

Strategies and Practices for Effective Teacher Professional Development in Tertiary Institutions in Northeast States of Nigeria

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Abstract: This study examined strategies for teacher professional development in Ramat Polytechnic, Maiduguri, Borno State, Nigeria. Teacher professional development is a natural process of personal and professional growth where the teacher extends his or her knowledge, broadens his or her horizons, discovers new methodologies and takes new values on board which are gradually applied to his or her personal and professional life. The study was guided by one research question and one hypothesis. The study adopted descriptive survey research design. The population of the study was 373 lecturers, 66 respondents were drawn through stratified random sampling techniques. The instrument used for data collection was structured questionnaire validated by two experts and pilot tested. A reliability coefficient of 0.88 was established through Crombatch Alpha method. The data collected was analysed using mean and standard deviation. The null hypothesis was test using z-test. The study revealed that information communication technology, courses and workshops, collaborative learning among teachers, education conferences and seminars, professional development network like online communities, collaborative research, observation visits to other schools, and qualification programmes, mentoring and coaching, formal training courses, and individuals' to update knowledge of a subject in light of recent advances in the area, individuals' to update skills in light of the development of new teaching techniques and objectives, individuals' to update approaches in light of the development of new circumstances and new educational research, individuals' to update approaches in light of the development of new circumstances and new educational research all practices for professional teacher development. It was concluded that teachers have to be open to ongoing professional development. It was recommended that teachers should acquire the various components of 21st century skills so as to be able to freely deploy the most appropriate pedagogies in teaching and learning through collaboration, mentoring, professional development networks etc.

Keywords: Teacher, Professional Development, Strategies, Collaboration, Community Network.

Introduction

Research has proved that the role and functioning of schools are changing and so is what is expected of teachers. Often times teachers are asked to teach in increasingly multicultural classrooms, to place greater emphasis on integrating students with special learning needs in their classrooms, to make more effective use of information and communication technologies for teaching; to engage more in planning within evaluative and accountability frameworks, and to do more to involve parents in planning school's activities.

It is worthy of note that teaching profession is currently going through difficult times (hard working conditions, little social recognition, demoralization, delegitimization etc.) that no doubt require the reprofessionalization of teaching as a function. AbdulRab (2023) opined that these are changing times in education systems around the world. The need for schools to produce workers with 21st Century skills is a challenge that is confronting teachers. Therefore,

the professional development of teachers, namely education and training to enhance teachers' knowledge and skills, has thus become a top priority in education sector. In order to effectively foster students' development of 21st Century skills, teachers themselves must have at least a good command of these skills and be well prepared in their own capacity to impart such skills onto students. Therefore, it appears to be crucial that teacher professional development programmes should equip teachers with the necessary skills to achieve the expectations of 21st Century education. According to Chu, et al., (2017) observed that teachers need to meet new expectations to facilitate the development of 21st century skills in student-centered learning. Getting teachers prepared for the launch of a new 21st century skills-oriented teaching style is no easy task. It is proposed that most of the learning goals of 21st century skills can be taught within the context of scientific inquiry or project-based learning, which requires "ambiguous" teaching. It is candid an opinion that no matter how good pre-service training for teachers is, it cannot be expected to prepare teachers for all the challenges they will face throughout their careers. Education systems therefore pursue to provide teachers with opportunities for in-service professional development in order to maintain a high standard of teaching and to retain a high-quality teacher workforce.

Professional development is considered as activities that develop an individual's skills, knowledge, expertise and other characteristics as a teacher. Development can be provided in many ways, ranging from the formal to the informal. It can be made available through external expertise in the form of courses, workshops or formal qualification programmes, through collaboration between schools or teachers across schools (*e.g.* observational visits to other schools or teacher networks) or within the schools in which teachers work. In this context, development can be provided through coaching/mentoring, collaborative planning and teaching, and the sharing of good practices. Teacher development Haßler in Litz (2021) is the professional growth a teacher achieves as a result of gaining increased experience and examining his or her teaching systematically. Teacher professional development is better than teacher training. Teacher learns how to learn, how to put theory into practice to advance student development (Villegas-Reimers, 2013), professional development includes formal experiences (such as attending workshops and professional meetings, mentoring, etc.) and informal experiences (such as reading professional publications, watching television documentaries related to an academic discipline, etc.). Villegas-Reimers affirms that professional development is broader than career development, which he defined it as the growth that occurs as the teacher moves through the professional career cycle; and broader than staff development, which he sees it as the provision of organized in-service programmes designed to foster the growth of groups of teachers.

To Silvyia, Siswasandari and Leny (2024) teacher professional development is a natural process of personal and professional growth where the teacher extends his or her knowledge, broadens his or her horizons, discovers new methodologies and takes new values on board which are gradually applied to his or her personal and professional life. It is therefore based on dynamics where theory, practice, thought and action are all intrinsically linked. Teacher professional development refers to the process of improving teachers' knowledge, skills, and abilities through various forms of learning and training (Desimone, 2011), it is an ongoing process that aims to enhance teaching practices and improve student outcomes. According to Little (2012) teacher professional development requires growth in knowledge, skills, judgment (classroom-related), and the contribution teachers make to a professional community. the programmes which promote professional development should focus on the following:

- i. Developing survival skills.

- ii. Becoming competent in the basic skills of teaching.
- iii. Expanding one's instructional flexibility.
- iv. Acquiring instructional expertise.
- v. Contributing to the professional growth of colleagues; and
- vi. Exercising leadership and participating in decision-making.

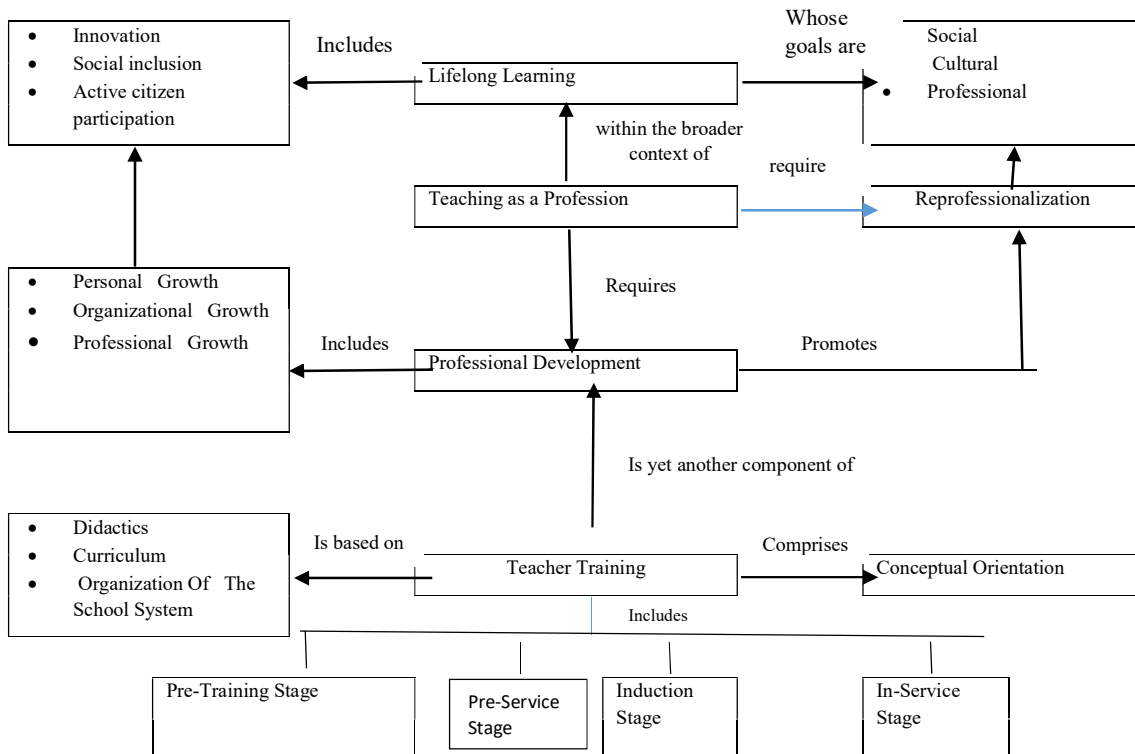
Types of Professional Development (Darling-Hammond, Hyler, & Gardner, 2017).

- i. courses/workshops (e.g. on subject matter or methods and/or other education-related topics);
- ii. education conferences or seminars (at which teachers and/or researchers present their research results and discuss education problems);
- iii. qualification programme (e.g. a degree programme);
- iv. observation visits to other schools;
- v. participation in a network of teachers formed specifically for the professional development of teachers;
- vi. individual or collaborative research on a topic of professional interest; and
- vii. mentoring and/or peer observation and coaching, as part of a formal school arrangement.

Effective professional development programmes Yadu (2020) should be designed to promote collaboration and social interaction among teachers. Professional development activities should provide opportunities for teachers to engage in collaborative learning, share experiences, and reflect on their practice. Jonathan and Kalyan (2023) states that collaborative learning opportunities includes, professional learning communities, peer observation, and mentoring relationships. They reported that these opportunities allow teachers to share knowledge and skills, learn from each other's experiences, and develop a sense of community within their schools. "Being part of a professional learning community will really help teachers to develop teaching skills. they share ideas, they observe each other's classes, and they give each other feedback. They further explained that teacher Professional Development could be Contextualized professional development which emphasized the need for professional development opportunities that were relevant to teacher(s) specific needs and interests, as well as the local context. Teachers need something more specific to their subject(s) area and the needs of their students; Teacher Empowerment which emphasized the importance of empowering teachers to take ownership of their own professional development. This could be achieved through opportunities for teacher-led professional development, action research, and leadership roles within the school; and Supportive Leadership that emphasized the importance of supportive leadership for effective teacher professional development. Supportive Leadership suggest that school leaders need to create a culture of learning and growth, provide resources, and time for professional development, and demonstrate a commitment to ongoing learning of teachers. Supportive leadership of professional development encourages teachers to attend conferences and workshops, and provides teachers with the resources needed to improve teaching.

Fig. 1

The process of Professional Teacher Development (Alexandre & Oliver, 2014)



The development of teachers beyond their initial training can serve a number of objectives (OECD cited in Jonathan and Kalyan, 2023), including:

- i. to update individuals’ knowledge of a subject in light of recent advances in the area;
- ii. to update individuals’ skills, attitudes and approaches in light of the development of new teaching techniques and objectives, new circumstances and new educational research;
- iii. to enable individuals to apply changes made to curricula or other aspects of teaching practice;
- iv. to enable schools to develop and apply new strategies concerning the curriculum and other aspects of teaching practice;
- v. to exchange information and expertise among teachers and others, *e.g.* academics, industrialists; and
- vi. to help weaker teachers become more effective.

Teacher Professional Development Models and Strategies in the 21st Century

According to AbdulRab (2023) after introducing 21st century skills that many teachers are particularly lacking and therefore need to adopt, it is worth to discuss the strategies or methods through which teachers can develop such skills. Yue (2019) stated that, "Teacher professional development integrates 21st century skills into teaching. For instance, integrates cross-cultural understanding skills into literature class, practices critical thinking and problem-solving skills in management class. Strategies of teacher professional development should be cohesive and coherent with 21st century skills. The following methods can strengthen teacher professional development for 21st century education. Equally, effective teacher professional

development models are crucial for improving teaching practices and students learning outcomes.

- (i) Collaborative Professional Learning is one of the most effective models that involve collaborative learning among teachers with shared interests and goals (Yadu, 2020). This model is designed to build a culture of professional learning communities (PLCs), which provide opportunities for teachers to collaborate, share knowledge, and support each other in improving their teaching practices. According to Vescio, Ross, and Adams (2018), PLCs have been shown to improve teacher collaboration and enhance student learning outcomes

Collaboration Yue (2019, p. 254) can take different forms, such as: teacher networks, team-based, learning community and peer coaching. Depending on job-embedded professional development, in their group's teachers can discuss together, exchange different opinions, learn from each other to achieve the same goal. Moreover, teachers develop themselves by collaborating with other colleagues replace of work alone while cross-discipline groups with same goals on student performance and achievement of 21st century skills. In the view of Darling-Hammond, Hyster, & Gardner (2017), to integrate 21st century skills into the current teaching content, teachers have to be open to ongoing professional development. It does not suffice for teachers to only focus on routine practice of instruction in their respective classrooms and disregard other teachers. In addition to keeping track of their own professional learning, it is beneficial that teachers share their knowledge with colleagues in a community of practice, engage in reflections of their own teaching, are ready to take risks and foster trust within the community of practice (Chu et al., 2017).

- (ii) Mentoring and coaching are models that provide personalized support to teachers to improve their teaching practices. Mentors and coaches are experienced teachers or experts in a specific subject or instructional method who work with teachers one-on-one or in small groups. They provide feedback, guidance, and support to teachers to help them develop new skills and knowledge. Daly and Villarreal (2018) suggest that mentoring and coaching can enhance teacher self-efficacy and instructional practices.

According to Yue (2019), mentoring invests the best practice and brings appropriate tools in teacher professional development. There is a need to introduce experienced teachers who use effective methods to educate teachers and develop their 21st century skills into professional development. Peer-mentors can act as advisors and consultants to help teachers with prior experience and nurture teachers with self-management, communication and leadership skills. Peer-mentors know the teachers well that can design beneficial training to guide them how to teach 21st century skills and how to stimulate student learning.

- (iii) Professional Learning Networks (PLNs) are online communities that enable teachers to connect and share knowledge and resources with other educators from around the world. PLNs provide opportunities for teachers to participate in webinars, discussions, and other collaborative activities to improve their teaching practices. According to Baker-Doyle (2014), PLNs can facilitate teacher learning and support the development of new teaching practices. According to Yue (2019), Information communication technology can be applied in teacher professional development. Online forum produces a platform for teachers communicate with each other to share training experience of 21st century skills together and learn from peers. Peer-mentors can use video in training teachers.

- Peer support in the form of the teacher communities is another way to engage teachers in the professional development of 21st century skills. In teacher communities, teachers with common goals in areas such as teaching and problem solving can exchange ideas on classroom practice and student learning, develop and share teaching materials, observe one another teach when possible, and offer advice that helps members of the community learn new ways of teaching (Lomos et al., 2011; and Chu et al., 2017).
- (iv) Job-Embedded Professional Development is another effective model designed to provide teachers with opportunities to apply new knowledge and skills directly in their classrooms. This model involves ongoing professional development that is integrated into the regular workday of teachers. It provides opportunities for teachers to work collaboratively, plan lessons, and reflect on their teaching practices. Penuel, Fishman, Yamaguchi, and Gallagher (2007) suggest that job-embedded professional development can lead to significant improvements in student achievement and teacher instructional practices.
 - (v) Formal Training Courses. According to Chu et al. (2017), "Formally structured courses are organized, often by higher education institutes, to serve the purpose of enhancing teachers' capacity to adapt to changes required in 21st century teaching. The researchers pointed out, these courses guide teachers step-by-step through the process of implementing the pedagogy, providing them with the necessary knowledge and skills, as well as chances to share them with colleagues at work. These courses may cope with different aspects of 21st century skills, and are held over a period of time to allow teachers the time needed to absorb what they have learned.

Combining these models/strategies can create a comprehensive and effective teacher professional development programmes that can be adapted to different contexts and the needs of teachers. Effective teacher-professional development models/strategies are crucial for improving the quality of education and enhancing student learning outcomes at all levels of learning and more especially tertiary institutions.

Teachers are the backbone of the education system, playing a vital role in shaping the minds of future generations. However, the teaching profession is not static, and teachers need to continually update their skills and knowledge to stay abreast of changing curriculum requirements, technological advancements, and evolving student needs. Professional development is essential for teachers to enhance their pedagogical practices, improve student outcomes, and stay motivated and engaged in their profession. Effective professional development can have a profound impact on teacher quality, student achievement, and school success. However, traditional approaches to professional development, such as one-time workshops or conferences, often fall short in providing sustained support and meaningful change.

In recent years, there has been a shift towards more innovative and effective strategies for teachers' professional development, including collaborative learning communities, coaching and mentoring, micro-credentialing, and teacher-led professional development. These approaches prioritize ongoing support, teacher autonomy, and contextualized learning, recognizing that teachers are the experts in their own professional growth. This topic explores the various strategies for teachers' professional development, examining the latest research, best practices, and innovative approaches to support teacher growth and student success. By

investigating these strategies, it can empower teachers to become agents of change, driving education forward and improving outcomes for all students.

Statement of the Problem

Education sector in Nigeria has undergone significant reforms in recent years, with a focus on improving the quality of teaching and learning. However, despite these efforts, student outcomes remain low, with high rates of student dropouts, low completion rates, and poor academic achievement (World Bank, 2019). One of the key factors contributing to these challenges is the quality of teacher professional development. In addition, research has proved that traditional forms of teacher professional development, such as workshops and conferences, are not always effective in improving teacher practice and student outcomes.

Despite the recognition of teachers as a critical factor in improving student learning outcomes, many teachers in (context/school district) lack the necessary skills, knowledge, and support to effectively implement best practices in teaching and learning, resulting in limited pedagogical expertise; inadequate use of technology in the classroom; insufficient content knowledge; ineffective classroom management; and low teacher morale and high turnover rates. Current professional development opportunities are often inadequate, ineffective, unaligned with school goals, and lacking in support from school administrators. This has led to a persistent gap in teacher quality, ultimately affecting student achievement and hindering the overall success of the education system. Therefore, there is a need to investigate and develop effective strategies for teachers' professional development that address these challenges and improve teacher quality, student learning outcomes, and school performance.

Research Objectives

This study examined strategies and practices for teacher professional development in polytechnics. The specific objectives were to:

1. identify strategies for teacher professional development in polytechnics.
2. determine practices for teacher professional development in polytechnics.

Research Questions

1. What are the strategies for teacher professional development in polytechnics?
2. What are the practices for teacher professional development in polytechnics?

Research Hypotheses

Based on the objectives of this study the following hypotheses is formulated and to be tested at 0.05 level of significance.

Ho1: There is no significant difference between the mean ratings of male and female lecturers in polytechnics regarding the strategies for teacher professional development.

Ho2: There is no significant difference between the mean ratings of male and female lecturers in polytechnics regarding the practices for teacher professional development.

Methodology

The aim of this study was to examine strategies and practices for teacher professional development in Polytechnics, in Northeast States of Nigeria. Teacher professional development is a natural process of personal and professional growth where the teacher extends his or her knowledge, broadens his or her horizons, discovers new methodologies and takes new values on board which are gradually applied to his or her personal and professional life.

The area of the study covered North eastern region of Nigeria. These states are; Adamawa, Bauchi, Borno, Gombe, Taraba and Yobe States. This region is located between longitude $11^{\circ}73'N$ and latitude $10^{\circ}14'E$ of the Greenwich Meridian and lies within the North eastern region of Nigeria. Nigeria's total land area is 103,639sq/km². (World Atlas Map).

The study were guided by tow research questions and two hypotheses. The study adopted descriptive survey research design. The population of the study consisted of all lecturers in polytechnics in Northeastern States of Nigeria. The study used multi-stage sampling techniques to determine the sample size. At the first stage the study area was divided into stratus/states: Adamawa State, Bauchi State, Borno State' Gombe State, Taraba State; and Yobe State. At the secod stage one polytechnic from each state of the six states was selected using stratified random sampling technique. The polytechnic that were randomly selected are: Federal Polytechnic, Mubi, Adamawa State, 756; Federal Polytechnic, Bauchi, Bauchi State, 620; Ramat Polytechnic, Maiduguri, Borno State, 373; Gombe State Polytechvic, Tudun- Wada, Gombe State, 348; Taraba State Polytechnic Jalingo, 263, Taraba State; and Federal Polytechnic, Damaturu Yobe State.54. These polytechnic have a population of 3,043 lecturers in the polytechnics. To obtain true representation of the population, the study employed Taro Yamani sample size formula to draw a sample size of 354 At the third stage; the respondents were proportionately selected through random sampling by balloting. Federal Polytechnic, Mubi, Adamawa State, 756(88); Federal Polytechnic, Bauchi, Bauchi State, 72; Ramat Polytechnic, Maiduguri, Borno State, 44; Gombe State Polytechvic, Tudun- Wada, Gombe State, 40; Taraba State Polytechnic Jalingo, 56, Taraba State; and Federal Polytechnic, Damaturu Yobe State.54.

Six (6) research assistants were used in examining strategies and practices for teacher professional development in polytechnics in Northeasters states of Nigeria. The instrument for data collection were structured questionnaire designed in 4 point Likert-scale of Strongly Agree = 4, Agree = 3, Disagree = 2. Strongly Disagree = 1. The instrument were divided into section A and B. Section A was made up of demographic data of the respondents, while section B contained the question items.

The instrument were validated by two experts, and a pilot study was conducted at Federal polytechnic, Jigawa, Jigawa State. To establish the reliability coefficient of the instrument Crombatch Alpha method was employed which yield a reliability coefficient of 0.87. The data collected for the study were analysed using mean and standard deviation for research questions. The null hypotheses were tested using z-test. The decision rule for the research questions one to two weighted mean score of 2.50 and above were considered as positive, while weighted mean scores of 2.49 and below were considered as negative. For the test of null hypotheses one and two, hypothesis of no significant difference was retained when the observed probability value was greater than or equal to values on 0.05 level of significance. Where the observed probability value was less than values on 0.05 level of significance, the null hypothesis was rejected.

Results

Research Question 1

What are the strategies for teacher professional development in tertiary institutions?

Table 1

Mean and Standard deviation of responses on strategies for teacher professional development in tertiary institutions

S/N	Items	Junior		Senior		Total		Decision
		\bar{x}	SD	\bar{X}	SD	\bar{x}	SD	
1	Information communication technology (Online forum)	3.12	1.13	3.10	1.11	3.11	1.12	Positive
2	Courses and workshops	3.22	0.96	3.26	0.94	3.24	0.95	Positive
3	Collaborative learning among teachers	3.38	0.52	3.29	0.54	3.34	0.53	Positive
4	Education conferences and seminars	3.36	0.66	3.24	0.24	3.30	0.68	Positive
5	Professional development Network	3.20	0.76	3.16	0.76	3.18	0.77	Positive
6	Collaborative research	3.16	0.54	3.22	0.70	3.19	0.62	Positive
7	Observation visits to other schools	3.27	0.82	3.23	0.86	3.25	0.84	Positive
8	Qualification programmes	3.28	0.75	3.30	0.69	3.29	0.72	Positive
9	Mentoring and coaching	3.38	0.51	3.29	0.55	3.34	0.50	Positive
10	Formal Training Courses	3.29	0.73	3.22	0.70	3.26	0.72	Positive
11	Job-Embedded Professional Development	3.22	0.79	3.29	0.85	3.26	0.82	Positive
12	Peer support in the form of the teacher communities	3.39	0.46	3.32	0.51	3.36	0.49	Positive
	Weighted Average Mean	3.22	0.73	3.31	0.68	3.26	0.73	Positive

Table 1 above showed the responses of junior and senior lecturers of Polytechnics in northeast states of Nigeria on the strategies for teacher professional development. The result of the analysis revealed that all the constructs outlined junior and senior lecturers of in northeast states of Nigeria on the strategies for teacher professional development with a weighted average mean of 3.26, and SD 0.73. The close range of the standard deviations showed that the respondents were not very far from each other in their responses. This implies that all the items in Table 1 are strategies for teacher professional development. Combining these strategies can create a comprehensive and effective teacher professional development programmes that can be adapted to different contexts and the needs of teachers.

Research Question 2

What are the practices for teacher professional development in tertiary institutions?

Table 2

Mean and Standard deviation of responses on practices for teacher professional development in tertiary institutions

S/N	Items	Male		Female		Total		Decision
		\bar{x}	SD	\bar{X}	SD	\bar{x}	SD	
1	Individuals' to update knowledge of a subject in light of recent advances in the area	3.22	0.79	3.29	0.85	3.26	0.82	Positive
2	individuals' to update skills in light of the development of new teaching techniques and objectives	3.22	0.96	3.26	0.94	3.24	0.95	Positive
3	individuals' to update approaches in light of the development of new circumstances and new educational research	3.28	0.75	3.30	0.69	3.29	0.72	Positive
4	Individuals to apply changes made to curricula or other aspects of teaching practice	3.36	0.66	3.24	0.24	3.30	0.68	Positive
5	Schools to develop and apply new strategies concerning the curriculum and other aspects of teaching practice	3.20	0.76	3.16	0.76	3.18	0.77	Positive
6	Exchange information and expertise among teachers and others, e.g. academics, industrialists	3.38	0.51	3.29	0.55	3.34	0.50	Positive
7	Help weaker teachers become more effective	3.28	0.74	3.30	0.69	3.29	0.72	Positive
	Weighted Average Mean	3.28	0.73	3.26	0.67	3.27	0.74	Positive

Table 2 above presents the responses of male and female lecturers of Polytechnics in northeast states of Nigeria on the practices for teacher professional development. The result of the analysis revealed that all the constructs outlined male and female lecturers of in northeast states of Nigeria on the practices for teacher professional development with a weighted average mean of 3.28, and SD 0.73. The close range of the standard deviations showed that the respondents were not very far from each other in their responses. This implies that all the items in Table 2 are strategies for teacher professional development. Combining these strategies can create a comprehensive and effective teacher professional development practices that can be adapted to different contexts and the needs of teachers.

Testing of Hypotheses

Ho1: There is no significant difference between the mean ratings of junior and senior lecturers on the strategies for teacher professional development

Table 3

Summary of z-test of the difference between the mean ratings of junior and senior lecturers of Polytechnics on the strategies for teacher professional development

Group	N	\bar{X}	SD	Df	t_{cal}	t_{criq}	Decision
Junior Lecturers	39	3.22	0.73	64	0.4381	2.101	Not Rejected
Senior Lecturers	27	3.31	0.68				

P>0.05

Table 2 revealed that there are 66 junior and senior Lecturers. The junior and senior lecturers' responses showed the strategies for teacher professional development in tertiary institutions (Polytechnic, northeast states of Nigeria (Mean= 3.22, SD=0.73) and (mean = 3.31, SD =0.68 at a degree of freedom of 18, with t_{cal} of 0.4381). Their responses are close to the mean as the standard deviations are very low. The Table revealed that there was no significant difference between the mean responses of junior and senior lecturers of Polytechnics northeast state of Nigeria on the strategies for teacher professional development in tertiary institutions as the calculated value (0.4381) was less than the table value (2.101), and therefore null hypothesis was not rejected. This implies that junior and senior lecturers of Polytechnic, northeast states of Nigeria did not differ in their responses regarding the strategies for teacher professional development in tertiary institution. Though there was a slight difference between their mean responses with senior lecturers having higher mean responses, but the difference was not statistically significant (Mean = 0.09).

Ho2: There is no significant difference between the mean ratings of male and female lecturers in polytechnics regarding the practices for teacher professional development.

Table 3

Summary of z-test of the difference between the mean ratings of male and female lecturers of Polytechnics on the strategies for teacher professional development

Group	N	\bar{X}	SD	Df	t_{cal}	t_{criq}	Decision
Male	48	3.28	0.73	64	0.4381	2.101	Not Rejected
Female	18	3.26	0.67				

P>0.05

Table 3 revealed that there are 66 male and female Lecturers. The male and female lecturers' responses presents the practices for teacher professional development in Polytechnics, northeast states of Nigeria) (Mean= 3.28, SD=0.73) and (mean = 3.26, SD =0.69 at a degree of freedom of 64, with t_{cal} of 0.4381). Their responses are close to the mean as the standard

deviations are very low. The Table revealed that there was no significant difference between the mean responses of male and female lecturers of Polytechnics northeast state of Nigeria on the practices for teacher professional development in tertiary institutions as the calculated value (0.4381) was less than the table value (2.101), and therefore null hypothesis was not rejected. This implies that male and female lecturers of Polytechnic, northeast states of Nigeria did not differ in their responses regarding the strategies for teacher professional development in tertiary institution. Though there was a slight difference between their mean responses with male lecturers having higher mean responses, but the difference was not statistically significant (Mean = 0.02).

Discussion of Result

With reference to research question 1, the findings revealed that information communication technology (Online forum), courses and workshops, collaborative learning among teachers, education conferences and seminars, are strategies for teacher professional development. Also, the study revealed that professional development Network like online communities, collaborative research, observation visits to other schools, and Qualification programmes are all strategies for teacher development. The study further revealed that Mentoring and coaching, formal training courses, Job-embedded professional development, and peer support in the form of the teacher communities are strategies for teacher professional development in tertiary institutions,

This finding is in line with Yue (2019) that collaboration can take different forms, such as: teacher networks, team-based, learning community and peer coaching. Depending on job-embed professional development, in their group's teachers can discuss together. He added Information communication technology can be applied in teacher professional development. Online forum produces a platform for teachers communicate with each other to share training experience of 21st century skills together and learn from peers. Peer-mentors can use video in training teachers. To also support this finding is Baker-Doyle (2014), that professional learning networks provide opportunities for teachers to participate in seminars, discussions, and other collaborative activities to improve their teaching practices, facilitate teacher learning and support the development of new teaching practices. The finding equally agrees with Daly and Villarreal (2018) that mentoring and coaching can enhance teacher self-efficacy and instructional practices. Yue (2019), mentoring invests the best practice and brings appropriate tools in teacher professional development.

Research question 2 revealed that individuals' to update knowledge of a subject in light of recent advances in the area, individuals' to update skills in light of the development of new teaching techniques and objectives, individuals' to update approaches in light of the development of new circumstances and new educational research, individuals' to update approaches in light of the development of new circumstances and new educational research, individuals to apply changes made to curricula or other aspects of teaching practice all practices for teacher professional development. It was also revealed that schools to develop and apply new strategies concerning the curriculum and other aspects of teaching practice, exchange information and expertise among teachers and others, *e.g.* academics, industrialists, and help weaker teachers become more effective are practices for teacher professional development in tertiary institutions.

To support this finding is (OECD) cited in Jonathan and Kalyan, (2023) that the development of teachers beyond their initial training can serve a number of objectives: to update individuals'

knowledge of a subject in light of recent advances in the area; to update individuals' skills, attitudes and approaches in light of the development of new teaching techniques and objectives, new circumstances and new educational research; to enable individuals to apply changes made to curricula or other aspects of teaching practice; to enable schools to develop and apply new strategies concerning the curriculum and other aspects of teaching practice; to exchange information and expertise among teachers and others, e.g. academics, industrialists; and to help weaker teachers become more effective.

Conclusion

Based on findings and discussion of the study, it was concluded that information communication technology (Online forum), courses and workshops, collaborative learning among teachers, education conferences and seminars, are strategies for teacher professional development, professional development network like online communities, collaborative research, observation visits to other schools, and qualification programmes are all strategies for professional teacher development. Mentoring and coaching, formal training courses, Job-embedded professional development, and Peer support in the form of the teacher communities are strategies for teacher professional development in tertiary institutions. Equally individuals' to update knowledge of a subject in light of recent advances in the area, individuals' to update skills in light of the development of new teaching techniques and objectives, individuals' to update approaches in light of the development of new circumstances and new educational research, individuals' to update approaches in light of the development of new circumstances and new educational research, individuals to apply changes made to curricula or other aspects of teaching practice all practices for teacher professional development.

There are great demands placed on teachers in the twenty first century; they must enable their students to meet the rapidly changing demands of the 21st century job market. Thus, the type of teacher education requires teachers to be high-level knowledge workers who are constantly developing their professional knowledge. Today, teacher professional development programmes are designed to equip teachers with these skills.

Recommendations

Based on the findings, the study recommended that in order to successfully implement 21st century skills pedagogies, teachers should first acquire the various components of 21st century skills so as to be able to freely deploy the most appropriate pedagogies in teaching and learning through collaboration, mentoring and coaching, professional development networks etc. To effectively perform their jobs as professional teachers should update their attitudes and approaches in light of the development of new teaching techniques and objectives, new circumstances and new educational research.

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