
Impact of the Split Teaching Practice Model on Undergraduate Pre-Service Teachers' Performance in Science Content Delivery

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Abstract: *The study adopted an observational research design to assess the impact of the Split Teaching Practice Model on undergraduate pre-service teachers' performance in science content delivery within classroom settings, without researchers' intervention. The population consisted of 119 second-year and 102 third-year science education students at Federal University Gusau - Nigeria, engaged in First and Second-phase teaching practice during the 2022/2023 academic session. A convenience sample of 96 pre-service teachers (54 in First-phase, 42 in Second-phase) was obtained. Data collection involved structured classroom observations using instrument tagged Pre-service Teachers' Performance in Science Content Delivery. Validity and reliability of the instrument were established through expert validation and inter-rater reliability assessment, yielding a correlation coefficient of 0.86. Four null hypotheses were tested using t-tests, focusing on lesson planning, presentation, class management, and attainment of objectives. The findings of the study revealed that, significant differences in favour of Second-phase pre-service teachers in aspects like sequential presentation, subject matter mastery, instructional materials usage, time management, and student participation. No significant differences were found in lesson introduction and questioning techniques. Second-phase pre-service teachers outperformed in class management and objective attainment. The study recommended continued adoption of the Split Teaching Practice Model, emphasizing refinement and customization to address specific improvement areas through feedback in teacher training institutions.*

Keywords: *Pre-Service Teachers, Classroom Observation, Split Teaching Practice Model, Performance, Science Content Delivery.*



1. INTRODUCTION

The field of teacher education is essential for preparing pre-service teachers to teach science effectively, as teachers are key to the success of any educational system. In Nigeria, like in many countries, the quality of science education relies heavily on the competence of science teachers, making their preparation a critical component of the education system [12,18]. The training of future science teachers requires a balance of theoretical knowledge and practical experience, with teaching practice being a crucial aspect [3,9,15]. Teaching practice, also known as teaching internship or practicum, is a transformative period where pre-service teachers gain valuable experience, refine pedagogical skills, and learn to deliver content effectively, especially in science [29]. According to [3], teaching practice is a structured and supervised experience that provides aspiring teachers with an authentic opportunity to interact with students, design and implement instructional strategies, and manage classrooms. It offers a structured and supervised environment for aspiring teachers to interact with students, design instructional strategies, and manage classrooms [3,10,18].

Teaching practice can be likened to housemanship in Medicine, Student Industrial Work Experience Scheme (SIWES) for engineers, and Court Attachment for lawyers [25]. Mandated by the National Policy on Education (NPE) and emphasized in academic standards set by bodies like the National Universities Commission (NUC), teaching practice is a cornerstone of teacher education in Nigeria [14,20,23]. Completing teaching practice is a requirement for obtaining teaching qualifications such as the Nigeria Certificate in Education (NCE) and Bachelor's degree in Education (B.Ed.), emphasizing its significance [30]. The National Universities Commission (NUC) plays a central role in shaping teaching practice in Nigerian universities [8]. The Benchmark Minimum Academic Standard (BMAS) of National Universities Commission [20] and the more recent Core Curriculum Minimum Academic Standards (CCMAS) [23] for Nigerian universities emphasize the significance of teaching practice. Both standards emphasize teaching practice as a fundamental component, mandating that it be a compulsory course that all undergraduate students enrolled in education related programmes at Nigerian universities must be completed and receive a pass grade.

Teaching practice aims to equip pre-service teachers with the skills and practical experience necessary for real classroom settings [28,30]. It is therefore not just a formality but a cornerstone of teacher education in Nigeria. However, challenges exist, particularly in teaching specific subjects like science, which require effective content delivery to enhance learning [19,32,34]. Successful science content delivery involves transmitting complex concepts in a way that fosters understanding, critical thinking, and application among students [26]. It encompasses mastery of subject matter, lesson planning, effective communication, and the use of engaging pedagogical strategies [4,5]. While some universities globally adopt alternative models of teaching practice, the Block and Split Models are commonly adapted [1,31]. These models differ in duration, integration into the curriculum, and the experiences they offer to pre-service teachers, impacting their performance in science content delivery. The choice between teaching practice models significantly influences the experience and performance of pre-



service teachers, emphasizing the need for careful consideration in teacher training curriculum planning and implementation for efficient production of science teachers.

2. RELATED WORKS

The block Teaching Practice model in Nigerian involves a continuous and immersive 12-week teaching practice period, which typically covers an entire school term or one whole semester [25,27]. This model takes inspiration from the British education system, aiming to provide pre-service teachers with an intensive and comprehensive teaching experience. It aligns with the required standards stipulated in the BMAS (2007). However, it may also present challenges related to vigour and the ability to maintain peak performance over an extended period [25]. The Split Teaching Practice Model on the other hand, divides the teaching practice into two separate phases, usually six-week each [1,2,23,27]. In this model, pre-service teachers spend their First-phase (six weeks) of teaching practice at the end of their second year and the Second-phase (six weeks) at the end of their third year. The split model provides a gradual and incremental teaching experience, which is typically associated with the American education system [1]. It offers advantages such as timelier feedback [16] and the opportunity for pre-service teachers to apply lessons learned in the First-phase to the Second-phase. However, it may introduce challenges related to inconsistencies in evaluation and the need for pre-service teachers to adapt to changing classroom dynamics [1].

The assessment of science education pre-service teachers' performance in science content delivery is of paramount importance. It serves as a benchmark for assessing their readiness to become effective science teachers [27]. To assess their proficiency, several criteria are often considered, including the planning of lesson skills, the use of instructional aids, the conduct or presentations of lessons in the classroom setting, subject matter knowledge, classroom management [33], teacher's personality [26] among others. In this regard, the effectiveness of teaching practice supervision plays an important role in enhancing pre-service teachers' performance in science content delivery [7,17]. Effective supervision involves meaningful assessment through observation and constructive feedback that guides pre-service teachers' development as aspiring science teachers [1,3,16,17]. It is essential for bridging the gap between theory and practice (14,35,36) and ensuring that pre-service teachers can effectively translate educational principles into classroom teaching [21].

However, while the importance of teaching practice and supervision is clear, the impact of the Split Teaching Practice Model on pre-service teachers' performance in science content delivery remains under researched. The adoption of Split Teaching Practice Model has raised several concerns, particularly regarding its potential impact on the preparedness of pre-service science teachers [10]. One prominent concern is the perceived short duration of each six-week teaching practice phase. Pre-service teachers, as well as some supervisors, cooperating schools, teachers and researchers have argued that this timeframe may be insufficient for pre-service teachers to fully develop their teaching skills, especially in teaching complex subjects like science [10]. A study conducted by [10] found that 53.7% of respondents believed that the practicing period of 4 to 6 weeks is rather too short. Similarly, [20] argued that even a 12-week period may also be



inadequate, as it does not provide pre-service teachers with ample time to effectively gain the experience intended to encourage. Again, another challenge associated with the Split Teaching Practice Model is the potential for discrepancies in the evaluation of pre-service teachers' performance. The two distinct phases in Split Teaching Practice Model can create variations in the assessment process, as expectations may differ between the two phases. Supervisors may also experience "halo effects", where their previous evaluation of a pre-service teacher during the First-phase influences their assessment during the Second-phase. These inconsistencies in evaluation could affect the quality of feedback provided to pre-service teachers and, consequently, their professional competence [14,17].

Moreover, the time gap between the first and second teaching practice phases can influence the quality of evaluation. Classroom dynamics may change, and the learning environment may evolve between the two phases. These shifts can make it challenging to provide feedback accurately, potentially leading to disparities in the supervisors' assessment process [1]. The Split Teaching Practice Model's emphasis on two distinct phases can also affect pre-service teachers' perceptions and attitudes toward the teaching profession. Some pre-service teachers may regard the First-phase as an introduction to teaching, characterized by nervousness and unfamiliarity with the classroom environment. The Second-phase, then, provides an opportunity for pre-service teachers to apply lessons learned and make improvements based on feedback received. Therefore, while the Split Teaching Practice Model aims to provide a comprehensive assessment of pre-service teachers' performance, it can lead to inconsistencies in the evaluation process [1]. The challenge of evaluating pre-service teachers' performance within the Split Teaching Practice Model is further compounded by the multifaceted nature of science content delivery. Effective science content delivery involves not only conveying subject matter knowledge but also engaging students, promoting critical thinking, and addressing individual learning needs of students [26]. It necessitates clear explanations, active listening, and the ability to address student questions and misconceptions [30].

Despite these challenges, the Split Teaching Practice Model is continuously being adopted in Nigerian teachers training institutions. The adoption of this model reflects a deliberate choice to provide pre-service teachers with a phased and incremental teaching experience which aligns with the American education system's approach to teacher preparation [1]. The effectiveness of the Split Teaching Practice Model in training science pre-service teachers raises questions and concerns. Some studies (e.g. 11) argue that the model's shorter durations for each phase may limit the depth of experience and hinder pre-service teachers' ability to develop into proficient science teachers. The potential for inconsistencies in evaluation between the two phases raises doubts about the model's ability in assessing pre-service teachers' performance accurately [7]. Based on this, the main objective of this study is to examine how the Split Teaching Practice Model impacts the performance of undergraduate pre-service teachers in science content delivery. Based on this, the following null hypotheses were formulated;

H₀₁: There is no significant difference in the mean ratings of aspects of lesson planning between First-phase and Second-phase pre-service teachers.



H0₂: There is no significant difference in the mean ratings of aspects of lesson presentation in classroom setting between First-phase and Second-phase pre-service teachers.

H0₃: There is no significant difference in the mean ratings of aspects of class management during instruction between First-phase and Second-phase pre-service teachers.

H0₄: There is no significant difference in the mean ratings for the attainment of lesson objectives between First-phase and Second-phase pre-service teachers.

3. METHODOLOGY

The study adopted an observational research design. According to [24], observational research involves systematically observing and recording behaviours, events, or phenomena as they naturally occur without direct intervention or manipulation by the researcher. The target population comprised 119 second-year and 102 third-year undergraduate students from the Department of Science Education at Federal University Gusau, who were respectively involved in the First and Second-phase teaching practice during the 2022/2023 academic session. The students are studying Bachelor of Science in Education degrees in Chemistry, Biology, Physics, and Mathematics. Convenience sampling technique was employed to select the participants for the study. This technique was chosen because the assessors of the participants had a pre-existing group of pre-service science education students randomly assigned to them as supervisors during the teaching practice exercise. As a result, a sample size of 96 pre-service teachers was established, consisting of 54 pre-service teachers undergoing their First-phase teaching practice and 42 pre-service teachers undergoing their Second-phase teaching practice. Research instrument for data collection was adapted from the Teaching Practice Assessment Form designed by the Faculty of Education, Federal University Gusau, Nigeria. The adapted instrument was tagged Pre-service Teachers' Performance in Science Content Delivery (SPSCD). The SPSCD assessed various aspects of science content delivery, including Lesson Planning, Lesson Presentation, Classroom Management, and Attainment of Lesson Objectives. A team comprising three experts in the field of science education conducted a validation of the SPSCD to ensure its effectiveness in measuring the intended aspects of instructional delivery in secondary school biology classrooms. Before the main study, a pilot test was conducted to evaluate the instrument's reliability. In accordance with the inter-rater reliability guidelines of [35], two experienced senior university lecturers independently employed the SPSCD to observe instructional delivery in classrooms not part of the study sample. Subsequently, the reliability of the instrument was confirmed with a Cohen's kappa coefficient of 0.86.

The data collection process was structured to assess pre-service teachers' science content delivery in various classroom settings. Science Education lecturers, with over five years of teaching practice supervision experience, served as assessors. Before data collection, a training was organized on study objectives, data collection protocols, and SPSCD utilization, including discussions on evaluation criteria, calibration exercises, and simulated observation scenarios. Standardized observation protocols were implemented to ensure consistency across classrooms. Throughout the observation process, the assessors attended each lesson presentation conducted by pre-service science teachers and evaluated their performance. Observations occurred during regular school hours in cooperating secondary schools across

Zamfara, Katsina, and Kaduna states, where pre-service teachers were posted. Collected data were subjected to descriptive statistical analysis (means and standard deviations) and inferential statistics (t-tests), were conducted at a significance level of $\alpha = 0.05$.

4. RESULTS AND DISCUSSION

The results of the findings are presented based on the hypotheses formulated.

Null Hypothesis One (H₀₁): There is no significant difference in the mean ratings of aspects of lesson planning between First-phase and Second-phase pre-service teachers.

Table 1. Summary of the mean ratings of aspects of lesson planning between First-phase and Second-phase pre-service teachers

Aspects of Lesson planning	First-phase pre-service teachers (n=54)		Second-phase pre-service teachers (n=42)		t-value	p-value
	Mean	SD	Mean	SD		
Clear Learning Objectives	2.56	0.86	3.14	0.71	-2.38	0.020
Presentation of Content and Sequencing	2.87	0.74	3.21	0.69	-2.13	0.039
Teacher's and Students' Activities stated	2.23	0.94	2.89	0.83	-3.17	0.002
Provision for lesson evaluation	2.45	0.81	3.01	0.73	-2.63	0.011

Table 1 results shows that Second-phase pre-service teachers performed significantly better in various aspects of lesson planning. They outperformed First-phase counterparts significantly in "Clear Learning Objectives" ($t = -2.38$, $p = 0.020$), "Presentation of Content and Sequencing" ($t = -2.13$, $p = 0.039$), "Stating Teacher's and Students' Activities" ($t = -3.17$, $p = 0.002$), and "Provision for Lesson Evaluation" ($t = -2.63$, $p = 0.011$). Thus, the null hypothesis one (H₀₁) stating no significant differences in mean ratings of lesson planning aspects between First-phase and Second-phase pre-service teachers is rejected for all aspects. The findings reveal significant differences in favour of Second-phase pre-service teachers across the four aspects of lesson planning. These findings are in line with [11] report on the effectiveness of structured (Split Teaching Practice) teaching practice in improving lesson planning skills of pre-service teachers. The significant differences found in this study between the two groups in all aspects of lesson planning could be attributed to the increased experience and exposure that Second-phase pre-service teachers might have gained during the First-phase of their teaching practice. It shows that, they have had another chance to refine their lesson planning skills, receive feedback, and implement improvements.

Null Hypothesis Two (H₀₂): There is no significant difference in the mean ratings of aspects of lesson presentation in classroom setting between First-phase and Second-phase pre-service teachers.

Table 2. Comparison of lesson presentation aspects between First-phase and Second-phase pre-service teachers

Aspects of Lesson Presentation	First-phase pre-service teachers (n=54)		Second-phase pre-service teachers (n=42)		t-value	p-value
	Mean	SD	Mean	SD		
Introduction of the lesson	2.86	0.81	2.84	0.68	-0.21	0.836
Sequential Presentation	2.91	0.85	3.16	0.73	-2.53	0.014*
Mastering of Subject Matter	2.95	0.85	3.16	0.75	-2.33	0.025*
Use of Chalkboard	2.72	0.88	3.00	0.85	-2.12	0.049*
Questioning Techniques	2.80	0.76	2.97	0.80	-1.55	0.128
Use of Instructional Material(s)	2.40	0.81	2.78	0.79	-3.37	0.003**
Time Management	2.79	0.83	3.09	0.71	-2.86	0.008**
Active Participation of Students in the Lesson	2.70	0.81	2.97	0.80	-2.14	0.047*
Conclusion of Lesson	2.86	0.76	3.09	0.71	-2.35	0.024*

Note: *p < 0.05 (statistically significant difference), **p < 0.01 (highly significant difference), ***p < 0.001 (extremely significant difference)

The results in Table 2 reveals that Second-phase pre-service teachers obtained higher mean ratings in aspects of lesson presentation in the classroom setting, specifically in sequential presentation (First-phase: M=2.91, SD=0.85; Second-phase: M=3.16, SD=0.73, t=-2.53, p=0.014), mastering of subject matter (First-phase: M=2.95, SD=0.85; Second-phase: M=3.16, SD=0.75, t=-2.33, p=0.025), use of chalkboard (First-phase: M=2.72, SD=0.88; Second-phase: M=3.00, SD=0.85, t=-2.12, p=0.049), use of instructional materials (First-phase: M=2.40, SD=0.81; Second-phase: M=2.78, SD=0.79, t=-3.37, p=0.003), time management (First-phase: M=2.79, SD=0.83; Second-phase: M=3.09, SD=0.71, t=-2.86, p=0.008), active participation of students in the lesson (First-phase: M=2.70, SD=0.81; Second-phase: M=2.97, SD=0.80, t=-2.14, p=0.047), and conclusion of the lesson (First-phase: M=2.86, SD=0.76; Second-phase: M=3.09, SD=0.71, t=-2.35, p=0.024). Therefore, the null hypothesis two (H₀₂) which stated that there is no significant difference in the mean ratings of aspects of lesson presentation in classroom setting between First-phase and Second-phase pre-service teachers is rejected. Hence, Second-phase pre-service teachers significantly performed better in their lesson presentations compared to their First-phase counterparts. These findings are consistent with [16], who stressed the positive impact of extended teaching practice on content delivery skills. Second-phase pre-service teachers' significant performance in aspects of lesson presentation may be due to their deeper content knowledge acquired after their First-phase teaching practice

and increased confidence. They might have had more opportunities to master their subject matter and experiment with different instructional materials. These inclinations are supported by [20] and [18]. The finding is also consistent with [16] and [37] who reported that, an increased practice and the opportunity for a second attempt result in improved performance. [36] associated this, as an indication of pre-service teachers' engagement in reflective practices during the concluding phase of their teaching practice. However, there were no statistically significant differences observed between First-phase and Second-phase pre-service teachers, specifically in the aspects of Introduction of the Lesson and Questioning Techniques. This indicates that both groups exhibited comparable proficiency in these specific aspects of lesson presentation.

Null Hypothesis Three (H₀₃): There is no significant difference in the mean ratings of aspects of class management during instruction between First-phase and Second-phase pre-service teachers.

Table 3. Comparison of class management between First-phase and Second-phase pre-service teachers

Aspects of Class Management	First-phase pre-service teachers (n=54)		Second-phase pre-service teachers (n=42)		t-value	p-value
	Mean	SD	Mean	SD		
Class Control	2.78	0.62	3.14	0.54	-3.12	0.003
Class Arrangement	2.65	0.59	2.95	0.61	-2.14	0.038
Reaction to Pupils' Responses	2.45	0.67	2.81	0.73	-2.66	0.010
Reinforcement of Pupils' Responses	2.32	0.71	2.68	0.69	-2.77	0.007

Table 3 reveals that, Second-phase pre-service teachers achieved higher mean ratings in all aspects of class management having t-values and p-values below the significance level ($\alpha=0.05$): class control (First-phase: M=2.78, SD=0.62; Second-phase: M=3.14, SD=0.54, t=-3.12, p=0.003), class arrangement (First-phase: M=2.65, SD=0.59; Second-phase: M=2.95, SD=0.61, t=-2.14, p=0.038), reaction to pupils' responses (First-phase: M=2.45, SD=0.67; Second-phase: M=2.81, SD=0.73, t=-2.66, p=0.010), and reinforcement of pupils' responses (First-phase: M=2.32, SD=0.71; Second-phase: M=2.68, SD=0.69, t=-2.77, p=0.007). Therefore, the null hypothesis three (H₀₃), which state that, there is no significant difference in the mean ratings of aspects of class management during instruction between First-phase and Second-phase pre-service teachers is rejected, signifying that Second-phase pre-service teachers outperformed their First-phase counterparts in class management during instruction. These findings on class management might be ascribed to the accumulative benefits of learning and skill development linked with the split teaching practice model. The findings aligned with [33] and [36] report on the potential advantage of a phased teaching practice model in improving class management skills of pre-service teachers. The split model's structure allows Second-phase pre-service teachers to leverage their experiences from the first phase, fostering

increased confidence and competence in managing classrooms effectively. In consistence with this finding, [33] and [11] noted that, each teaching practice phase in the split model may contribute to a more relaxed learning environment and in preparing pre-service teachers to excel in class management.

Null Hypothesis Four (H0₄): There is no significant difference in the mean ratings for the attainment of lesson objectives between First-phase and Second-phase pre-service teachers.

Table 4. Attainment of lesson objectives between First-phase and Second-phase pre-service teachers

Aspects of Lesson Evaluation	First-phase pre-service teachers (n=54)		Second-phase pre-service teachers (n=42)		t-value	p-value
	Mean	SD	Mean	SD		
Attainment of Lesson Objectives	3.49	0.75	3.53	0.79	-2.33	0.025*

The data in Table 4 reveals that, First-phase pre-service teachers had a mean rating of 3.49 with a SD of 0.75, while second-phase pre-service teachers (n=42) had a mean of 3.53 with a SD of 0.79. The t-value of -2.33, with the p-value of 0.025*, indicates that this observed difference is statistically significant. Therefore, the null hypothesis four (H0₄) which posits that there is no significant difference in the mean ratings for the attainment of lesson objectives between first-phase and second-phase pre-service teachers is rejected. This indicated that, there is indeed a significant difference between these two groups in favour of the Second-phase pre-service teachers. This difference, according to [37], is likely a reflection of the developmental changes in teaching competencies as teacher training progresses. This finding is in line with [6] assertion, who emphasized the role of experience in aligning lesson objectives with learning outcomes. The significant difference found in the present study on attainment of lesson objectives is an indication that, Second-phase pre-service teachers' improved ability to align their teaching objectives with the desired learning outcomes. With more experience, as rightly put by [6], pre-service teachers may have become better at setting realistic objectives and achieving them in a classroom setting.

5. CONCLUSION

Based on the findings of the study, Second-phase pre-service teachers demonstrated significant strengths in lesson planning, especially in setting clear objectives and content presentation. They also significantly performed better than First-phase counterparts in the aspects of lesson planning, presentation, classroom management, and in the attainment of lesson objectives. In all aspects of science content delivery, the only areas where no significant differences were observed between First-phase and Second-phase pre-service teachers were 'Introduction of the Lesson' and 'Questioning Techniques'. These findings revealed the significant impacts of Split Teaching Practice Model in training future science teachers for effective science instruction.



Recommendations

Based on the findings of the study, the following recommendations were proffered;

1. Teacher training institutions should adopt the Split Teaching Practice Model due to its structured approach, which significantly improves pre-service teachers' development of essential teaching skills through reflective practices.
2. Teacher training institutions adopting the Split Teaching Practice Model should focus on refining its implementation during supervision by addressing specific areas of difficulty observed in the First-phase of the model.
3. Pre-service teachers whose institution adopts Split Teaching Practice Model should take advantage of it by systematically building their content knowledge and pedagogical skills through reflective practices from the feedback received from their supervisors, mentors and peers.

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