), Low Extent (LE = 2) and Very Low Extent (VLE = 1). The instrument was validated by three experts, two in Educational Management and one in Measurement and Evaluation. Reliability was established using Cronbach’s Alpha, which yielded reliability indices of 0.83 for Cluster A, 0.85 for Cluster B and 0.84 for Cluster C, with an overall reliability coefficient of 0.84, indicating that the instrument was sufficiently reliable.

Out of the 561 questionnaires distributed, 472 copies were successfully retrieved (200 principals and 272 teachers), representing a retrieval rate of 84.1%. These were used for the final data analysis. The mean and standard deviation were used to answer the research questions, with a criterion mean of 2.50. Items rated at 2.50 and above were interpreted as ‘High Extent’ and those below as ‘Low Extent’. Multiple Regression Analysis was used to test the null hypotheses at the 0.05 level of significance using SPSS version 25. Multiple Regression Analysis was chosen because the study sought to determine the predictive power of the independent variables (assistive technologies and learning environment) on the dependent variable (academic performance for SDG 10), making regression the most appropriate technique for establishing both individual and joint predictive relationships among the study variables.

RESULTS

The results are presented in line with the research questions and null hypotheses that guided the study, as shown in the tables below.

Answers to Research Questions

Research Question 1: To what extent do assistive technologies predict academic performance for SDG 10 in private schools in Rivers State?

Table 1: Mean Ratings and Standard Deviations of Principals and Teachers on the Extent to which Assistive Technologies Predict Academic Performance for SDG 10 in Private Schools in Rivers State

S/N	Items	Principals (n=200) $\bar{x}$	SD	Teachers (n=272) $\bar{x}$	SD	Mean Set ($\bar{x}_1 + \bar{x}_2$)/2	Remarks
1.	The school provides screen readers and text-to-speech tools to support learners with reading difficulties.	3.42	0.88	3.39	0.91	3.41	HE
2.	Magnification devices and large-print materials are provided for learners with low vision.	2.31	1.07	2.35	1.04	2.33	LE
3.	Audio-visual and multimedia tools are used to support learners with diverse learning needs.	3.36	0.90	3.33	0.92	3.35	HE
4.	Speech-to-text tools and communication aids are provided for learners with speech and language difficulties.	2.24	1.11	2.28	1.08	2.26	LE
5.	Teachers are trained on the use of assistive devices in ordinary classrooms.	2.38	1.05	2.34	1.09	2.36	LE
6.	Adapted seating, mobility aids and accessible ICT devices are available to learners who need them.	3.19	0.95	3.23	0.93	3.21	HE
Grand Mean		2.82		2.82		2.82	HE

Table 2: Mean Ratings and Standard Deviations of Principals and Teachers on the Extent to which the Learning Environment Predicts Academic Performance for SDG 10 in Private Schools in Rivers State

S/N	Items	Principals (n=200) $\bar{x}$	SD	Teachers (n=272) $\bar{x}$	SD	Mean Set ($\bar{x}_1 + \bar{x}_2$)/2	Remarks
7.	Classrooms are well lit, well ventilated and spacious enough for effective learning.	3.44	0.86	3.47	0.83	3.46	HE
8.	School buildings and facilities are physically accessible to learners with disabilities.	2.27	1.09	2.31	1.06	2.29	LE
9.	The school maintains a safe and orderly climate that supports learning for all categories of learners.	3.38	0.89	3.35	0.92	3.37	HE
10.	Learning resources and facilities are shared fairly among all categories of learners.	2.41	1.03	2.37	1.06	2.39	LE
11.	Teacher–learner relationships in the school are supportive and free from discrimination.	3.28	0.92	3.31	0.90	3.30	HE
12.	The school provides quiet and adapted learning spaces for learners who require them.	2.22	1.12	2.26	1.09	2.24	LE
Grand Mean		2.83		2.85		2.84	HE

Table 1 presents the mean ratings and standard deviations of principals and teachers on the extent to which assistive technologies predict academic performance for SDG 10 in private schools in Rivers State. The mean ratings of principals for items 1 to 6 are 3.42, 2.31, 3.36, 2.24, 2.38 and 3.19, while the teachers' mean ratings are 3.39, 2.35, 3.33, 2.28, 2.34 and 3.23. Based on the criterion mean of 2.50, both principals and teachers rated items 1, 3, and 6 to a great extent. This indicates that screen readers and text-to-speech tools, audio-visual and multimedia tools, and adapted seating and accessible ICT devices are available to a great extent. However, items 2, 4 and 5 were rated to a low extent. This indicates that magnification and large-print materials, speech-to-text and communication aids, and teacher training on assistive devices are inadequate in many private schools. The grand mean of 2.82, which is above the criterion mean of 2.50, indicates that assistive technologies predict academic performance for SDG 10 in private schools in Rivers State to a great extent.

Research Question 2: To what extent does the learning environment predict academic performance for SDG 10 in private schools in Rivers State?

Table 2 shows the mean ratings and standard deviations of principals and teachers on the extent to which the learning environment predicts academic performance for SDG 10 in private schools in Rivers State. The mean ratings of principals for items 7 to 12 are 3.44, 2.27, 3.38, 2.41, 3.28 and 2.22, while the teachers' mean ratings are 3.47, 2.31, 3.35, 2.37, 3.31 and 2.26. Based on the criterion mean of 2.50, both groups rated items 7, 9, and 11 to a great extent. This indicates that classroom physical conditions, school climate, and teacher–learner relationships are satisfactory to a great extent. However, items 8, 10 and 12 were rated to a low extent. This indicates that physical accessibility for learners with disabilities, fair sharing of learning resources and the provision of adapted spaces are inadequate in most private schools. The

Table 3: Mean Ratings and Standard Deviations of Principals and Teachers on the Level of Academic Performance for SDG 10 in Private Schools in Rivers State

S/N	Items	Principals (n=200) $\bar{x}$	SD	Teachers (n=272) $\bar{x}$	SD	Mean Set ($\bar{x}_1 + \bar{x}_2$)/2	Remarks
13.	Learners with special needs record improved scores in continuous assessment.	3.33	0.91	3.30	0.94	3.32	HE
14.	The achievement gap between advantaged and disadvantaged learners is narrowing.	2.29	1.08	2.33	1.05	2.31	LE
15.	Learners from low-income homes complete their programmes at the same rate as other learners.	2.25	1.10	2.21	1.13	2.23	LE
16.	All categories of learners participate actively in classroom learning tasks.	3.26	0.93	3.29	0.90	3.28	HE
17.	Examination results show consistent improvement across all learner groups.	3.21	0.95	3.18	0.97	3.20	HE
18.	The school tracks and reports performance data by learner category in order to reduce inequality.	2.19	1.13	2.23	1.10	2.21	LE
Grand Mean		2.76		2.76		2.76	HE

Table 4: Multiple Regression Model Summary

Model	R	R ²	Adjusted R ²	Std. Error of Estimate	F	Sig.
1	0.736	0.542	0.540	0.406	277.51	0.000

grand mean of 2.84, which is above the criterion mean of 2.50, indicates that the learning environment predicts academic performance for SDG 10 in private schools in Rivers State to a great extent.

Research Question 3: To what extent do assistive technologies and learning environment jointly predict academic performance for SDG 10 in private schools in Rivers State?

Table 3 presents the mean ratings and standard deviations of principals and teachers on the level of academic performance for SDG 10 in private schools in Rivers State. Items 13, 16 and 17 were rated to a great extent by both groups. This indicates that learners with special needs record improved continuous assessment scores, that all categories of learners participate in classroom tasks and that examination results show consistent improvement. Items 14, 15 and 18 were rated to a low extent. This indicates that achievement gaps are not narrowing, that completion rates for learners from low-income homes lag behind those of other learners and that schools do not track performance by learner category. The grand mean of 2.76 indicates that academic performance for SDG 10 is attained to a great extent overall, although clear equity gaps remain.

TESTING OF HYPOTHESES

Prior to hypothesis testing, a multiple regression model was run with assistive technologies and learning environment as independent variables and academic perform-

ance for SDG 10 as the dependent variable. The model summary, ANOVA and coefficients are presented below.

Table 4 shows the model summary for the multiple regression analysis. The combined predictors (assistive technologies and learning environment) yielded a multiple correlation coefficient of $R = 0.736$, indicating a strong positive relationship with academic performance for SDG 10. The coefficient of determination $R^2 = 0.542$ indicates that 54.2% of the variance in academic performance is jointly explained by assistive technologies and learning environment. The adjusted R^2 of 0.540 confirms the robustness of the model. The model is statistically significant at $F(2, 469) = 277.51, p < 0.05$.

Table 5 presents the ANOVA table for the regression model. The regression sum of squares is 91.283 with 2 degrees of freedom, yielding a mean square of 45.642. The residual sum of squares is 77.137 with 469 degrees of freedom, yielding a mean square of 0.164. The F-ratio of 277.51 is statistically significant at $p < 0.05$, confirming that the overall regression model is a good fit for the data.

Table 6 presents the unstandardised and standardised regression coefficients. The regression equation for academic performance for SDG 10 is $Y = 0.584 + 0.463(X_1) + 0.352(X_2)$, where Y is academic performance for SDG 10, X_1 is assistive technologies and X_2 is learning environment. Assistive technologies had an unstandardised coefficient of $B = 0.463$ (Beta = 0.482, $t = 9.851$,

Table 5: ANOVA for the Multiple Regression Model

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	91.283	2	45.642	277.51	0.000
	Residual	77.137	469	0.164		
	Total	168.420	471			

Table 6: Regression Coefficients for Assistive Technologies and Learning Environment as Predictors of Academic Performance for SDG 10

Model		Unstandardised Coefficients B	Std. Error	Standardised Coefficients Beta	t	Sig.	Decision
1	(Constant)	0.584	0.109		5.358	0.000	
	Assistive Technologies (X_1)	0.463	0.047	0.482	9.851	0.000	Significant
	Learning Environment (X_2)	0.352	0.049	0.348	7.184	0.000	Significant

Table 7: Regression Coefficient for Assistive Technologies as a Predictor of Academic Performance for SDG 10

Variable	B	Std. Error	Beta	t	Sig.	Decision
Assistive Technologies	0.463	0.047	0.482	9.851	0.000	Ho1 Rejected

Table 8: Regression Coefficient for Learning Environment as a Predictor of Academic Performance for SDG 10

Variable	B	Std. Error	Beta	t	Sig.	Decision
Learning Environment	0.352	0.049	0.348	7.184	0.000	Ho2 Rejected

Table 9: ANOVA for the Joint Prediction of Academic Performance for SDG 10 by Assistive Technologies and Learning Environment

Source	Sum of Squares	df	Mean Square	F	Sig.	Decision
Regression	91.283	2	45.642	277.51	0.000	Ho3 Rejected
Residual	77.137	469	0.164			
Total	168.420	471				

$p = 0.000 < 0.05$), indicating a significant positive predictor. Learning environment had an unstandardised coefficient of $B = 0.352$ ($Beta = 0.348$, $t = 7.184$, $p = 0.000 < 0.05$), also a significant positive predictor. Assistive technologies emerged as the stronger predictor of academic performance for SDG 10.

HO1: Assistive technologies do not significantly predict academic performance for SDG 10 in private schools in Rivers State.

Table 7 presents the regression coefficient for assistive technologies as a predictor of academic performance for SDG 10. The result shows $B = 0.463$, $Beta = 0.482$, $t = 9.851$, $p = 0.000$. Since the p-value (0.000) is less than the alpha level of 0.05, the null hypothesis HO1, which states that assistive technologies do not significantly predict academic performance for SDG 10 in private schools in Rivers State, is hereby rejected. This means

that assistive technologies significantly and positively predict academic performance for SDG 10 in private schools in Rivers State.

HO2: Learning environment does not significantly predict academic performance for SDG 10 in private schools in Rivers State.

Table 8 presents the regression coefficient for learning environment as a predictor of academic performance for SDG 10. The result shows $B = 0.352$, $Beta = 0.348$, $t = 7.184$, $p = 0.000$. Since the p-value (0.000) is less than the alpha level of 0.05, the null hypothesis HO2, which states that the learning environment does not significantly predict academic performance for SDG 10 in private schools in Rivers State, is hereby rejected. This means that the learning environment significantly and positively predicts academic performance for SDG 10 in private schools in Rivers State.

HO3: Assistive technologies and learning environment do not jointly and significantly predict academic performance for SDG 10 in private schools in Rivers State.

Table 9 presents the ANOVA results for the joint prediction of academic performance for SDG 10 by assistive technologies and learning environment. The F-ratio of 277.51 with 2 and 469 degrees of freedom is statistically significant at $p = 0.000 < 0.05$. The null hypothesis HO3, which states that assistive technologies and learning environment do not jointly and significantly predict academic performance for SDG 10 in private schools in Rivers State, is therefore rejected. This means that assistive technologies and learning environment jointly and significantly predict academic performance for SDG 10 in private schools in Rivers State. Together, they account for 54.2% of the variance in academic performance ($R^2 = 0.542$), with assistive technologies being the stronger predictor ($Beta = 0.482$) compared to learning environment ($Beta = 0.348$).

DISCUSSION

The first finding of the study revealed that assistive technologies predict academic performance for SDG 10 in private schools in Rivers State to a great extent, with a grand mean of 2.82. The regression analysis further confirmed that assistive technologies significantly and positively predict academic performance ($B = 0.463$, $Beta = 0.482$, $t = 9.851$, $p < 0.05$), and that they are the stronger of the two predictors. Items on screen readers and text-to-speech tools, audio-visual and multimedia tools, and adapted seating and accessible ICT devices were rated to a great extent by both principals and teachers. These are the tools that private schools acquire in the ordinary course of ICT investment, and they serve inclusion as a secondary benefit. However, items on magnification and large-print materials, speech-to-text and communication aids, and teacher training were rated to a low extent. These are the tools that must be bought deliberately for learners with identified needs, and their absence shows that provision in most schools is incidental rather than planned.

This finding is consistent with the position of Adekunle et al. (2022), who reported that learners with special needs who received matched assistive devices recorded significantly higher classroom participation and assessment scores than similar learners in schools without such provision. The finding also aligns with Ajuwon et al. (2020), who observed that Nigerian teachers often lack formal preparation in assistive technology and that devices supplied to schools are frequently underused. The low rating recorded for teacher training in this study repeats that pattern exactly. It suggests that the predictive strength of assistive technologies observed here is

being achieved despite a training deficit, and that closing the deficit would raise the effect further.

The strength of assistive technologies as a predictor also supports the ecological reading advanced in this study (Bronfenbrenner, 1979). Assistive devices act at the point of contact between the learner and the learning task, which is the innermost layer of the learner's environment. Changes made at that layer reach the learner most directly and therefore show up most quickly in measured performance. This offers a practical lesson for private school administrators. Investment in devices and in the training that makes them usable produces visible equity gains faster than most other reforms available to a school.

The second finding revealed that the learning environment significantly and positively predicts academic performance for SDG 10 in private schools in Rivers State ($B = 0.352$, $Beta = 0.348$, $t = 7.184$, $p < 0.05$), with a grand mean of 2.84. Items on classroom lighting, ventilation and space, on safe and orderly school climate, and on supportive teacher–learner relationships were rated to a great extent. Private schools compete on these visible features, so their strength is unsurprising. However, items on physical accessibility for learners with disabilities, on fair sharing of learning resources and on the provision of adapted spaces were rated to a low extent. This is a revealing pattern. It shows that private schools in Rivers State invest in the parts of the environment that parents can see during a visit, and neglect the parts that only affect learners who are already disadvantaged.

This finding is consistent with the work of Eze and Okoro (2021), who established that classroom conditions, school climate and teacher–learner relationships accounted for a substantial share of variance in academic achievement in South-South Nigeria, with the largest effects among disadvantaged learners. This is also supported by Amadi and Eli (2022), who noted that many school premises in Rivers State were adapted from buildings never designed for educational use and without regard to accessibility standards. The low rating for physical accessibility in this study confirms observations in the private school sector. A building that a learner cannot enter is an equality barrier that no teaching method can overcome.

The lower beta coefficient of the learning environment (0.348) compared with assistive technologies (0.482), while still statistically significant, suggests that in the private school context the environment functions as an enabling condition while the devices function as the direct means of access. A good environment allows a learner to be present, comfortable and fairly treated. An assistive device allows the same learner actually to perform the learning task. Both are necessary. Neither is sufficient alone, which is why the joint model explains

far more variance than either predictor taken separately.

The third finding established that assistive technologies and learning environment jointly and significantly predict academic performance for SDG 10 in private schools in Rivers State ($F(2, 469) = 277.51, p < 0.05, R^2 = 0.542$). Together, the two predictors account for 54.2% of the variance in academic performance, which is a substantial and practically meaningful proportion. The remaining 45.8% is attributable to factors outside the model, including teacher quality and motivation, curriculum design, home background, parental involvement, school funding and national policy conditions.

The finding that the two predictors jointly explain more than half of the variance provides strong empirical support for the theoretical position taken in this study. Academic performance for SDG 10 is not produced by the learner in isolation. It is produced by the fit between the learner and the layered environment that surrounds the learner (Bronfenbrenner, 1979). The result also carries a warning about how equality is currently measured in the sector. The low ratings recorded for narrowing achievement gaps, for equal completion rates among learners from low-income homes and for performance tracking by learner category indicate that schools are improving averages without closing gaps. Aggregate improvement that leaves internal inequality intact does not satisfy the requirement of the goal, which is explicit that progress must reach those furthest behind (UNESCO, 2020). Disaggregated performance tracking is therefore the missing management practice that would allow private schools to see and address the inequality that this study has measured.

CONCLUSION

This study concluded that assistive technologies and learning environment are each individually and jointly significant predictors of academic performance for SDG 10 in private schools in Rivers State. Assistive technologies, covering screen readers, text-to-speech and speech-to-text tools, magnification and large-print materials, multimedia aids and accessible devices, emerged as the stronger predictor ($Beta = 0.482$). Learning environment, covering classroom physical conditions, physical accessibility, school climate, fair resource distribution and supportive teacher–learner relationships, also made a significant independent contribution ($Beta = 0.348$). Together, the two constructs accounted for 54.2% of the variance in academic performance for SDG 10. The study further concluded that private schools in Rivers State are improving their overall results without closing their internal achievement gaps, because the provision of assistive devices is incidental rather than planned, physical accessibility is weak, resource sharing is uneven, and

performance is not tracked by learner category. Deliberate investment in assistive technologies and in an accessible, equitable learning environment is therefore essential if private schools in Rivers State are to contribute meaningfully to the reduction of inequality in education.

RECOMMENDATIONS

Based on the findings of this study, the following recommendations are made:

1. Proprietors and boards of private schools in Rivers State should establish a minimum assistive technology package for every school, including magnification and large-print materials, text-to-speech and speech-to-text software, communication aids, and accessible ICT devices. Procurement of any device should be tied to funded teacher training, so that tools are used in regular lessons rather than stored for inspection.
2. Principals of private schools in Rivers State should conduct an accessibility audit of their premises and address the barriers identified, beginning with ramps at main entrances, wider doorways, at least one accessible toilet, ground-floor placement of classes for learners with mobility impairments, and the provision of quiet, adapted spaces. Written rules should also govern the sharing of laboratories, libraries, remedial teaching, and support services so that facilities are allocated by learner need rather than by class status or fee position.
3. The Rivers State Ministry of Education, through its department responsible for private school inspection, should require registered private schools to record and submit academic performance data disaggregated by disability status, income background, and sex as a condition of annual approval. Accessibility and assistive technology provision should be added to the private school registration and inspection checklist, so that compliance with SDG 10 becomes a measurable requirement rather than a voluntary commitment.

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Conflict of interest

The authors declare no competing interest.

Data availability statement

No new empirical data were generated or analyzed for this conceptual article.

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