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Teachers' Professional Development and Digital Literacy as Predictors of Students' Academic Performance in Public Secondary Schools in Rivers State, Nigeria

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ABSTRACT

The study examined teachers' professional development and digital literacy as predictors of students' academic performance in public secondary schools in Rivers State, Nigeria. The study was guided by two objectives, two research questions and two null hypotheses. The correlational research design was adopted for the study. The population consisted of 199,610 teachers and students in 311 public secondary schools in Rivers State, comprising 6,174 teachers and 193,436 students. An initial sample of 924, comprising 462 teachers and 462 students, was selected through a multistage sampling procedure; following retrieval and matching, 417 valid teacher responses and 417 students' academic-performance records constituted the final dataset. Data on teachers' professional development and digital literacy were collected using the relevant clusters of the Teachers' Professional Characteristics Scale (TPCS), while students' academic performance scores were obtained from official school academic records through an Academic Performance Record Proforma. The instruments were validated by experts. Cronbach Alpha coefficients of .978 and .904 were obtained for the professional development and digital literacy clusters, respectively. Data were analysed using simple regression, while the null hypotheses were tested using the t-test associated with simple regression at the 0.05 level of significance. The findings showed that teachers' professional development positively predicted students' academic performance to a moderate extent, accounting for 24.7% of the variance in students' academic performance. Teachers' digital literacy also positively predicted students' academic performance to a moderate extent, accounting for 17.0% of the variance. The predictions of professional development and digital literacy were statistically significant. The study concluded that teachers' continuing professional learning and capacity to apply digital resources in instructional activities contribute significantly to students' academic performance. It was recommended that teachers should participate regularly in structured professional development programmes and strengthen the digital competencies required to integrate appropriate technological resources into classroom instruction.

Keywords: Professional Development, Digital Literacy, Teachers, Academic Performance, Public Secondary Schools, Rivers State.

INTRODUCTION

Education enables schools to develop students' knowledge, competencies and capacities for productive participation in society. Within the school system, students' academic performance remains an important indication of the extent to which teaching and learning produce the expected educational outcomes. Márquez et al. (2023) described academic performance as students' level of learning attainment as reflected in classroom participation, assignment completion, test performance, continuous assessment, learning consistency and overall academic progress. Although students' motivation, study habits, family background and peer influence contribute to achievement, teachers remain central because they interpret the curriculum, organise learning activities, explain subject content, assess learning and provide feedback. Consequently, persistent weaknesses in students' academic performance draw attention not only to student-related conditions but also to the professional capacity of teachers and the instructional practices through which learning occurs (Oti et al., 2023).

Public secondary education in Nigeria prepares young people for higher education, employment, civic participation and responsible adulthood (Federal Republic of Nigeria [FRN], 2014). The achievement of these purposes depends substantially on teachers who translate curriculum requirements into classroom experiences. Recent examination outcomes have nevertheless sustained concern about students' achievement. The corrected 2025 West African Senior School Certificate Examination results showed that 62.96% of candidates obtained five credits and above, including English Language and Mathematics, compared with 72.12% in 2024 (Usman, 2025). National Examinations Council results similarly showed that 60.55% attained the same benchmark in 2024 and 60.26% in 2025 (Guardian Nigeria, 2024; Guardian Nigeria, 2025). These outcomes indicate that a substantial proportion of candidates still fail to attain the minimum academic benchmark required for progression to higher education.

Teachers' professional characteristics provide one basis for explaining differences in students' academic outcomes. Akinlade (2025) described these characteristics as the knowledge, competencies, skills, attitudes, values and work behaviours that enable teachers to perform instructional and non-instructional responsibilities effectively. Among these characteristics, professional development and digital literacy are closely related because contemporary teaching requires teachers both to update their professional knowledge continuously and to use digital resources purposefully. Professional development strengthens the knowledge and instructional practices required for effective teaching, while digital literacy enables teachers to locate, evaluate, communicate and apply technology-based resources in lesson delivery, assessment and professional interaction.

Professional development is a need-driven capacity-building process through which teachers update knowledge, refine instructional practice and respond to changing curriculum demands through workshops, seminars, in-service training, peer observation and collaborative professional learning (Ukaigwe & Igbozuruike, 2019). These activities can expose teachers to improved teaching methods, current subject knowledge, assessment practices and strategies for responding to students' learning difficulties. Olaifa et al. (2025) found a strong significant relationship between teachers' professional development and students' academic achievement in public senior secondary schools, while Kani and Ezeodo (2023) reported that participation in training programmes was associated with improved student performance across selected subjects. Professional development therefore becomes educationally useful when teachers transfer acquired knowledge and skills into classroom practice.

The effect of professional development depends on its relevance, regularity and connection with teachers' actual instructional responsibilities. Joshi et al. (2024) reported mixed outcomes where professional development lacked meaningful connection with classroom application. Participation in workshops or seminars may therefore produce limited academic benefit when programme content does not address identifiable instructional needs or when schools provide little opportunity for teachers to apply acquired practices. Professional development is more likely to strengthen students' academic performance when training is subject-related, pedagogically relevant and supported by follow-up activities that reinforce classroom application.

Digital literacy represents another professional capacity required of contemporary teachers because teaching, assessment and communication increasingly involve digital tools, online resources, educational software and virtual platforms (Okigbo & Anikelechi, 2025). Teachers' digital literacy refers to their capacity to use such resources purposefully to facilitate instruction, communicate content, support assessment and engage students in learning activities. Herbert (2023) identified technical proficiency, information literacy, instructional design, digital communication, content creation, digital citizenship and adaptability as relevant dimensions of teacher digital literacy. These competencies enable teachers to select credible online materials, prepare technology-supported lessons, communicate through digital platforms and guide students in the responsible use of digital information.

The instructional value of digital literacy depends on purposeful pedagogical application rather than mere access to technology. Nwadike and Omodu (2023) found that teachers' digital literacy had a moderate positive relationship with students' learning satisfaction in Rivers State secondary schools, while Nwagwu (2025) observed that undirected digital behaviours, including unsupervised internet and social media use, may negatively predict academic achievement. Teachers therefore need to evaluate digital information, select resources that correspond with curriculum objectives and integrate technology into organised learning activities. In Rivers State, however, inadequate digital infrastructure, irregular power supply and limited availability of ICT facilities can restrict the extent to which teachers apply digital competencies in classroom instruction (Nweze, 2018).

Professional development and digital literacy consequently represent complementary dimensions of teacher capacity. Professional development can expose teachers to current digital instructional practices, while digital competence expands teachers' access to online courses, webinars, professional networks and electronic teaching resources. Existing studies have established relationships between professional development and academic achievement, and between digital literacy and educational outcomes; however, evidence concerning the extent to which each variable predicts students' actual academic performance in public secondary schools across Rivers State remains necessary. The present study therefore examined teachers' professional development and digital literacy as predictors of students' academic performance in public secondary schools in Rivers State.

Statement of the Problem

Students' academic performance in public secondary schools depends partly on the quality of instruction teachers provide and the professional capacities they bring to classroom practice. Ideally, teachers should participate regularly in professional development programmes that strengthen their subject knowledge, instructional methods and assessment practices. They should also possess the digital literacy required to use online resources, educational software and other technology-supported tools meaningfully in teaching and learning. However, this expected situation is not fully evident in many public secondary schools in Rivers State. Some teachers participate irregularly in professional development activities, while others experience difficulty in using digital tools, sourcing relevant online materials and integrating technology into classroom instruction. These limitations may restrict teachers' capacity to respond effectively to changing curriculum demands and students' learning needs. Although previous studies have linked professional development and digital literacy with different educational outcomes, the extent to which each characteristic predicts students' actual academic performance in public secondary schools across Rivers State remains insufficiently established. The problem of this study was therefore to determine the extent to which teachers' professional development and digital literacy predict students' academic performance in public secondary schools in Rivers State.

Aim and Objectives

The aim of this study was to examine teachers' professional development and digital literacy as predictors of students' academic performance in public secondary schools in Rivers State. Specifically, the study sought to:

1. investigate the extent to which teachers' professional development predicts students' academic performance in public secondary schools in Rivers State.
2. determine the extent to which teachers' digital literacy predicts students' academic performance in public secondary schools in Rivers State.

Research Questions

The following research questions were answered in the study:

1. To what extent does teachers' professional development predict students' academic performance in public secondary schools in Rivers State?
2. To what extent does teachers' digital literacy predict students' academic performance in public secondary schools in Rivers State?

Hypotheses

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

1. Teachers' professional development does not significantly predict students' academic performance in public secondary schools in Rivers State.
2. Teachers' digital literacy does not significantly predict students' academic performance in public secondary schools in Rivers State.

METHODOLOGY

The study adopted a correlational research design. The population consisted of 199,610 teachers and students in 311 public secondary schools in Rivers State, comprising 6,174 teachers and 193,436 students. A multistage sampling procedure produced an initial sample of 924, comprising 462 teachers and 462 students drawn from 66 public secondary schools across 11 Local Government Areas. Data on teachers' professional development and digital literacy were obtained from the relevant clusters of the Teachers' Professional Characteristics Scale (TPCS), while students' academic performance scores were extracted from approved school records using an Academic Performance Record Proforma. The TPCS used a modified four-point Likert-type scale of Very High Extent, High Extent, Low Extent and Very Low Extent. The instrument was validated by the researcher's supervisors and an expert in Measurement and Evaluation. Cronbach Alpha reliability coefficients of .978 and .904 were obtained for the professional development and digital literacy clusters respectively. The researchers administered 462 copies of the TPCS, of which 417 were properly completed and retrieved, representing a 90.26% retrieval rate. Correspondingly, 417 valid students' academic performance records were obtained and matched with the 417 valid teacher responses to constitute the final dataset. Data were analysed using SPSS version 27. Simple regression was used to answer the two research questions, while the t-test associated with simple regression was used to test the corresponding null hypotheses at the 0.05 level of significance.

RESULTS

Research Question One: *To what extent does teachers' professional development predict students' academic performance in public secondary schools in Rivers State?*

Table 1: Simple regression analysis on the extent to which teachers' professional development predicts students' academic performance in public secondary schools in Rivers State

Model	R	R Square	Adjusted R Square	Degree of Prediction	Decision
1	.497	.247	.245	24.7%	Moderate

Predictor: (Constant), Teachers' professional development.

Table 1 shows the extent to which teachers' professional development predicts students' academic performance in public secondary schools in Rivers State. The R value of .497 indicates a positive and moderate relationship between teachers' professional development and students' academic performance. The coefficient of determination ($R^2 = .247$) shows that teachers' professional development accounted for 24.7% of the variance in students' academic performance. Thus, teachers' professional development predicted students' academic performance to a moderate extent.

Research Question Two: *To what extent does teachers' digital literacy predict students' academic performance in public secondary schools in Rivers State?*

Table 2: Simple regression analysis on the extent to which teachers' digital literacy predicts students' academic performance in public secondary schools in Rivers State

Model	R	R Square	Adjusted R Square	Degree of Prediction	Decision
1	.413	.170	.168	17.0%	Moderate

Predictor: (Constant), Teachers' digital literacy.

Table 2 shows the extent to which teachers' digital literacy predicts students' academic performance in public secondary schools in Rivers State. The R value of .413 indicates a positive and moderate relationship between teachers' digital literacy and students' academic performance. The coefficient of determination (R^2 = .170) shows that teachers' digital literacy accounted for 17.0% of the variance in students' academic performance. Therefore, teachers' digital literacy predicted students' academic performance to a moderate extent.

Test of Hypotheses

H_{o1}: Teachers' professional development does not significantly predict students' academic performance in public secondary schools in Rivers State.

Table 3: t-test associated with simple regression analysis on the significance of the prediction between teachers' professional development and students' academic performance in public secondary schools in Rivers State

Model	B	Std. Error	Beta	t-value	p-value	Critical Value	Decision
Constant	33.603	3.163		10.622	< .001		
Teachers' professional development	1.066	.096	.497	11.076	< .001	±1.96	Significant; H_{o1} rejected

Dependent Variable: Academic Performance; α = .05.

Table 3 shows that teachers' professional development significantly predicted students' academic performance in public secondary schools in Rivers State. The analysis yielded a t-value of 11.076, which exceeded the critical value of ±1.96, while the probability value was below the 0.05 level of significance. The null hypothesis was therefore rejected. This result indicates that the positive prediction of students' academic performance by teachers' professional development was statistically significant.

H_{o2}: Teachers' digital literacy does not significantly predict students' academic performance in public secondary schools in Rivers State.

Table 4: t-test associated with simple regression analysis on the significance of the prediction between teachers' digital literacy and students' academic performance in public secondary schools in Rivers State

Model	B	Std. Error	Beta	t-value	p-value	Critical Value	Decision
Constant	43.653	2.849		15.324	< .001		
Teachers' digital literacy	.787	.090	.413	8.767	< .001	±1.96	Significant; H_{o2} rejected

Dependent Variable: Academic Performance; α = .05.

Table 4 shows that teachers' digital literacy significantly predicted students' academic performance in public secondary schools in Rivers State. The analysis yielded a t-value of 8.767, which exceeded the critical value of ±1.96, while the probability value was below the 0.05 level of significance. The null hypothesis was therefore rejected. The result shows that the positive prediction of students' academic performance by teachers' digital literacy was statistically significant.

DISCUSSION OF FINDINGS

The analysis of the data in Table 1 showed that teachers' professional development predicted students' academic performance in public secondary schools in Rivers State to a moderate extent ($R = .497$, $R^2 = .247$), accounting for 24.7% of the variance in academic performance. The corresponding hypothesis test also showed that the prediction was statistically significant ($t = 11.076$, $p < .001$). This finding indicates that teachers' participation in professional development activities such as workshops, seminars, conferences, peer learning and in-service training is meaningfully associated with students' academic performance. Such activities provide opportunities for teachers to update professional knowledge, refine instructional methods and respond more effectively to classroom demands. The moderate predictive strength, however, indicates that professional development is not the only teacher-related factor associated with students' achievement and that its contribution may depend on the regularity, relevance and quality of the programmes provided. This finding supports Olaifa et al. (2025), who reported a strong and significant relationship between teachers' professional development and students' academic achievement in public secondary schools. These findings are also in agreement with Kani and Ezeodo (2023), who found that teachers' participation in professional development programmes was associated with improved students' performance across English Language, Mathematics, Civic Education, Physics and Chemistry. The present finding further agrees with Ojekudo (2016), who observed that professional activities directed towards correcting teachers' deficiencies and improving instructional quality strengthened educational service delivery. However, Joshi et al. (2024) reported mixed effects of professional development, showing that participation in training does not necessarily translate into improved academic outcomes when programme content is insufficiently connected to classroom practice. The implication is that professional development is more likely to contribute to students' academic performance when programmes are practical, subject-related, pedagogically relevant and supported by opportunities for classroom application.

The findings obtained from answering Research Question Two showed that teachers' digital literacy predicted students' academic performance to a moderate extent ($R = .413$, $R^2 = .170$), accounting for 17.0% of the variance in academic performance. The corresponding hypothesis was rejected because teachers' digital literacy significantly predicted students' academic performance ($t = 8.767$, $p < .001$). This finding suggests that teachers' capacity to use digital tools, create digital instructional content, communicate through digital platforms and apply technology in teaching has a measurable relationship with students' academic outcomes. The moderate predictive strength may reflect the conditions under which digital technologies are used in public secondary schools, particularly limitations associated with infrastructure, electricity supply, access to functional digital facilities and opportunities for teachers to receive relevant digital training. This finding is in agreement with Nwadike and Omodu (2023), who found that teachers' digital literacy had a moderate positive relationship with students' learning satisfaction in secondary schools in Rivers State. It also supports Okon (2025), who established that digital literacy skills significantly predicted students' academic engagement in Rivers State public secondary schools. Nweze (2018), however, reported that inadequate ICT laboratories, irregular power supply and insufficient numbers of computer-literate teachers constrained the utilisation of ICT facilities for teaching and learning in Rivers State. These conditions provide a plausible context for the moderate predictive value observed in the present study because teachers cannot apply digital competencies consistently where the technological facilities required for instruction are unavailable or unreliable.

The finding also accords with Okigbo and Eze (2026), who reported that digital literacy significantly predicted students' achievement in Mathematics, although their reported predictive strength was higher than that obtained in the present study. In contrast, Okigbo and Anikelechi (2025) found that overall

digital literacy explained only a very small proportion of the variance in Basic Science achievement, notwithstanding the significant joint contribution of the dimensions examined. These differences indicate that the relationship between digital literacy and academic outcomes can vary according to subject area, educational context, digital resources and the particular competencies measured. Amie-Ogan and Osuji (2016) similarly found limited availability and utilisation of digital instructional materials in Rivers State public secondary schools and inadequate teacher computer competence for innovative teaching. The implication is that improving teachers' digital literacy without corresponding access to functional infrastructure and sustained technical support may limit the contribution that digital competence makes to students' academic performance.

Overall, the findings establish professional development and digital literacy as significant but moderate predictors of students' academic performance. Professional development recorded the stronger predictive contribution, explaining 24.7% of the variance compared with 17.0% explained by digital literacy. The findings imply that strengthening students' academic performance requires attention to both continuing teacher learning and the capacity to use digital resources purposefully. Professional development programmes have to be tailored to address identifiable instructional needs and include practical opportunities for classroom application, while digital competence development should be accompanied by functional technological resources, reliable access and continuing technical support. In this way, the two professional characteristics can operate as complementary capacities through which teachers respond to changing instructional demands and strengthen students' learning outcomes.

CONCLUSION

The study concluded that teachers' professional development and digital literacy are professional characteristics associated with students' academic performance in public secondary schools in Rivers State. Teachers who continually strengthen their professional knowledge and apply digital competencies are better positioned to support teaching and learning. Both characteristics therefore contribute to instructional practice and improved academic outcomes. Their value depends on sustained professional learning, purposeful use of digital resources and supportive school conditions that enable teachers to apply acquired knowledge and skills.

RECOMMENDATIONS

Based on the findings of the study, the following recommendations were made:

1. Teachers should participate regularly in professional development programmes such as workshops, seminars, conferences, in-service training and peer-learning activities to update their instructional knowledge and strengthen the practices through which students' academic performance can be improved.
2. Teachers should strengthen their digital literacy by developing the capacity to use digital tools, online learning resources, educational software and technology-supported instructional methods effectively in classroom teaching.
3. The Rivers State Government, school administrators and relevant education stakeholders should provide sustained capacity-building opportunities, functional digital infrastructure and technical support that enable teachers to apply professional-development outcomes and digital competencies effectively in teaching and learning.

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