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Bridging theoretical knowledge with classroom practices: Effectiveness of Teaching Practicum for Perspective Teachers in Developing Pedagogical Skills

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ABSTRACT

This qualitative study explores the effectiveness of teaching practice in developing pedagogical skills among prospective science teachers. Through in-depth interviews, classroom observations, and reflective journals, the research investigates how hands-on teaching experiences, inquiry-based learning, mentorship, and diverse instructional strategies contribute to the professional growth of future educators. The findings reveal that real-world classroom experiences, supported by constructive feedback and mentorship, are crucial for bridging the gap between theory and practice. Additionally, the study highlights the importance of reflective practice, student-centered learning, and continuous professional development in fostering effective teaching strategies. The data was collected from teachers interviews and student focus groups who were engaged in teaching practice. The participants reported increased confidence, improved classroom management skills, and a deeper understanding of how to engage students in scientific inquiry. The research underscores the need for comprehensive, multifaceted approaches in teacher education programs to prepare prospective science teachers for the complexities of modern classrooms.

Keywords: *Teaching Practice, Science Teachers, Modern Classrooms, Professional Development*

INTRODUCTION AND CONTEXT OF STUDY

Effective teaching practices are crucial for providing high-quality education and ensuring that students reach their full potential. By understanding how children learn and grow, recognizing the impact of mindset on learning, reflecting on teaching practices, creating a positive classroom environment, using effective instructional strategies, assessing student learning, communicating with parents and guardians, and staying current with best practices, educators can provide the best possible education for their students (Danielson, 2011). Instead of focusing on what great teachers accomplish, that research tended to focus on how they appear. In the final part of the 20th century, the emphasis turned to "teaching effectiveness," or what constitutes effective teaching. There are many different methods to be a good teacher and teach effectively to develop students' pedagogical skills in the classroom, according to more recent research, which has shown that effective teaching is not based on any universal laws.

In most teacher training colleges, the aims of teaching practice are the same. For this reason, all Cameroonian teacher training colleges demand practice. There are variations in this paradigm, especially about duration, in three other state institutions that have schools of education: Ecole Normale Superieure (ENS), which prepares secondary school teachers and is situated in Yaounde, Bamenda, and Maroua. Both ordinary classroom teachers and topic teachers tend to believe that integrating kids with special needs into their classes is an unworkable approach.

Both ordinary classroom teachers and topic teachers tend to believe that integrating kids with special needs into their classes is an unworkable approach. Among the complaints made against the policy are the following, Teachers are not equipped to provide the specialized training special education pupils need; teaching students with special needs necessitates a particular kind of teaching expertise; and pupils in special education spend instructional time apart from those who are more likely to achieve. In fact, courses that include children with special education needs saw a little improvement in the academic performance of kids without special education requirements. Demeris, Childs, and Jordan (2007) found no negative correlation between the number of special education students in Grade 3 classrooms and the achievement scores of kids without special education needs on provincial assessments. There may be a correlation between the inclusion of special needs pupils and somewhat improved test scores for the remaining students. Teaching practice aims are the same in all teacher training programs.

Every Cameroonian teacher training school requires the course "Practice makes perfect." Three months are set aside for teaching practice, which is completed just once before graduation at the Ecole Normale Superieure (ENS) for secondary school teacher training in Yaounde, Bamenda, and Maroua, three additional state institutions with schools of education. To allow student instructors and their supervisors to concentrate on teaching practice, classes are not held during this time. Although there are some anomalies in this modelIn particular, the block time for teaching practice appears to be the conventional model for teaching practice because it is utilized by the majority of colleges across the globe.

Subject matter experts and regular classroom teachers agree that it is a bad idea to let special needs students join their classes. Teachers are not prepared to give the specialized instruction that students with special education needs need, teaching special education students demands specialized teaching skills, and students with special education needs take up teachers' instructional time away from students who are more likely to succeed, according to a number of complaints against the policy.

The scholastic achievement of pupils without special needs may even rise noticeably in classrooms where children with special needs are integrated. When special needs children are incorporated into Grade 3 classrooms, Demeris, Childs, and Jordan (2007) showed no detrimental effect on the provincial test accomplishment scores of children without special needs. The presence of special needs students may be linked to slightly better performance from the other students in the class. In most teacher training schools, the goals of teaching practice are essentially the same. For this reason, all Cameroonian teacher training schools require practice.

Three months are set aside for teaching practice at the Ecole Normale Superieure (ENS) for secondary school teacher training, which is offered at three other state institutions with schools of education (Yaounde, Bamenda, and Maroua). This practice is only taken once till graduation. To allow student instructors and their supervisors to concentrate on teaching practice, classes are not held during these times. The majority of institutions throughout the world employ block periods for teaching practice, therefore they appear to be the model for teaching practice, despite some changes under this paradigm, most notably in the amount of time.

Most teachers of subjects taught in conventional classrooms believe that it is a terrible idea to include students with special needs in their classes. Students with special education needs divert instructional time from teachers to students who are more likely to succeed, teachers lack the necessary training to provide the specialized instruction that special education students require, and teaching special education students requires special teaching skills, according to the policy's complaints. The performance of regular students may even be marginally higher in classes with special education needs.

According to Demeris, Childs, and Jordan (2007), the proportion of special needs kids enrolled in Grade 3 classes had no negative impact on the provincial exam scores of ordinary students. In fact, there may be a

correlation between the presence of special needs students and somewhat higher-class scores. In most teacher training schools, the goals of teaching practice are nearly the same. For this reason, all Cameroonian teacher training schools require practice. Three months are set aside for teaching practice, which is only done once until graduation at the Ecole Normale Superiore (ENS) for secondary school teacher training in Yaounde, Bamenda, and Maroua, three other state institutions with schools of education.

To allow student instructors and their supervisors to focus on teaching practice, there are no classes for three months. Although there are some variations, particularly with regard to duration, the block period appears to be the model for teaching practice because it is used in the majority of universities worldwide. It's a prevalent misconception among regular class and subject teachers that having kids with special needs in their classes will only lead to failure.

Teachers are not prepared to provide the special instruction that students with special education needs need; students with special education needs take up teachers' instructional time away from students who are more likely to succeed; and teaching special education students calls for specialized teaching abilities, according to the complaints against the policy. Students without special education requirements can even perform somewhat better academically in grade 3 special education classrooms. The accomplishment scores of kids without special education needs on provincial examinations were not adversely affected by the proportion of special education students in Grade 3 classes, according to Demeris, Childs, and Jordan (2007).

The presence of pupils with special needs may be associated with marginally higher test scores for the rest of the class. Most teacher training colleges have the same goals for their teaching practice. Because of this, all Cameroonian teacher training colleges demand practice. Three months are set aside for teaching practice at the Ecole Normale Superieure (ENS) for secondary school teacher training, which is offered once till the student graduates at three more state institutions with schools of education (Yaounde, Bamenda, and Maroua). In order to allow student instructors and their supervisors to concentrate on teaching practice, classes are not held during this time.

Although there are several discrepancies in this model, especially about time, the block period for teaching practice is used by most colleges worldwide, making it seem to be the standard model for teaching practice. Most topic professors and regular classroom teachers think that allowing kids with special needs to attend their classes is a bad idea" Teaching students with special education needs necessitates specialized instructional skills; teachers are unprepared to provide the specialized instruction that these students require; and special education students occupy instructional time that could be used with students who are more likely to succeed. These are some of the grievances raised regarding the policy.

Children without special needs may even do somewhat better in a classroom when there are children with extraordinary needs present. The achievement scores of students without special needs on provincial assessments are unaffected by the presence of special needs children in Grade 3 classes, claim, Demeris, Childs, and Jordan (2007). In fact, there may be a correlation between somewhat higher-class ratings and the number of students with disabilities.

Many teacher education programs have about the same practice teaching goals. In all Cameroonian teacher training colleges, practice is a mandatory course. Three months are set aside for teaching practice at the Ecole Normale Superieure (ENS), which is a school of education at three different state universities that train secondary school teachers (in Yaounde, Bamenda, and Maroua). This practice is only done once till graduation. During this time, there are no classes so that student instructors and their supervisors can concentrate on their teaching duration. Although there are several discrepancies in this model, especially about time, the block period for teaching practice is used by most colleges worldwide, making it seem to be the standard model for teaching practice.

Regular class and subject Teachers frequently believe that it is not a good idea to include students with special needs in their classes. Teachers are not prepared to provide the specialized instruction that students with special education needs need; students with special education needs take up teachers' time away from students who are more likely to learn; and students with special education needs need specialized teaching skills, according to some criticisms of the policy. Students without special education needs may even do marginally better in classes when children with special education needs are integrated.

The percentage of special education children integrated into Grade 3 classrooms has no negative impact on the achievement scores of kids without special education needs on provincial tests. There may be a correlation between the availability of special needs children and slightly higher grades for the rest of the class. In many teacher training institutions, the objectives for teaching practice are similar (Demeris, Childs, and Jordan, 2007).

Teaching practice is only allowed once till graduation. To allow student instructors and their supervisors to concentrate on teaching practice, classes are not held during this time.In all Cameroonian teacher training schools, the course "Practice makes perfect" is mandatory. Three months are set aside for teaching practice at the Ecole Normale Superieure (ENS) for secondary school teacher training, which is offered at three other state institutions with schools of education (Trigwell, 2012)).

Even if there are differences, particularly in length, the teaching practice period appears to be the norm for teaching practice because it is used in every university in the globe. Teaching special needs students in regular classes is often seen as an unproductive policy by subject matter experts.

Students with special education needs take up teachers' instructional time away from students who are mo re likely to succeed, teachers are not prepared to give the specialized instruction that these students requir e, and teaching special education needs requires special teaching skills. These are the policy-related grievances Students without special needs may even perform marginally better in Grade 3 courses that include children with exceptional needs. The accomplishment levels of kids without special needs on provincial assessments were unaffected by the proportion of special needs students placed in Grade 3 classes. In fact, there may be a correlation between the presence of special needs students and somewhat higher test scores for the remainder of the class (Demeris, Childs, and Jordan, 2007).

Several data sources were gathered to investigate instructors' perceptions of students' abilities and disabilities in the SET project and how they connected to their choices and methods. Our goal was to find belief clusters that might be connected to the pedagogical activities teachers stated and saw to improve students' classroom skills. Our primary measure of teachers' practices is the Classroom Observation Scale, a third-party observation tool (Jordan & Stanovich, 2004; McGhie, Underwood, & Jordan, 2007). This observation takes place during a half-day of language arts, math, and science sessions in the regular classroom when special education needs children are present.

STATEMENT OF THE PROBLEM

The goal of the problem statement is to identify the issue that requires attention and to refine it so that it can be analyzed in a systematic manner. It describes the problem and offers a research strategy to solve it, or it demonstrates why additional information is needed before a solution can be found. Despite extensive research on effective teaching practices, significant gaps remain in understanding how the diverse nature of student- teacher relationships impact secondary students' academic outcomes. Secondary school students often interact with multiple teachers across different subjects, creating a complex web of relationships that could influence their engagement and academic performance. While some studies have investigated teacher-student relationships, there is limited research examining the balance of negative and positive relationships across various subjects and its influences on student engagement.

This research aims to address the gap by exploring how students' engagement levels vary based on the range of relationships they have with their teachers in different subjects. This dynamic is crucial for optimizing educational practices and improving student outcomes. By examining various aspects of these relationships, this study seeks to provide insights that could enhance teaching strategies and support systems for students, ultimately contributing to more effective educational practices.

OBJECTIVES OF THE STUDY

1. To explore the current state of teaching practices in science education
2. To identify the essential pedagogical skills required for effective science teaching and learning.
3. To explore the difficulties in teaching practice for science students

Research Questions of the study

1. Is teaching practice effective improving student teaching skills?
2. How do you assess effectiveness of teaching practice for science students?
3. What are the difficulties of teaching practice for science students?

Significance of the study

When teachers have pedagogical topic knowledge, they can use educational theories, and best practices, and techniques to teach their subjects effectively.
teachers can develop effective teaching strategies if they have a solid grasp of the material**.** To find the keys to designing an effective and memorable learning experience, a pedagogical skill analysis is necessary. To reach logical inference, several logical steps must be followed. Additionally, it aids students in comprehending pedagogical abilities have the potential to improve the quality of the teaching-learning process, enhance group learning, reduce monotony, and enable individualized learning.

REVIEW OF THE RELATED LITERATURE

A number of dimensions have been used by researchers to classify and group instructional methods. These elements include perspectives that are more student-centered and those that are more teacher-centered. Effective teaching practices in the classroom are summarized by Borich (1996), as cited in Mujis & Reynolds, 2001) as follows: creating a warm, supportive atmosphere; obtaining feedback before moving on to the next section of material; presenting information in manageable chunks with opportunities for practice; stressing the application of knowledge; drawing on students' experiences; utilizing individually differentiated materials; and motivating students to take responsibility for their own education.

Teaching methods from the perspective of middle school teachers in China. He discovered a four-factor model of teaching practice that includes fostering student involvement, maintaining extracurricular ties, employing innovation and variety of methods, and being solely teacher-oriented. In passing, it should be mentioned that the writers did not locate a lot of literature in this field. To teach PBLI, we incorporated three different activities into the residency curriculum: weekly inpatient morbidity and mortality morning reports (MMMR), continuity clinic chart self-audits, and resident learning portfolios. These duties are discussed using the metaphor of the mirror (Chen, 2010). Faculty and residents' inpatient medical practices are reflected symbolically by the MMMR. Once a week, during morning report, residents and medical students meet with the program director to examine all mortality and selected morbidity from the inpatient medical services over the previous week.

The lack of research focus in this area is significant for organizations seeking to identify and measure exceptional teaching behaviors required for the contemporary educational context. A literature review did, however, provide enough information for speculation and a description of some of the required skills. Their

validity and quantitative nature will need to be determined. However, defining, redefining, and measuring teaching excellence abilities in the twenty-first century may prove to be very challenging. "Teaching and learning are not two distinct phenomena," according to, Postareff, Lindblom, and Nevgi(2007) that looked at how pedagogical training affected teaching in higher academia.

Since the 1960s, teaching-learning settings have employed the microteaching approach. One noteworthy component of pre-service teachers' instructional strategies is microteaching (Görgen, 2003). The microteaching approach gives pre-service instructors fresh and unique chances to create and execute innovative teaching techniques. Microteaching is important in preparing students for teaching professions because it may show how theory and practice are connected (Ajayi and Talabi, 1986).

One method in teacher education that facilitates the transfer from theory to actual teaching scenarios is microteaching (Çelik, 2001). "A system of controlled practice that makes it possible to concentrate on specific teaching behavior and to practice teaching under controlled conditions" is how microteaching was described by Allen and Eve (1968). Through microteaching, pre-service teachers try to bridge the gap between theory and practice by applying their skills and knowledge (Gürses, Bayrak, Yalçın, Açıkyıldız & Doğar, 2005).

Lessons in microteaching are brief (5–20 minutes) and have a small student body (no more than 20) (Külahçı, 1994). Teachers strive to meet a single teaching skill per subject. The cycle of microteaching begins with planning. The process of teaching, criticizing, re-planning, re-teaching, and re-criticizing is the cycle depicted in Figure 1 (Peker, 2009). Faculty members' working life have always been impacted by outside forces, but throughout the last 20 years, change has increased significantly in terms of speed, complexity, and intensity (Day, 2012).

The function and working conditions of academics have been significantly impacted by several worldwide changes that are upending higher education. Faculty are asked to perform more with less because of funding arrangements being reduced and economic pressures (Day, 2012). Institutions are currently in a competitive position in the vast worldwide education market thanks to social migration and globalization (Day, 2012).

Therefore, what qualifications are necessary for effective teaching in the twenty-first century. Pratt (2002) cautions against embracing a single, prevailing theory of education or learning. Simply put, there is no "one size fits all" definition of effective teaching that can encompass the different "philosophical orientations to knowledge, learning, and the role and responsibility of being a teacher, are relevant in building the skills and abilities required for outstanding teaching in light of the shifting dynamics and tensions between teaching and research, technology use, and other disruptions. The widespread use of technology and faculty's increased responsibility in institutional governance (Levin *et al*., 2006) have led to a shift in student demographics, along with funding cuts and increased competition for student enrollment. As a result, institutions are now accepting a more diverse student body because of the expansion and extension of faculty's work types and working hours both inside and outside of the classroom.

As is well known, teaching and learning in the twenty-first century call for a completely different set of abilities. To the best of my knowledge, there aren't many studies that try to rethink the function of faculty in teaching and learning in the twenty-first century, according to a closer examination of the literature. Teachers who are highly qualified and motivated are more likely to use student-centered teaching strategies (Trigwell, 2012), and the relationship between teaching strategies and learning outcomes has long been recognized (Biggs, Kember & Leung, 2001; Postareff et al., 2007 Parry & Smart, 2007, Seidel & Shavelson, 2007, Shevlin, et al., 2000, Umbach & Wawrzynski, 2005).

According to Gibson (2010), "the day when academics in the higher education sector simply could copy the teaching practices that they learned as students is rapidly passing. It is clear from the study that to

support modern learning, teachers must become more creative (Gibson, 2010; Zhu et al, 2013). Clearer definitions of effective teaching and learning are needed, as are frameworks (professional development units) that can be used to assist better instruction, according to a review of studies in the subject (Scott, 2011). Zhu *et al.*, (2013) contend that it is unrealistic to expect that traditional teaching and learning would have helped today's pupils.

It has been observed that students in the majority of secondary schools have multiple teachers in a single day and may engage with each of them in a variety of ways. However, no study has attempted to examine the amount of positive and negative teacher-student interactions, as well as whether the ratio of negative to positive teacher-student relationships affects students' academic achievement, using relational data on a set of students' school topics. This would be surprising considering that the majority of secondary students have a lot of teachers in their careers and that the form and impact of these encounters can differ from teacher to teacher.

RESEARCH METHODS

Interviews for the Exploring the Effectiveness of teaching practice for perspective teachers in developing pedagogical skills in science teacher had been built with the aid of using the researcher. Different questions were developed so that respondents answer the given questions. In addition, closed-ended questions have the advantage of generating response frequencies that can be modified by statistical analysis. The Interview turned into built to Exploring the Effectiveness of teaching practice for perspective teacher in developing pedagogical skills in science teacher within side the classroom. To discover those concerns, targets and boundaries questions had been built so that they may cowl the required location of Effectiveness of teaching practice for perspective teachers in developing pedagogical skills in science teacher. Research questions were asked to discover these objectives:

1. To explore the current state of teaching practices in science education and identify areas for improvement.
2. To identify the essential pedagogical skills and knowledge required for effective science teaching and learning.
3. To explore the difficulties during teaching practice.

This study was qualitative in nature and conducted within the controlled situation in order for respondents to provide truthful answers to the questions. One hundred university-level students received the qualitative questionnaires, therefore there was a sufficient sample size to make intelligible results. I started data collection in a pilot study and at level of pilot study the qualitative questionnaires were distributed to 10 students at university-level (male and female) before the study was conducted. However, the pilot study sample is different from the main study sample. I thoroughly planned and carefully expressed the focus group interview with a complete discussion related to the interpretation of the questions. To explore these concerns and aims thoroughly questions were constructed in such a way that they could cover the difficulties for the improvement of effectiveness of teaching practice.

The researchers started data collection in a pilot study and a pilot interview question was 2- focus group at university-level teachers and students (male and female) before the study was conducted. However, the pilot study sample was different from the main study sample. Researcher got in touch with the participants and told them about my study. On the moment, we both agreed. Researcher met the participants at the hour they had specified. They agreed to provide me with their data by signing the consent form. Researcher gave the participants my word that their information would remain confidential. He gave me permission to record his voice.

The following were the main themes that emerged from the interview data:

- Teaching Practice Helps Prospective Teachers Become Better Science Educators
- Pedagogical Skills Can Prospective Teachers
- Impact Prospective Teachers' Confidence in Teaching Science
- most effective teaching practices for prospective science educators
- prospective teachers apply teaching practice to improve student learning outcomes in science

Theme 1: Teaching Practice Helps Prospective Teachers Become Better Science Educators

Participants were asked about the importance of teaching practice help prospective teachers become better science educators. They were asked about using Hands-On Experience.

Subtheme 1: Provides real-world teaching scenarios

Many participants had three years of experience, according to the data gathered. Within the last three years, they began implementing problem-based learning in science. For Example, a participant stated:

A teacher presents students with a real-world environmental issue, such as water pollution. Students work in groups to research the causes, effects, and potential solutions, ultimately presenting their findings and recommendations (T5).

Hence this data indicate that A teacher presents students with a real-world environmental problem, such as water pollution. Students work in groups to explore causes, effects, and possible solutions, and ultimately present their findings and recommendations.

On the other hand, few participants had two years of teaching experience.

A math teacher takes students to a local grocery store. Students are given a budget and must plan a meal, calculating costs, discounts, and taxes, thus applying their math skills in a practical setting. (T2).

Hence, this data indicates, A mathematics teacher takes students to a local grocery store. Students are given a budget and must plan meals, calculate costs, discounts, and taxes, and apply their mathematics skills in a practical setting.

Students read and analyze a novel at home. In class, they engage in discussions, group activities, and projects that delve deeper into themes, character development, and author intent, fostering a more interactive learning environment. (G1S1).

Hence, this data shows that Students read and analyze novels at home. In class, they engage in discussions, group activities, and projects that delve deeper into themes, characters, and author's intent, fostering a more interactive learning environment.

Subtheme 2: Encourages adaptation to diverse learning styles

The collected data showed that half of the participants favored the Encourages adaptation to diverse learning styles. Most of the participants think that it is not an easy task to Encourages adaptation to diverse learning styles.

For Example, one participant stated:

Incorporate visual, auditory, and kinesthetic activities in lessons. For example, a science teacher might use diagrams (visual), lectures (auditory), and hands-on experiments (kinesthetic) to explain concepts. (T3).

Hence, this data indicates, Integrate visual, auditory, and kinesthetic activities into the classroom. For example, a science teacher might use diagrams (visual), lectures (auditory), and hands-on experiments (kinesthetic) to explain concepts. The collected data showed that all the participants used Personalized Learning Plans. For example, a few participants noted that:

Develop individualized learning plans that consider each student's strengths, weaknesses, and preferred learning styles, allowing for more tailored instruction. (T1)

This data indicates, Create individualized learning plans and provide customized instruction that consider each student's strengths, weaknesses, and preferred learning styles. Few Participants stated that;

Have students create interactive notebooks that include drawings, diagrams, written notes, and hands-on activities, catering to visual, auditory, and kinesthetic learners simultaneously. (G3S2).

Hence, this data show that students create interactive notebooks that include pictures, diagrams, notes, and hands-on activities while engaging visual, auditory, and kinesthetic learners.

Theme 2: Pedagogical Skills Can Prospective Teachers

Participants were inquired about their pedagogical skills can prospective teachers. They were asked and probed to talk about their viewpoint and thoughts on skill Development. They were asked about pedagogical skills. Data collection showed that the majority of the participants knew about of Enhances classroom management abilities. They believed it is a process of looking back on past experiences about classroom management abilities. For Example, one participant Asked:

Arrange seating to minimize distractions and facilitate interaction. Group students in clusters for collaborative work and place easily distracted students closer to the teacher (T1).

Hence, this data shows that the Arrange seating to minimize distractions and encourage interaction. Group students into collaboration groups and place easily distracted students closer to the teacher. One participant stated that:

Use non-verbal signals, such as hand gestures or visual cues, to gain students' attention or indicate transitions. This reduces the need for verbal interruptions. (G1S1).

Hence Use nonverbal cues, such as hand gestures and visual cues, to get students' attention and indicate transitions. This reduces the need for verbal interruptions. Another participant Pointed that:

Include short movement breaks in the schedule to help students release excess energy and improve focus, reducing restlessness and disruptive behavior. (G5S2).

Hence, this data shows that incorporating short movement breaks into the schedule can help students expend excess energy, increase focus, and reduce restlessness and disruptive behavior.

Provide individualized support for students with specific behavioral needs. Develop personalized strategies to address their unique challenges and strengths. (G4S5).

Provide individualized support to students with special behavioral needs. Develop personalized strategies to address individual challenges and strengths.

Other participants stated that:

Proficiency in utilizing web browsers to visit websites, conduct information searches, and comprehend fundamental internet protocols such as URLs and hyperlinks (G5S3).

This data indicates, internet protocols such as URLs and hyperlinks, browser Skills were used for search of information

Data collection showed that majority of the participants about Professional Development.

Engage in ongoing professional development focused on classroom management techniques. Stay updated with new strategies and best practices to continuously improve classroom management skills. (T1).

Therefore, this data show that Participate in continuing professional development with a focus on classroom management techniques. Stay up to date on new strategies and best practices to continually improve your classroom management skills.

Others noted that:

Attend workshops and seminars on current educational trends, innovative teaching methods, and classroom management strategies to stay updated with the latest practices. (T4).

Thus, this data reveals that, Stay up to date with the latest practices by attending workshops and seminars on current educational trends, innovative teaching methods, and classroom management strategies.

Another participant stated that:

Engage in peer observation programs where teachers visit each other's classrooms to observe and provide feedback on teaching practices and classroom management. (T5).

Therefore, in a peer observation program Participate where teachers visit each other's classrooms to observe and provide feedback on their teaching practices and classroom management. Some other participants stated that:

Conduct action research projects to investigate and improve specific aspects of teaching or classroom management. This involves identifying a problem, implementing a strategy, and analyzing the results. (T7)

Hence this data indicates that the Conduct an action research project to investigate and improve a particular aspect of teaching or classroom management. This involves identifying a problem, implementing a strategy, and analyzing the results. Data showed that majority of the participants knew about the of fosters inquiry-based learning techniques. They thought it is a good source of looking back on past experiences to explore, inquiry-based learning practices.

Encourage students to ask open-ended questions about the subject matter. Use techniques like the Socratic method to facilitate discussions that explore complex ideas and stimulate critical thinking (G5S2).

Hence, this data show that, encourage students to ask open-ended questions about a topic. Use techniques such as the Socratic Method to facilitate discussions that explore complex ideas and encourage critical thinking.

Design projects that require students to identify and solve real-world problems. For instance, students might design a sustainable city or develop a solution to a local environmental issue (G5S4).

This data indicates that, design projects that require students to identify and solve a real-world problem. For example, students could design a sustainable city or develop a solution to a local environmental problem.

Theme 3: Impact Prospective Teachers' Confidence in Teaching Science

Participants were inquired about their impact on prospective teachers' confidence in teaching science. They were asked and probed to talk about their viewpoint and thoughts on the impact of perspective in teaching science. They were asked about the Computer Literacy Skills Required at Pakistani universities.

Subtheme 1: Offers practical teaching experiences

Data reveals that majority of the participants were about Offers practical teaching experiences.

For Example, one participant noted that:

Arrange for pre-service teachers to observe experienced teachers in various classroom settings. Observations provide insights into classroom management, instructional strategies, and student engagement (T4).

Hence, this data show that Allow future teachers to observe experienced teachers in a variety of teaching situations. Observations provide insight into classroom management, instructional strategies, and student engagement.

Another participant stated that:

Use simulations to mimic real classroom scenarios, such as managing disruptive behavior or adapting lessons for diverse learners. This helps pre-service teachers develop problem-solving skills in a controlled environment (T5).

Hence, this data show that the Use simulations to mimic real-life teaching situations. B. Dealing with disruptive behavior or adapting lessons to different learners. This helps aspiring teachers develop problem-solving skills in a controlled environment. Other participants stated that:

Conduct workshops where pre-service teachers create and refine lesson plans. Provide guidance on aligning lessons with educational standards and incorporating effective instructional strategies (G5S2).

This data show that, conduct workshops for beginning teachers to create and refine lesson plans. It provides guidance for adapting instruction to educational standards and incorporating effective teaching strategies. Data showed that majority of the participants easily grow up Facilitates constructive feedback and mentorship. For Example, one, participant noted that:

Constructive feedback provides specific, actionable suggestions for improvement. (G4S3).

Observing Understanding Constructive feedback provides specific, actionable suggestions for improvement.

Feedback can boost confidence by highlighting accomplishments and progress. (G4S5).

This data indicates that, Feedback can boost self-confidence by highlighting successes and progress.

Facilitating constructive feedback and mentorship is essential for promoting personal and professional growth. They offer valuable insights, support, guidance, and encouragement that can help individuals reach their full potential. (G5S3).

Hence, this data show that Constructive feedback and coaching are essential to foster personal and professional growth. They provide valuable insight, support, guidance and encouragement to help individuals reach their full potential. The data showed that majority of the participants about Constructive Criticism Training. For Example, one participants pointed that:

Constructive criticism is feedback given in a supportive and helpful manner, aimed at helping the recipient improve. It can improve employee performance, increase productivity, and enhance teamwork. (G5S2).

This data indicates that, Constructive criticism is feedback given in a supportive and helpful way, with the aim of helping the recipient improve. You can improve employee performance, increase productivity and improve teamwork. Other Participants Stated that:

By listening actively, asking clarifying questions, and expressing gratitude for the feedback. Using the sandwich approach (positive-negative-positive), offering actionable advice, and providing examples. (T8).

Hence, this data indicates that, by actively listening, asking clarifying questions and appreciating feedback. Use the sandwich approach (positive, negative, positive) to provide actionable advice and give examples.

Theme 4: most effective teaching practices for prospective science educators

Participants were inquired about the most effective teaching practices for prospective science educators. They were asked and probed to talk about the most effective teaching practices for prospective science educators. The data showed that most of the participants easily grow up Promotes collaborative learning. For Example, one participant noted that:

Collaborative learning ensures that all students actively engage in the learning process. Students can learn from each other through discussions and sharing of ideas. It allows students to develop better communication and interpersonal skills. (T1).

Hence, this data show that Collaborative learning allows all students to actively participate in the learning process. Students can learn from each other through discussion and sharing of ideas. This allows students to develop better communication and interpersonal skills. Other participants stated that:

Collaborative learning requires effective communication to succeed. Students can brainstorm and explore innovative ideas collectively. Students learn how to collaborate effectively as a team. Collaborative learning creates a sense of community and support among students. (T5).

Hence, this data show that Effective communication is necessary for collaborative learning to be successful. Students can brainstorm together and come up with innovative ideas. Students learn how to work effectively in teams. Collaborative learning creates a sense of community and support among students.

Working collaboratively encourages students to embrace challenges and learn from mistakes. Collaborative learning allows students to approach problems from different angles. Students learn to understand and appreciate their peers' perspectives and experiences. (G5S1).

This data indicate that Working together allows students to embrace challenges and learn from their mistakes. Collaborative learning allows students to approach problems from different perspectives. Students learn to understand and value the perspectives and experiences of their peers.

Theme 5: prospective teachers apply teaching practice to improve learning outcomes

Participants were inquired about the limitations of Implements formative assessment strategies. They were asked and probed to all about the Implements formative assessment strategies.

Other participants stated that:

Give chances for students to demonstrate their learning through different modalities. Use formative assessment data to inform parent-teacher conferences. Employ data trackers to monitor student progress

over time. Collaborate with colleagues to share best practices for formative assessment. Encourage students to reflect on their learning process. (T4)

Hence, this data show that Use formative assessment data to inform parent-teacher conferences. Employ data trackers to monitor student progress over time. Collaborate with colleagues to share best practices for formative assessment. Encourage students to reflect on their learning process.

implementing formative assessment strategies is essential for promoting student learning and growth. By utilizing a variety of strategies, providing timely feedback, and using data to inform instruction, teachers can effectively support student progress and achievement. (T10)

Hence, this data indicates that by utilizing a variety of strategies, providing timely feedback, and using data to inform instruction, teachers can effectively support student progress and achievement.

DISCUSSIONS

Since the 1960s, teaching-learning settings have employed the microteaching approach. One noteworthy component of pre-service teachers' instructional strategies is microteaching (Görgen, 2003). Results from surveys and interviews show that students feel they value teaching practice. The syllabus they had to teach was based on the content covered, but the exams given to students rewarded the correct rendering of that content. Because teaching practice is important because it may show how theory and practice are related role in preparing students for careers in teaching (Ajayi and Talabi, 1986). A real-world environmental problem, such water contamination, is presented to the class by the instructor. Students investigate the causes, effects, and potential remedies in groups before presenting their conclusions and suggestions. Thus, this information demonstrates that students read and discuss novels at home. To create a more dynamic learning environment, they participate in class discussions, group projects, and activities that go deeper into themes, characters, and the author's aim. The extensive use of technology and the expanding faculty duties in institutional administration have led to an increase in the types of work and working hours for faculty members both within and outside of the classroom (Levin et al., 2006). It is often known that teaching and learning in the twenty-first century require a whole new set of skills. basic internet technologies, including hyperlinks and URLs.

Thus, this data suggests that students should create interactive notebooks that include notes, diagrams, drawings, and hands-on activities in order to engage visual, auditory, and kinesthetic learners. Accordingly, our research suggests that incorporating short movement breaks into the curriculum can assist students release excess energy, enhance focus, and reduce restlessness and disruptive behavior. ability to view websites, search for information, and understand basic internet protocols like URLs and hyperlinks using web browsers. The analysis of studies in this area indicates that more precise definitions of high-quality teaching and learning are required. In order to promote better teaching practices, professional development units should also be made accessible as support systems (Scott, 2011). It is impossible to expect that pupils in the modern day will benefit from traditional teaching and learning approaches, claim Zhu, Wang, Cai, and Engels (2013). To stay up to date with the newest practices, attend conferences and seminars on cutting-edge teaching techniques, classroom management techniques, and current educational trends. Investigate and enhance particular facets of instruction or classroom management by conducting action research projects. This entails determining an issue, putting a plan into action, and assessing the outcomes.

Since our sample of students had to take science, math, English, history, and geography classes, it is possible to see how the students interacted with their teachers in each of these subjects. Students would therefore be able to rate their relationship with each teacher. The methodology of our investigation was inspired by analogous conceptualizations by Ang (2005), Hughes (2011), and Munns (1998) and was based on a review by Martin and Dowson (2009). Students were encouraged to ask open-ended questions of the subjects. Use

techniques like the Socratic method to have discussions that delve deeper into concepts and encourage critical thinking. Use simulations to mimic real-world classroom scenarios, such as handling disruptive behavior or adapting lessons for a variety of student backgrounds. In a supervised environment, this helps pre-service teachers hone their problem-solving abilities.

Pascarella et al., (2004); Lohfink & Paulsen (2005); Dennis, Phinney, & Chuateco (2005); Pike & Kuh (2005)). To promote both professional and personal growth, mentorship and constructive criticism should be made available. They offer helpful counsel, support, encouragement, and guidance that can help people reach their full potential. Effective communication is essential for team learning to succeed. As a group, students can generate a lot of creative ideas. Collaborative skills are taught to the students. Students who participate in collaborative learning feel more supported and like they belong. Students who collaborate embrace the difficulties and can grow from mistakes. the students can approach challenges in different ways when they participate in cooperative learning.

The students who collaborate embrace difficulties and grow from mistakes. Students can approach challenges in different ways when they participate in cooperative learning. Additionally, students learn to respect and accept the wisdom and experiences of their peers. Across a variety of scientific fields, models and simulations are general tools used for process optimization, prediction, and understanding complex systems. In addition to fostering creativity and discovery in a variety of sectors, these tools have revolutionized how scientists and researchers observe the world around us. Give pupils multiple opportunities to demonstrate their learning (Zhu, Wang, Cai, and Engels, 2013). Thus, the Students should be asked to consider how they have learned. Using formative assessment techniques is essential to promoting students' learning and development. By employing a variety of techniques, providing prompt feedback, and using data to drive their decisions, teachers can effectively support students' growth and achievement.

The effectiveness of teaching practice for prospective science teachers in developing pedagogical skills have been appreciated by the participants. Hands-on teaching experience, inquiry-based learning, mentorship, and diverse instructional strategies are essential in bridging the gap between theory and practice. Continuous professional development, reflective practice, and student-centered learning approaches further enhance teaching effectiveness. Classroom management skills, curriculum design, assessment literacy, technology integration, and collaboration are also vital in preparing future science teachers to create engaging, inclusive, and effective learning environments.

Overall, an ample and versatile style to teaching practice is necessary to equip prospective science teachers with the skills and confidence needed for successful careers in education. Educational institutions should provide structured teaching practicums that offer real-world classroom experiences under the supervision of experienced mentors. These practicums should Offer training in a variety of instructional strategies, including differentiated instruction, use of technology, and multi-sensory approaches. This will prepare prospective teachers to effectively address diverse learning styles and needs and conduct workshops focused on classroom management techniques. Use role-playing and simulations to help prospective teachers develop skills in creating a conducive learning environment. Also, it is recommended to promote reflective practice by incorporating it into teacher education programs. Encourage prospective teachers to critically analyze their teaching experiences and identify areas for improvement. By implementing these recommendations, teacher education programs can better prepare prospective science teachers to meet the demands of modern classrooms, fostering their development into effective, adaptable, and innovative educators.

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