BUZZ SESSION AND ADAPTIVE LEARNING ENVIRONMENT INSTRUCTIONAL STRATEGIES AS DETERMINANTS OF INTEGRATED SCIENCE PRE-SERVICE TEACHERS' PEDAGOGICAL KNOWLEDGE AND SKILLS IN SOUTHWESTERN NIGERIA

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CERTIFICATION

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DEDICATION

The Ph.D. thesis is dedicated to Allah, most beneficent, most merciful and made everything concerning this work possible and beautiful.

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ABSTRACT

The main objective of teaching Integrated Science (IS) in Nigeria Colleges of Education (CoEs) is to produce professional teachers with scientific and technological knowledge and skills. However, pre-service IS teachers were deficient in Lesson Planning Skill (LPS), Teaching Skill (TS) and Pedagogical Knowledge (PK). Previous studies concentrated more on student-related factors than Buzz session and Adaptive learning environment strategies. The present research determined the effects of Buzz Session Strategy (BSS) and Adaptive Learning Environment Strategy (ALES) on pre-service IS teachers' PK and skills. The moderating effects of self-efficacy and mode of entry were also examined.

The Discovery Learning and Social Cognitive theories served as background, while 3x2x2 factorial matrix ofpretest-posttest control group quasi-experimental design was adopted. Three CoEs were randomly selected. Intact classes of Part two of pre-service IS teachers were used. The participants in the CoEs were randomly assigned to BSS (120), ALES (126) and control (112) groups. The instruments used were PK Test (0.85), LPS (0.88), TS (0.76) and Self-efficacy (0.81) scales and instructional guides. Analysis of covariance and Scheffe's Post-hoc test at 0.05 level of significance were used to analyse data.

The age range was 23.65±1.20 years, and 65.0% were admitted through direct entry. There was a significant main effect of treatment on PK ($F_{(2;\ 355)}$ =348.98; partial η^2 =0.67). The BSS recorded the highest mean score (24.01), followed by ALES (19.34) and the control (7.78) groups. Treatment had a significant main effect on LPS ($F_{(2;\ 355)}$ = 710.63; partial η^2 = 0.81). The BSS group had the highest mean score (67.41), followed by ALES (49.59) and control (31.20) groups. Treatment had a significant main effect on TS ($F_{(2;\ 355)}$ =204.68; partial η^2 =0.54). The BSS group had the highest mean score (65.03), followed by ALES (47.82) and control (35.09) groups. There were significant main effects of self-efficacy on LPS ($F_{(1;\ 356)}$ = 8.18; partial η^2 =0.03) and TS ($F_{(1;\ 356)}$ =5.44; partial η^2 =0.02). The participants with low self-efficacy (50.52) outperformed their counterparts with high self-efficacy (48.82) on LPS and TS. Self-efficacy was not significant on PK. There was a significant two-way interaction effect of treatment and self-efficacy on LPS ($F_{(2;\ 355)}$ = 3.36; partial η^2 =0.02) in favour of low self-efficacy students from BSS group. There was a significant two-way interaction effect of self-efficacy and mode of entry on LPS ($F_{(1;\ 356)}$ = 9.24; partial η^2 = 0.03) in favour of low self-efficacy students with Pre-NCE mode from BSS group. Other two-way interaction effects were not significant. The three-way interaction effects were significant on LPS ($F_{(2;\ 355)}$ = 5.38; partial η^2 = 0.03) and on TS ($F_{(2;\ 355)}$ = 4.38; partial η^2 = 0.03), both in favour of Pre-NCE with low self-efficacy students for BSS group, but not for others.

Buzz session and adaptive learning environment strategies improved pedagogical knowledge and skills of pre-service integrated science teachers in southwestern Nigeria, particularly among students with high self-efficacy. These strategies should be adopted to enhance pre-service teachers' preparation.

Keywords: Buzz session strategy, Adaptive learning environment strategy, Pedagogical knowledge, Lesson planning and teaching skills, Pre-service teachers in southwestern Nigeria

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CHAPTER ONE

INTRODUCTION

1.1 Background to the study

Science involves systematic study which deals withliving and non-living things. Itenables learners to acquire information about their natural world as they involve in inquiry, critical thinking and demonstration of skills. The scientific enterprise is more challenging and innovative, incorporating technology which is based on inventions and problem solving. Thus, sustainable development deals with interaction between science, technology and society. Similarly,it promotestechnological and industrial developmentamid the individualsin a given nation (Ugwu, 2014). Science entails every effort of human being to explore, interpret and manage the living and non-living things. It also deals with the pursuit and clarification of both uniformities and anomalies in nature. The determination of science is to change the environment towards enhancing the general wellbeing bybuildinga better world to live(Ugwu, 2014).

Integrated Science offered in Primary and Post-Primary was metamorphosed to Basic Science. This change has profound implication for learning and classroom practices. The improved efforts towards Integrated Science began with Committees working on the separate disciplines of Physics, Chemistry and Biology. This was followed by joint working sessions of representatives from the committees who attemptedthe integration of science subjects like Physics, Chemistry and Biology. The result was contained in the STANS Newsletter 1993 on an Integrated Science Course, which consisted guidelines for effecting the course into the Junior Secondary school as noted by the Association then. The concept of integration is concerned with a natural enquiry ofthe children. Hence, integrated science is a unifying curriculum that harmonise the whole science as one.Science education is the path through which a nation can survive scientifically and technologically. To encourage her citizens to be interested in science education, Nigerian government formed a policy that 60 percent of the students to be admitted into her Universities, Polytechnics, and Colleges of

Education should be science-oriented courses, while 40 percent be admitted into Arts and social science courses (Ajibola, 2008)

The foundation level which is the basic line of the 9-3-4 system of education has 3 years lower basic education, 3 years middle basic education and the upper basic education which is generally called Junior Secondary School (JSS). The basic education curriculum contents, showcasedeepness, correctnessand interrelatedness of basic science. Also, emerging issues which covered value orientation; peace and dialogue including human rights to education, family life/HIV and AIDS education and entrepreneurial skills acquisition education were infused into the relevant contents. Some introductory technology topics were introduced at the lower and middle levels while the upper basic was purely science topics. In summary the objectives of this curriculum are to: develop an interest in science and technology, acquire basic knowledge and skills in science and technology, apply the skills from scientific and technological knowledge to meet societal needs andtake advantages of the numerous career opportunities offered by science and technology tobecome prepared for further studies in science and technology (FME, 2012).

It is evident that Integrated Science begun atCollege levelas single and double major after 1989/1990 session. Single major programme allowsstudent teachers to combine Integrated Science with other courses (e.g. Integrated scinece/Maths etc) while double major has no combination(FRN, 2012). Professional teachers handling basic science at primary and lower secondary levels are product of this programme.Though, researcherreveals that the programme recorded little or poor success(Olarewaju and Popoola, 2010). Consequently,for any significantnationwideprogression and advancement to be attained, Science and Technology should be crucialportions of the Nations culture (Aina, 2013).

In last decades,different Pre-service integrated science educationprogramme have been organisedin order to assess and elevatethe training programme.Toshalis (2010) assessed what student teachers went through and achieved from their instructors at the course of their training. The student teachers were engrossed with worthytraining, which encourage them to teach. The poor learning outcome of the student teachers in science education course which is pre-requisite for their teaching practice exercise call for concern by all stakeholders in education. Various reasons

adduced for this area of interest and attitudes of students, lecturers mode of teaching and government instability in providing necessary materials for education and lecturer sticking to old conventional method of teaching (lecture method). Due to this, researchers had been complaining about that the method did not yield better achievement in pre-service teacher education. Abimbola and Abidoye (2013) opined that lecture method of teaching science prevails in our country, Nigeria. Ogundiwin and Ahmed (2015) revealed the inadequacy of lecture method in the teaching and learning of science.

Teachers' Pedagogical knowledge are the concepts,principles, processes, relationships and applications a teacher ought to possess in a course of study, which is suitable for and coordinationof subject(Ozden, 2008). Pedagogical knowledge (PK) is knowledge embedded in the actual subject matter which is to be learned or taught. The actual content which a teacher is expected to cover in history or home economics is different from the content to be covered in either computer science or mathematics and integrated science. Teachers are expected to know and understand the subjects which they are to teach, including knowledge of central facts, concepts, theories, and procedures within a given field; knowledge of explanatory frameworks that organize and connect ideas; and knowledge of the rules of evidence and proof (Mishra and Koehler, 2006). Teachers must also comprehend the nature of knowledge and inquiry in various fields. For example, how is mathematics proofdifferent to a historical explanation or a literary interpretation? Teachers who do not have these understandings can misrepresent those subjects to their students (Mishra and Koehler, 2006).

Pedagogical knowledge (PK) is depth knowledge about the procedures and methods of teaching and learning and how it incorporates, among other things, overall educational purposes, values, and aims (Mishra and Koehler, 2006). The general knowledge concerned about student learning, classroom management, and writing lesson plan and execution and student assessment, includes knowledge about techniques or methods to be used in the classroom; the nature of the target audience; and strategies for evaluating student understanding. A teacher with an in-depth pedagogical knowledge understands how students construct knowledge, acquire skills, and develop habits of mind and positive dispositions toward learning. As such, pedagogical knowledge requires an understanding of cognitive, social, and

developmental theories of learning and their applications to students in their classrooms(Mishra and Koehler, 2006). Invariably, curriculum and instructional method implementation depends on the level of teachers professionalism.

Research works had shownpoor performance of integrated science student teachers in pedagogical knowledge and could not promote good scientific and technological advancement. Many researches have been conducted in order to improve the studentteachers pedagogical knowledge in Integrated Science.Yet, students' performance has not improved. Researchers identified various factors that account for poor performance ofstudents'pedagogical knowledge in Integrated Science.These include student factors such as lack of interest in science andsubject combination (Aina, 2013), poor attitude to science and lack of role models in the subjects (Adepitan, 2003), inadequate backgroundin mathematical (Ogunleye, 2001). Others areineffective policy making, inadequate infrastructural provision and teachers' welfare (Ogunleye, 2001). Lastly,methods of teaching used (Agoro, 2012) and unwholesomerelationship between teacher and student.

Gbolagade (2009) emphasised necessity of skills development by tailoring the science content to an individuals and society through relevant methods of teaching that will foster growth and development. Wei and Pecheone (2010) reported that students' knowledge of the various subject matter especially in science subjects has dropped in the tertiary education. They were concerned witheffects of practical asperformance-based assessment in tertiary education.Table 1.1show the statistical data on results of pre-service integrated science teachers in a Course (ISC 212) titled Science Education from five Colleges of Education in Nigeria from 2012/2013 session to 2015/2016 session.

Table 1.1Result of Pre-service Integrated Science Teachers in ISC 212 (Science Education II) in Five Colleges of Education in Southwestern Nigeria

College Name	Years	Numbers and Percentages of Candidates Grades in ISC 212			Number of candidates examined
		A-C	D-E	Failed	
College "A"	2013	21 (28.0)	53 (70.7)	1 (1.3)	75
	2014	32 (50.0)	31 (48.4)	1 (1.6)	64
	2015	26 (37.7)	41 (59.4)	2 (2.9)	69
	2016	27 (39.7)	39 (57.4)	2 (2.9)	68
College "B"	2013	11 (20.8)	41 (77.4)	3 (1.8)	53
	2014	24 (41.4)	28 (48.3)	6 (10.3)	58
	2015	19 (34.5)	34 (61.8)	2 (3.7)	55
	2016	16 (38.1)	24 (57.1)	2 (4.8)	42
College "C"	2013	13 (22.4)	43 (74.1)	2 (3.5)	58
	2014	25 (46.3)	28 (51.9)	1 (1.8)	54
	2015	23 (37.7)	37 (60.7)	1 (1.6)	61
	2016	22 (34.4)	41 (64.1)	1 (1.5)	64
College "D"	2013	11 (30.6)	22 (61.1)	3 (8.3)	36
	2014	15 (35.7)	23 (54.8)	4 (9.5)	42
	2015	10 (23.8)	26 (61.9)	6 (14.3)	42
	2016	31 (67.4)	13 (28.3)	2 (4.3)	46
College "E"	2013	11 (18.0)	47 (77.1)	3 (4.9)	61
	2014	23 (35.9)	40 (62.5)	1 (1.6)	64
	2015	34 (48.6)	33 (47.1)	3 (4.3)	70
	2016	22 (37.9)	32 (55.2)	4 (6.9)	58

Source: The colleges of Education ** Percentages in Parenthesis*

Table 1.1 above show the performance of the student teachers in ISC 212, in five institutions in southwestern Nigeria across four consecutive years (2013 to 2016). The table revealed that those passing at credit level is below expectation. It is only on few occasions do we have more than 50% of the pre-service teachers passing at credit level. This is not good enough since these are the people that will eventually go to teach Science to our beginners in our schools. This poor students results in the examined institutions calls for an urgent attention. This performance exhibited by pre-service teachers could be that students' lesson planning skills were poor.This calls to question the ability and efficacy in lesson planning skills of student teachers in those institutions.

Lesson Planning Skill as defined by Sahin-Taskin (2017) is a crucial skill gained during the pre-service teachers' training which is needed by them to harness work, create goals and obtainresponse from learners. Without an effective lesson planning a pre-service teacher cannot be effective. Because planning for a lesson is crucial as it will affect what the teacher does in the classroom,a teacher that prepares for a lesson will discharge the duties in a professional way.A lesson plan is crucial as it helps teachers design anoutlinethat will assist learners to a destination (Jacobs, Martin and Otieno, 2008). Lesson plan has to do with goals, knowledge, and sequencing all of which involve in the whole process of teaching and learning (Vdovina and Gaibisso, 2013). It is also connection requirement between the curriculum and the textbook and classroom activities(Li, Chen and Khum, 2009).Tashevska (2008) opinedthat student teachers found lesson planning difficult. Which means that lesson planning skills can be difficult to a novice teacher which will prepare the lesson from textbooks or from browsing from the internet. Similarly, Senior (2006) concluded that pre-service teachers' or novice teachers spent most of their time planning lessons and found the planning process to be difficult as most of the materials that is needed could not be readily available for the novice teachers to peruse, therefore taking them time to prepare a lesson.

According to Sahan (2017) studentteachers are potential teachers expected to be equipped with necessary professional skills that will enable them showcase their level of professionalism thereafter. Also, the study viewedstudent teachers' teachings skills asnot always evaluated but if these are readily evaluated, it would improve student teachers teaching skills in the tertiary institutions.Surel (2010) reviewed

literature to compare the different teaching styles from different faculties in higher institution. The study was of the view that the teaching skills of these faculties can contribute to the teaching and training of more quality teachers. Therefore, the study is important in order to groom student teachers adequately onlesson planning and teaching skills.Effects of training will be determined after they graduated from colleges and practicing as a professional teacher. This in turn will showcase in future students' performance when taught by a well-trained teacher.Table 1.2 below shows the statistical data on achievement of Pre-service teachers in Teaching Practice from five institutions in southwestern, Nigeria from 2012/2013 session to 2015/2016 session.

Table 1.2Pre-service Integrated Science Teachers' Teaching Practice Results in Five Colleges of Education in Southwestern Nigeria

College Name	Years	Numbers and Percentages of Candidates Grades			Number of candidates examined
		A-C	D-E	Failed	
College "A"	2012	19 (27.9)	40 (58.8)	9 (13.3)	68
	2013	17 (22.7)	53 (70.7)	5 (6.6)	75
	2014	20 (31.3)	40 (62.5)	4 (6.2)	64
	2015	26 (37.7)	29 (42.0)	14 (20.3)	69
	2016	25 (36.2)	28 (40.6)	16 (23.2)	69
College "B"	2012	22 (31.4)	33 (47.1)	15 (21.5)	70
	2013	36 (67.9)	10 (18.9)	7 (13.2)	53
	2014	21 (36.2)	21 (36.2)	16 (27.6)	58
	2015	9 (16.4)	26 (47.3)	20 (36.3)	55
	2016	10 (23.8)	23 (54.8)	9 (21.4)	42
College "C"	2012	15 (28.3)	26 (49.1)	12 (22.6)	53
	2013	25 (43.1)	25 (43.1)	8 (13.8)	58
	2014	17 (31.5)	29 (53.7)	8 (14.8)	54
	2015	26 (42.6)	22 (36.1)	13 (21.3)	61
	2016	20 (31.3)	40 (62.5)	4 (6.2)	64
College "D"	2012	20 (48.8)	13 (31.7)	8 (19.5)	41
	2013	18 (50.0)	11 (30.6)	7 (19.4)	36
	2014	21 (50.0)	14 (33.3)	7 (16.7)	42
	2015	18 (42.9)	18 (42.9)	6 (14.2)	42
	2016	14 (30.4)	26 (56.5)	6 (13.1)	46
College "E"	2012	14 (30.4)	26 (56.5)	6 (13.1)	46
	2013	26 (42.6)	22 (36.1)	13 (21.3)	61
	2014	20 (31.3)	40 (62.5)	4 (6.2)	64
	2015	22 (31.4)	33 (47.1)	15 (21.5)	70
	2016	25 (43.1)	25 (43.1)	8 (13.8)	58

Source: The colleges of Education ** Percentages in Parenthesis*

Comments made by teaching practice monitoring committee during the teaching practice exercise in College A at different years. Summary of their comments which affected student teachers' teaching practice exercise achievement,include the following: some student teachers were unable to state behavioural objectives adequately, lack or inadequate use of instructional materials, lack detailed explanation of main concept, pupils were not engaged as expectedduring teaching, unable to manage time and evaluation questions were not related to the objectives stated.

Comments made by teaching practice monitoring committee during the teaching practice exercise in College B at different years. Summary of their comments which affected student teachers' teaching practice exercise achievement,include the following: some pre-service teachers were unable to align new concept with the prior knowledge of the learners, Pupils were not encouraged to give their own hypotheses/prediction, Lack of evidence of good use of instructional materials, Lesson was not suitably summarized and they failed to carry out a formative evaluation.

Comments made by teaching practice monitoring committee during the teaching practice exercise in College C at different years. Summary of their comments which affected student teachers' teaching practice exercise achievement, include the following: some student teachers lack adequate use of chalkboard and had poor writing skills, lack verbal and non-verbal communication skills, inappropriate use of rewards and punishments, some of the activities given to the pupils were not in line with the content of the lesson and lesson presentation was not orderly.

Comments made by teaching practice monitoring committee during the teaching practice exercise in College D at different years. Summary of their comments which affected student teachers' teaching practice exercise achievement,include the following: some pre-service teachers had poor communication skill, attainment of behavioural objectives reference to evaluation questions were not followedand lack question and answer techniques.

Comments made by teaching practice monitoring committee during the teaching practice exercise in College E at different years. Summary of their comments which affected pre-service teachers' achievement in teaching practice include the following: some pre-service teachers lack classroom management control, process

skills were not adequately displayed, theyfailed to give further guidance to pupils on lesson activity/activities and assignments were not given.

In view of the above discussions and relevant information gathered, the results of student teachers in ISC212 and teaching practice monitoring committee's comments/reports on teaching practice exercise, had shown poor performances of pre-service teachers. However, it is imperative that educators should find other productive and effective strategies, like the Buzz Session Teaching Strategy and the Adaptive Learning Environment Strategy (ALES) in order to improve their lesson planning and teaching skills. Moreover, previous studies in other subject areas using buzz session and adaptive learning environment strategies found these strategies effective due to their features at thought provoking, social interaction and manipulation of environment. Olajide (2015) revealed a high level of students satisfaction in using buzz session strategy, while Siddique, Duarrani and Naqvi (2019) revealed that learners taught with an adaptive strategy performed better than others not taught with the strategy, therefore, this present study determined the effects of buzz session and adaptive learning environment strategies on the PK and skills of integrated science pre-service teachers.

Bell and Kozlowski (2007) reported Buzz session as a teaching strategy that is essential for building genuine pragmatic situation which assist institutions to effectively train teachers as professionals thereby meeting societal demand. Dr Donald conceived and developed Buzz session as a method in a citadel of learning in the United State of America. He divided class into group of six to brainstorm for six minutes about a certain concept. Soon this method was known as Phillips 66 technique.Buzz session teaching, like other forms of discussion, benefits from significant teaching principle, "interaction". Small groups buzz together and everyone is expected to contribute to a thought-provoking topic and thereafter present to entire class.

Buzz session requires more preparation time to achieve a certain task, answer questions and set context for the lecture. It may be images, data, multiple answer or over-head projector transparency. Moderate time is required probably a couple of hours including planning. The gain is the time spent in preparation and having less content material for the lecture. It is advantageous when learners interact and

brainstorm with one another guided by their facilitator (https://bible.org/seriespage/8-using-buzz-groups-your-teaching). On the other hand, the Adaptive Learning Environment Strategy(ALES) was designed by (Jones and Winne, 2018). They expressed Adaptive Learning Environment as a meeting point between Instructional and Computer science. ALES was assessed before 1960s to be an adequate strategy which improves learners' level of assimilation and comprehension.

Lang and Evans, 2006 Model ofAdaptive learning instruction introduced teaching strategies and models governed by logical rules planned to captivate in-depthmastering and curiosity in science and appliedinstructions. The modelwas used at Estonian Centre for Science and Engineering Pedagogy, for the training of technical and science student teachers in their respective area of specialisation. The model only allow student teachers to be creative and tractability in their approach to teaching profession but not taking place of essential instructional skills and forms of information needed as a professional trained teacher.Lang and Evans, (2006) added that, implementing a lesson using this Model of Adaptive learninginstruction must include revision and introduction, presentation, guided practice and self-determining exercise.Also, Eggen and Kauchak, (2006) viewed using the Model to involve ascertaining prior students' knowledge which gives "connections" to subsequent learning. The model promote meaningful learning because is engaged students throughout the instructional phases and allows for quality evaluation.

It is important to consider student teachers' self-efficacy since theirviewsare germaneideas in the advancement of learningeverywhere (Cheung, 2008). According to Bandura (2007), self-efficacy refers to an individual's belief ofhisability to carry out a certain assignment. Similarly, Wong, Teo and Russo (2012) defined Computer teaching efficacy of teachers as assessment of ability to impact usingdigital devicesas effectiveinstrument to facilitate learners' learning outcome. Anderson and Maninger(2007); Chen(2010) and Teo(2008) discovered self-efficacy as an important factor of purpose/goal. Anderson and Maninger (2007) reported student teachers' intentions to explore different soft-gadget and discovered students views and abilityas importantfactors. Ogunbameru and Uwameiye (2012) have identified low ability of NCE student teachers as a factor responsible to their performance deficiencies. Thus, if pre-service teachers' self-efficacy could be enhanced, their performance deficiencies would be remediated.

The method or channel through which a student gain admission into tertiary institution of learning is refers to as mode of entry. JAMB is saddled with the responsibility of conducting unified examination to enable prospectivecandidates gain admissions into higher institutions. The body usually conduct only University Matriculation Examination (UME) since inception in 1978 for some time before adopting the responsibility of conducting examination for all tertiary institutions which solvesissues of some candidates gaining offer to different institution while other may not. Thus, the new name of the examination body as UTME (JAMB, 2019).

The mode of entry into higher institutions in Nigeria is categorized by JAMB for the undergraduate education admission as the Unified Tertiary and Matriculation (UTME) admissions, those admitted through direct admissions and those admitted byuniversities through their developed programmes. The requirement for the admissions depends on the category (Emaikwu, 2012). The irregular academic calendar in colleges of education, agriculture and polytechnics serves as an issues for candidates seeking admissions through direct mode because often time their results may not be read to be used to facilitate the admissions processes. However, it is obvious that some of these institutions operate separately from the existing rules which affects the level of how their graduate were baked with varying experiences (Emaikwu, 2012). Students are admitted into colleges through JAMB or pre-degree.

Moreover, Mgbake (2006) opined that the level at which a student is admitted is not a yardstick or determining factor to his or her performance. He stated that the performance depends on an individual determination and efforts which afford one's the opportunity of gainful employment at the end of the studies. Agada (2008) reported learners' method of study and commitment as factors that influence their achievement. His results emphasised learners' commitment in all aspect of the teaching and learning in order to attain quality educational output. Likewise, Long (2005) carried out a research on students level of admissions through a course of study and discovered that the results of those that came in through remedial studies, UTME and direct levels were relatively the same. While, Adeniyi (2004) opined thatstudents' age, experience and exposure served as factors that made them performed poorest in the unified tertiary matriculation examination.Ipaye (2004) reported that direct entry students'performance outweigh preliminary students in arts subjects at degree examinations whereas the remedial students'performance outweigh in science and

technical subjects. Ezema(2006) carried out comparative analysis ofperformance of the three levels of students admittedfor degree programmeand discovered that the periods assessedhad no significant difference between the cumulative grade point average of the three groups before their degree examinations. Contrary to some of the findings Angulu (2007) reported that those admitted through direct level had good results compared to those that came in through preliminary studies which he attributed to their prior knowledge.

Agoro (2012) reported that the performance of the pre-service teachers'entrance level into colleges of education examined had no difference but research showed that Prelim student teachers' performance was better in science process skills examined than their counterpart. Adeyemi (2009) opined that an examination results can be used to determine future learning outcome and he concluded that level of entrance into an institutions determines students' performance. Based on the deficiencies stated above, this study therefore,investigatedBuzz Session and Adaptive Learning Environment Instructional Strategies as Determinants of Integrated Science Pre-service Teachers' Pedagogical Knowledge and Skills in South-Western Nigeria.

1.2 Statement of the Problem

Evidence abound that pre-service integrated science teachers were deficient in skills (lesson planning and teaching) and they were poor in pedagogical knowledge with the reports submitted to the teaching practice committee in the selected colleges by the teaching practice moderators and also their result in a course titled: Science Education II, ISC 212which supposed to prepare pre-service integrated science teachers for the skills is not good enough. Previous efforts to improve pre-service integrated science teachers lesson planning and teaching skills and their pedagogical knowledge concentrated more on students' dispositional factors than innovative teaching strategies such as Buzz session and Adaptive learning environment strategies. Previous studieswho worked onthese two innovative strategies reported high level of performance of the students in other subject areas since these strategies had features of social interaction, thought provoking and conducive learning the effects of buzz session and adaptive learning environment instructional strategies on integrated

science pre-service teachers' pedagogical knowledge and skills, while self-efficacy and mode of entry serve as moderating variables.

1.3 Hypotheses

The following sevenhypotheses were formulated:

H_o1: There will be no significant main effect of treatment on integrated science pre-service teachers'

(a) Pedagogical Knowledge
(b) Lesson Planning Skill
(c) Teaching Skill

H_o2: There will beno significant main effect of self-efficacy on integrated sciencepre-service teachers'

(a) Pedagogical Knowledge
(b) Lesson Planning Skill
(c) Teaching Skill

H_o3: There will beno significant main effect of mode of entry on integrated sciencePre-service teachers'

(a) Pedagogical Knowledge
(b) Lesson Planning Skill
(c) Teaching Skill

H_o4: There will beno significant interaction effect of treatment and self-efficacy on integrated sciencepre- service teachers'

(a) Pedagogical Knowledge
(b) Lesson Planning Skill
(c) Teaching Skill

H_o5: There will beno significant interaction effect of treatment and mode of entry on integrated sciencepre-service teachers'

(a) Pedagogical Knowledge
(b) Lesson Planning Skill

(c) Teaching Skill

H_o6: There will beno significant interaction effect of self-efficacy and mode of entry on integrated sciencepre-service teachers'

(a) Pedagogical Knowledge
(b) Lesson Planning Skill
(c) Teaching Skill

H_o7: There will beno significant interaction effect of treatment, self-efficacy and mode of entry on integrated sciencepre-service teachers'

(a) Pedagogical Knowledge
(b) Lesson Planning Skill
(c) Teaching Skill

1.4 Scope of the Study

The study covered 200 level Integrated Science Pre-service Teachers in Colleges of Education in Southwestern, Nigeria. It also determined the effects of Buzz Session and Adaptive Learning Environment Instructional Strategies with moderating effects of Self-efficacy and Mode of Entry. It also covered Pre-service Teachers' Pedagogical Knowledge and their skills.

1.5 Significance of the Study

Findings from this study would equip the pre-service teachers with the knowledge of the role of socialization in teaching, and application of Buzz session and Adaptive Learning Environment Strategies that they can use when they are practicing. The findingswould provide reference materials on the prospects of these strategies to science teaching, for science educators and researchers. Specifically, the developed model instructional guides would be of great benefit to Basic Science teachers in lesson preparation and instructional delivery using Buzz session and Adaptive Learning Environment Strategies in the teaching of the subject in schools.

The finding would provide the learners the springboard in which they can buzz on a particular topic and prepare to present to the whole class their findings. This will enable them practice brainstorming and act of presentation to wade away stage fright and also enable them to learn effectively on the concept discussed as they did it

themselves. It wouldalso provide lecturers of science courses with relevant information on relevant skills needed to make teaching more vibrant and flexible. Likewise, it would enable curriculum planners to include appropriate teaching strategies in the curriculum especially for the NCE programme. The study also covered course content area of teacher as a planner, teacher as a presenter, instructional plan, teacher as a manager of learning environment.

Furthermore, the government at various levels, concerned with the business of providing science and technology education to citizens would find this work useful, as it will providethem with information on the ways of giving quality science education to its citizen through effective teaching and learning, using strategies which foster reflection and cooperation in learning.

1.6 Operational Definition of Terms

Adaptive Learning Environments Strategy:deals with brandingpedagogy process to cut across all structured procedures and stated objectives in the curriculum for effective teaching and learning in order to assist learners to adapt to the environment as indicatedin Operational Guide for Adaptive Learning Environment Strategy (OGALES).

Buzz SessionStrategy:is a teaching strategy that is essential for building genuine pragmatic situation which assist institutions to effectively train teachers as professionals thereby meeting societal demand as indicated in Operational Guide for Buzz Session Instructional Strategy (OGBSIS).

Conventional Strategy:is defined as the talk and chalk method of instruction as indicated in the Operational Guide for Conventional Instructional Strategy (OGCIS).

Integrated Science:can be defined as a subject that treats the unified nature of science.

Lesson planning skill: This is the ability to adequately arrange the presentation of the lesson content in order to achieve the stated objectives as measured by Pre-Service Teachers Lesson Planning Skills Scale (PTLPSS).

Mode of Entry: Refers to the manner through which the pre-service teachers were admitted into the NCE program either through UTME or Prelim as measuredbyPre-service Mode of Entry Demographic Scale (PMEDS).

Pre-service Teacher: refers to the prospective teachers undergoing training in Colleges of Education or higher institution.

Pre-service Teachers' self-efficacy: This is the extent to which pre-service teachers believe they can organize and execute actions necessary to bring about a desired outcome as measured by Pre-service Teachers Self-Efficacy Scale (PTSS).

Pre-service Teachers' PedagogicalKnowledge of Integrated Science: This isthe body of knowledge and information that Pre-Service teachers learn and are expected to teach students in a given science education course as measured by Pre-service Teachers' Pedagogical Knowledge Test (PTPKT).

Science Education: is a field of study that treats science subjects (Biology, Chemistry, Physics, Integrated Science and etc.) in relation to educational context.

Teaching skill: This is the ability to adequately employ and exploit strategies for effective instructional delivery as measured by Pre-Service Teachers Teaching Skills Scale (PTTSS).

CHAPTER TWO

LITERATURE REVIEW

The chapterdeals with related worksas follows:

2.1 Theoretical Framework

2.1.1 Jerome Bruner Theory

The intelligent mind more or less brings understanding "nonspecific coding arrangements which enablesa learner to exceedinformation to different and feasibly productive expectations". Therefore, when a child grows, he/she may gain a channelto showcase "recurring predictabilities" within the surroundings. For instance, Hewas of the opinion that ideas, classifications and problem-solving measures developed formerly by the philosophy were learning outcome. Likewise, capability to “create” those variables.

Importance of Language

He claims that linguistic can cypher stimuli and allowed someonenot restraints toengaging with looks, to offer an extra multifaceted but malleable reasoning. Choice of words is capable of enhancing thoughts and thereby removing restraints on ideas. He sees children as a brainy and dynamic solutions provider from birth, with brainy capabilities comparable to that of grown up beings.

Educational Implications

Bruner believed that individual child can learn any task at any level which must be based on spiral curriculum because learners are active and highly intelligent and have ability to solve problems by themselves. His view was supported by Piaget who also believed on readiness on the part of the learner.

2. 1.2. Social Cognitive Learning Theory

History and Orientation

The theory was propoundedby miller and Dollard in the early 40’s while Bandera incorporated observational learning into it around late 70’s for more understanding. This Theory was based on behavioural change of the learners.

Definition of SocialCognitive Theory (SCT)

SCT refers to observational leaning i.e knowledge is acquired by viewing an individual. It has five propositions:

Proposition one: viewing a model which may be real or symbolic to acquire behaviour.

Proposition two: internalize a new ideal or behaviour i.e. processing a newly acquired behaviour.

Proposition three: acquisition of set goals or acquiring behaviour related to the goals set up.

Proposition four: Regulation of knowledge or behaviour.

Proposition five: Reward and punishment

Modeling

There are two types of models:

- Live models are individuals such as teachers, peers, supervisors whose behaviours are observable.
- Symbolic models are real or fictional characters displayed in texts, films and social media.

Quality: An effective model must possess outstanding features like competency, ability to perform task control and reputation and not gender bias.

Main Propositions and Opinion of the Theory

The theory discussed the ways learners obtained knowledge and methods of processing through certain skills (Bandura,2007). There are 3 factors in assessing behaviour/knowledge such as surrounding, persons and behaviour. Surrounding may be social or physical affecting individual's behaviour. Social surrounding maybe members of one's family, mates and friends while physical are room size, temperature, light, atmosphere, climate and culture.

Surrounding deals with factors which moderate individual character. Surrounding and situation serve as back bone upon which the character of individual is explained. These three factors (surrounding, persons and behaviour) are interwoven and affect each other.Behaviour is not the outcome of the surrounding and individual, likewise the surrounding (Glanz, Rimer, and Lewis, 2002). Observational learning takes place when individual views the performance of a model and motivation takes place. The individual must have the ability and skills to perform the desired behaviour.

Concept of the Social Cognitive Theory

Surrounding: means external features to an individual which give individuals rights and assistance.

Situation: views of the surrounding which movant positive conducts.

Bahavioural capacity: Awareness and arts to undertake a given conduct which aids mastery learning.

Anticipations: positive outcomes of a conduct.

Expectancies: virtues an individual expected from consequence.

Self-command: restraint exercise over one's own impulses, goal-directed conducts, emotion or desires.

Consciousness-learning: imitation of values or conducts of other person that are germane to learning

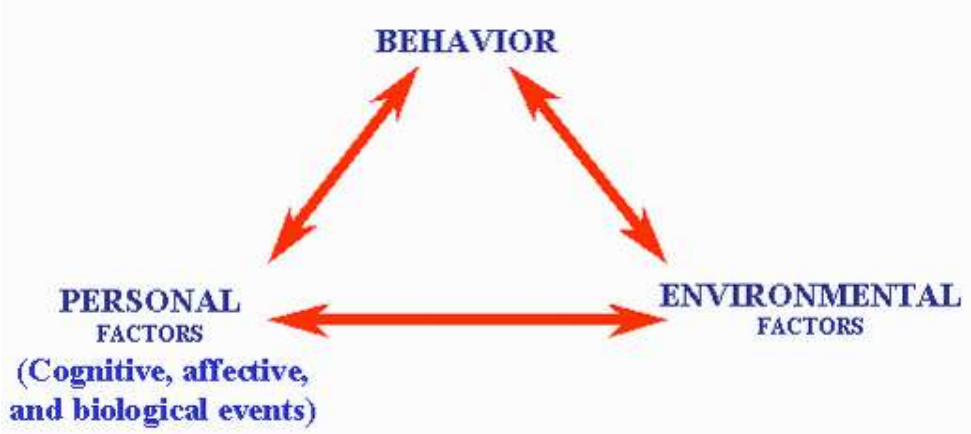
Support: response to individual's conduct that is intended to make an individual more likely to behave positively again or otherwise i.e. reward and punishment.

Self-effectiveness: power to produce an effect.

Emotional coping responses: approaches or systems or methods employed by an individual to withstand emotional impulses in solving problem or combating stress.

Complementary: mutual relationship between an individual conduct and surrounding upon which action is taken

An Overview of Social Cognitive Theory and Self-Efficacy



Source: pajares (2002)

Extent and Operation

Social cognitive theory covers all areas of education and describes how individual gain and sustain positive conducts relearnt to learning. It also serves as bedrock for innovative strategies to bring about meaningful leaning in education.

Example: the theory was employed to reduce alcohol intake of teens in the grade school by the help of community involvement, parental awareness, and programmes to promote free alcohol, social media to discourage alcohol intake and classroom discussion. The result of SCT revealed that community involvement resulted in less drinking of alcohol among the teenagers due to changes in the environment, norms of the community to reduce alcohol intake among high school students (Glanzet-al, 2002).

Theoretical component

Modelling

Social cognitive theory centres on knowledge attainment through observation of models. As a teacher/facilitator to promote meaningful learning or to get positive behaviour you have to present effective models. Bandura performed experiments by exposing children to play aggressive with Bobo doll or allow them to watch video of aggressive action on Bobo doll and later presented the children with bobo doll. Children who watched aggressive/violence video played violently or aggressively with Bobo doll. SCT shows how individual repeat the actions of earlier event or incident.

Observations involve: Mindfulness, detainment, output and encouragement.

Encouragement means rewarding positive conduct repeatedly.

Modelling involves live, verbal non-verbal and written/documented conducts which allow individuals to reciprocate or curb conducts or actions observed. Facilitator may use facial expression to suppress or caution an erring student in the class while others may observed and become calm to avoid such conduct. Facilitatorshould promote achievements of the students by improving their self-esteem in the class.

Resultant Anticipationis the expectation of enacting a conduct which varies, not dependent on the model may be effected by the situation or surroundings of individual. The major work of the facilitator is to enable the students acquire positive conducts, values or actions that would bring out positive and meaningful learning to students which would promote good behaviour

Identification: people want to be recognized with influential people or imitate good behaviour and associate themselves with the role models. Facilitator should help in presenting relearnt and important models to the learners for the purpose of enacting positive behaviour and to promote good relationship.

Educational implication

Educational implication of the theory to adaptive environment strategy, the theory was very relevant to this strategy, because it deals with individualised instruction, that is every learner should be given ample opportunities to construct his/her own knowledge

based on his/her intellect by manipulating the environment to achieve the stated objectives /goals. The role of the teachers in this context is to serve as facilitators and ensure that the environment is conducive for learning by putting all necessary materials in place.

Social cognitive theory and implication to buzz session strategy.This theory also beliefs that leaners can learn and construct their own knowledge through observation of models and processes the knowledge or information obtained to achieve the stated objectives/goals. The role of the teachers is to present relevant models to the learners in order to acquire right information. Through observation and social interactions with relevant models /materials learners can acquire and display right knowledge or behaviour.

2.2 Conceptual Review

2.2.1 Concept of Learning

Learning is the knowledge acquired through study, experience or being taught. Learning is a process that leads to change which occurs as a result of experience and increases the potential for improved performance and future learning. Ambrose et al. (2010), learning is not something done to students but rather something students themselves do. It is the direct result of how students interpret and respond to their experiences. Students need opportunities to develop interpersonal social skills that are important for professional and personal success. There are three basic types of learning styles which are visual, auditory and kinaesthetic, to learn we depend on our senses.

The importance of learning is to help individual acquire the necessary skills and knowledge to achieve his or her set goals. Learning promotes personal development to maintain a positive attitude in life, finding satisfying jobs and access to new opportunities. Hitesh (2019) states that learning is an indispensable tool that nourishes our minds, soothes our soul and necessity for both personal and professional career. It aids critical thinking skills, develop future opportunities, increase income and status, help self-confidence, make you happy and to acquire leadership qualities.

There six interactive components of the learning process: attention, memory, language, processing and organising, graphomotor (writing) and higher order thinking. Learning

is a process of obtaining knowledge to change human behaviour through interaction, practise and experience.

2.2.2 Concept of Teaching

Teaching can be defined as engagement with learners to enable their understanding and application of knowledge, concept and processes which enable students involved in the active construction of knowledge. A teacher requires not only knowledge of subject matter but knowledge of how students learn and how to transform them into active learner. The aim of teaching is not only to transmit information but also to transform students from passive recipients of other people's knowledge into active constructors of their own and others' knowledge. Teaching is fundamentally about creating the pedagogical, social and ethical conditions under which students agree to take charge of their own learning individually and collectively.

Pedagogy referred to the methods and activities of the practice of teaching. Characteristics of teaching include: desire to share your love of the subject with students, ability to make the material being taught stimulating and interesting, facility for engaging with students at their level of understanding and capacity to explain the material plainly. Others include commitment to make it clear, showing concern and respect for students, encourage independence ability to improvise and adapt to new demands, use teaching methods and academic teasks that require students to learn actively, responsibly and cooperatively using valid assessment methods, focus on key concepts, give the highest quality feedback on student work and desire to learn from students and other sources about the effects of teaching and how it can be improved. Basic requirements in teaching are three variables (teacher, students and environmental factors, professionalism, suitable environment, teacher/students relationship, students discipline and teacher and students devotion to teaching and learning.

2.2.3 Pre-service teachers Pedagogical Knowledge

Pedagogical knowledge (PK) is depth knowledge about the procedures and methods of teaching and learning and how it incorporates, among other things, overall educational purposes, values, and aims (Mishra and Koehler, 2006). The general knowledge concerned about student learning, classroom management, and writing lesson plan and execution and student assessment, includes knowledge about techniques or methods to be used in the classroom; the nature of the target audience;

and strategies for evaluating student understanding. A teacher with an in-depth pedagogical knowledge understands how students construct knowledge, acquire skills, and develop habits of mind and positive dispositions toward learning. As such, pedagogical knowledge requires an understanding of cognitive, social, and developmental theories of learning and how they apply to students in their classroom (Mishra and Koehler, 2006).

Teachers' Pedagogical knowledge are the concepts,principles, processes, relationships and applications a teacher ought to possess in a course of study, which is suitable for and coordinationof subject(Ozden, 2008). Pedagogical knowledge (PK) is knowledge embedded in the actual subject matter which is to be learned or taught. The actual content which a teacher is expected to cover in history or home economics is different from the content to be covered in either computer science or mathematics and integrated science. Teachers are expected to know and understand the subjects which they are to teach, including knowledge of central facts, concepts, theories, and procedures within a given field; knowledge of explanatory frameworks that organize and connect ideas; and knowledge of the rules of evidence and proof (Mishra and Koehler, 2006). Teachers must also comprehend the nature of knowledge and inquiry in various fields. For example, how is mathematics proofdifferent to a historical explanation or a literary interpretation? Teachers who do not have these understandings can misrepresent those subjects to their students (Mishra and Koehler, 2006).

2.2.4 Lesson planning skills

Lesson Planning Skill as defined by Sahin-Taskin (2017) is a crucial skill gained during the pre-service teachers' training which is needed by them to harness work, create goals and obtain response from learners. Without an effective lesson planning a pre-service teacher cannot be effective. Because planning for a lesson is crucial as it will affect what the teacher does in the classroom, a teacher that prepares for a lesson will discharge the duties in a professional way. A lesson plan is crucial as it helps teachers design an outline that will assist learners to a destination (Jacobs, Martin and Otieno, 2008). Lesson plan has to do with goals, knowledge, and sequencing all of which involve in the whole process of teaching and learning (Vdovina and Gaibisso, 2013). It is also connection requirement between the

curriculum and the textbook and classroom activities (Li, Chen and Khum, 2009). Tashevska (2008) opined that student teachers found lesson planning difficult. Which means that lesson planning skills can be difficult to a novice teacher which will prepare the lesson from textbooks or from browsing from the internet. Similarly, Senior (2006) concluded that pre-service teachers' or novice teachers spent most of their time planning lessons and found the planning process to be difficult as most of the materials that is needed could not be readily available for the novice teachers to peruse, therefore taking them time to prepare a lesson.

2.2.5 Teaching skills

Sahan (2017) stated that student teachers are potential teachers expected to be equipped with necessary professional skills that will enable them showcase their level of professionalism thereafter. Also, the study viewed student teachers' teachings skills as not always evaluated but if these are readily evaluated, it would improve student teachers teaching skills in the tertiary institutions. Surel (2010) reviewed literature to compare the different teaching styles from different faculties in higher institution. The study was of the view that the teaching skills of these faculties can contribute to the teaching and training of more quality teachers. Therefore, the study is important in order to groom student teachers adequately onlesson planning and teaching skills.Effects of training will be determined after they graduated from colleges and practicing as a professional teacher. This in turn will showcase in future students' performance when taught by a well-trained teacher.Teaching skill enables each pre-service course content to have a specific strategy for pedagogy (Scherff and Spector, 2011).

Victor (2011) identified learners to be capable of evaluating good teachers that possess necessary teaching skills for pedagogy. The skills includes knowledge of the course content, ability to communicate effectively, interest of making the whole process lively, respect which should be reciprocated between teacher and learners, ability to conclude by given an overview of the whole process, selecting adequate method of teaching and learning and using of appropriate learning styles among others.

2.2.6 Buzz session teaching Strategy

Bell and Kozlowski (2007) reported Buzz session as a teaching strategy that is essential for building genuine pragmatic situation which assist institutions to effectively train teachers as professionals thereby meeting societal demand. Dr Donald conceived and developed Buzz session as a method in a citadel of learning in the United State of America. He divided class into group of six to brainstorm for six minutes about a certain concept. Soon this method was known as Phillips 66 technique.Buzz session teaching, like other forms of discussion, benefits from significant teaching principle, "interaction". Small groups buzz together and everyone is expected to contribute to a thought-provoking topic and thereafter present to entire class.

Buzz session requires more preparation time to achieve a certain task, answer questions and set context for the lecture. It may be images, data, multiple answer or over-head projector transparency. Moderate time is required probably a couple of hours including planning. The gain is the time spent in preparation and having less content material for the lecture. It is advantageous when learners interact and brainstorm with one another guided by their facilitator (https://bible.org/seriespage/8-using-buzz-groups-your-teaching).

2.2.7 Adaptive learning Environment Teaching Strategy

Adaptive Learning Environment Strategy (ALES) was designed by (Jones and Winne, 2018). They expressed Adaptive Learning Environment as a meeting point between Instructional and Computer science. ALES cuts across different learning aspect in order to meet societal need and instructional system. ALES deals with brandingpedagogy process to cut across all structured procedures and stated objectives in the curriculum for effective teaching and learning in order to assist learners to adapt to the environment. ALES was assessed before 1960s to be an adequate strategy which improves learners' level of assimilation and comprehension.

Lang and Evans, 2006 Model ofAdaptive learning instruction introduced teaching strategies and models governed by logical rules planned to captivate in-depthmastering and curiosity in science and appliedinstructions. The modelwas used at Estonian Centre for Science and Engineering Pedagogy, for the training of technical and science student teachers in their respective area of specialisation. The model only allow student teachers to be creative and tractability in their approach to teaching profession

but not taking place of essential instructional skills and forms of information needed as a professional trained teacher.Lang and Evans, (2006) added that, implementing a lesson using this Model of Adaptive learninginstruction must include revision and introduction, presentation, guided practice and self-determining exercise.Also, Eggen and Kauchak, (2006) viewed using the Model to involve ascertaining prior students' knowledge which gives "connections" to subsequent learning. The model promote meaningful learning because is engaged students throughout the instructional phases and allows for quality evaluation.

2.2.8 Conventional Strategy

Abimbola and Abidoye(2013) opined that lecture method of teaching science prevails in our country, Nigeria. Traditional instruction is teacher-centredbrandedthroughteaching. Brown (2013) viewed traditional instruction as a method that enables teacher to carry out all the teaching processes by deciding on what, when, and how learners learn. Ogundiwin and Ahmed (2015) revealed the inadequacy of lecture method in the teaching and learning of science. There is a trend for the instructor to adopt teaching method used for them that made them to be at ease. It implies that learners were still been taught with traditional instructional method (Armington, 2003). In tertiary institutions traditional method of teaching is usually employed for instruction whereby the teacher do the talking while learners listen attentively and copy notes from the board or through dictations. The instructors carry out all the teaching processes complimented with guided instructions for the learners while learners only reply to enquiries from the teacher. Research revealed that teacher-centred instructional strategy is predominant in the teaching of chemistry (Zimmerman, 2007).

2.2.9 Self-efficacy

Self-efficacy refers to the assessment of person's ability to masterschore and self-assurance in skills vital to executechore (Yalcinkaya, Boz andErdur-Baker, 2012) and an important quality that student teachers must possess (Ergul, 2009). Olagunju and Asaaju (2018) submitted that having the conviction in one's capacity to execute a particular task profitably is one of the most powerful predictors of how well a person will execute virtually any assignment. Hence, it is expected that practicing science and would-be teachers should possess not just high but positive self-efficacy levels, and

attitude to science in order to transfer effectively their understanding, dexterity, and competencies to their learners (Olagunju and Asaaju, 2018).

Elaborate research has been undertaken on self-efficacy in diverse disciplines over the years and findings revealed unwaveringly that person's abilityhas great influence on learning at all levels of education. Despite the fact that assessing self-efficacy could be broad, an attempt to establish the synergy connecting measures of self-efficacy and achievement is very vital but there is a dearth of research in biology in relation to self-efficacy (Olagunju and Asaaju, 2018). Again, Ogunbameru and Uwameiye (2012) have identified low NCE students' ability as a factor responsible for their performance deficiencies. In other words, if pre-service teachers' self-efficacy could be enhanced, their performance deficiencies would be remediated.

It is important to consider student teachers' self-efficacy since their views are germane ideas in the advancement of learning everywhere (Cheung, 2008). According to Bandura (2007), self-efficacy refers to an individual's belief ofhisability to carry out a certain assignment. Similarly, Wong, Teo and Russo (2012) defined Computer teaching efficacy of teachers as assessment of ability to impact usingdigital devicesas effective instrument to facilitate learners' learning outcome. Anderson and Maninger(2007); Chen(2010) and Teo(2008) discovered self-efficacy as an important factor of purpose/goal. Anderson and Maninger (2007) reported student teachers' intentions to explore different soft-gadget and discovered students views and abilityas important factors.Pendergast, Garvis and Keogh (2011), they carried out research on teacher education programme and asserted that teachers' self-efficacy maybe improved by training programme of pre-service teachers. Likewise, Hemmings (2015) opined that studentteachers and their lecturers were cognizant of implications and relationship between self-efficacy and teaching proficiency.

2.2.10 Mode of Entry

The mode of entry into higher institutions in Nigeria is categorized by JAMB for the undergraduate education admission as the Unified Tertiary and Matriculation (UTME) admissions, those admitted through direct admissions and those admitted byuniversities through their developed programmes. The requirement for the admissions depends on the category (Emaikwu, 2012). The irregular academic

calendar in colleges of education, agriculture and polytechnics serves as an issues for candidates seeking admissions through direct mode because often time their results may not be read to be used to facilitate the admissions processes. However, it is obvious that some of these institutions operate separately from the existing rules which affects the level of how their graduate were baked with varying experiences (Emaikwu, 2012). Students are admitted into colleges through JAMB or Prelim.

Moreover, Mgbake (2006) opined that the level at which a student is admitted is not a yardstick or determining factor to his or her performance. He stated that the performance depends on an individual determination and efforts which afford one's the opportunity of gainful employment at the end of the studies. Agada (2008) reported learners' method of study and commitment as factors that influence their achievement. His results emphasised learners' commitment in all aspect of the teaching and learning in order to attain quality educational output. Likewise, Long (2005) carried out a research on students level of admissions through a course of study and discovered that the results of those that came in through remedial studies, UTME and direct levels were relatively the same. While, Adeniyi (2004) opined that students' age, experience and exposure served as factors that made them performed poorest in the unified tertiary matriculation examination.Ipaye (2004) reported that direct entry students'performance outweigh preliminary students in arts subjects at degree examinations whereas the remedial students' performance outweigh in science and technical subjects. Ezema (2006) carried out comparative analysis ofperformance of the three levels of students admittedfor degree programme and discovered that the periods assessedhad no significant difference between the cumulative grade point average of the three groups before their degree examinations. Contrary to some of the findings Angulu (2007) reported that those admitted through direct level had good results compared to those that came in through preliminary studies which he attributed to their prior knowledge.

Agoro (2012) reported that the performance of the pre-service teachers' entrance level into colleges of education examined had no difference but research showed that Prelim student teachers' performance was better in science process skills examined than their counterpart. Adeyemi (2009) opined that an examination results can be used to determine future learning outcome and he concluded that level of entrance into an institutions determines students' performance.

2.3 Empirical Review

2.3.1 Buzz session strategy and Pre-service Teachers Pedagogical Knowledge

Rahman, Khali, Jumani, Ajmal, Malik and Sharif (2011) reported the influence of conversationtechnique on learners learning outcome. The study adopted pretest-posttest control group designwith 62 students of grade 10th. Learners were divided into control and experimental groups of equal size. Discussion methodwas used on experimental group complimented with lecture while control group was treatedonly with lecture method. Four social studies content were selectedand taught for 45minutes which lasted for a month. Pre-test findings showedinsignificant difference in the learning outcome of both groups. While, post-tests revealed significant difference that existed in the mean score of both groups. The findingsproved thatexperimental group mean score was higher to thatof control group. It was resolved that discussion method was more effective than lecture method and recommended for teaching of social studies.

Pinamang and Penrose(2017)reportedAshanti student teachers' pedagogical knowledge in teaching geometric transformation (GT)in Ghana. Sample consisted of 82student teachers from two Colleges of Education. It was an empirical study which engaged survey method of investigationusingGT-Achievement Test(GTAT) as instrument for data collection. GTAT was administered on student teachers to ascertaintheir level ofexperienceon pedagogical knowledge in GT. Findingsconfirmed low level of pedagogical knowledge among student teachers in GT.Correlation analysis revealed a weak positive significant relationship between student teachers' content and pedagogical knowledge. Therefore,it was recommended that GT content and pedagogical courses be treated practically in order for student teachers to sufficiently rehearsal things on their own ahead of the task that await them.

Moreover, Omeodu (2019),who worked on a survey in River State on instructional strategies used as mode of instruction by physics teachers in senior secondary schools.The finding revealed that Buzz instructional strategy was rated as one of the strategies not employed by the facilitatorsfor instruction in physics. Contrary to Akudolu and Umenyi (2016) research, theyworked on institutionalizing culture of peace in basic education through appropriate curriculum

implementation.The finding revealed that Buzz session is one the interactive strategies often employed to facilitate instruction.

2.3.2 Buzz session strategy and Student Teachers Lesson Planning skills

Sahin-Taskin(2017) reported student teachers' perceptions of lesson planning in primary education. Eighteen student teachers on teaching practice exercise at primary schools were used as sample. Semi-structured interviews was employed for data collection andcontent analysis for analyses. Two groups were discovered as difficulties of planning and functions of lesson plans. Results revealed that, primary student teachers are conscious of planning lessons significance; but encounteredproblemsat the course of planning. They argue that, limited time constraint them to attend to pupils desires as expected which had negative impact on their preparation. Thus, the researcher concluded that, student teachers need ample time/period to familiarise themselves with the pupils for effective pedagogy.

Likewise, Afifah (2019) carried out research on buzz group technique to enhance learners' understanding of concepts. He used quasi experimental research design and samples was collected by using cluster random sampling technique. Test was used to for data collection. Paired t-test and independent t-test were used for data analyses. The finding revealed that there was positive improvement on learners taught using buzz group strategy compared to conventional method.König, Bremerich-Vos, Buchholtz, Fladung and Glutsch (2020) worked on enhancing student teachers' lesson planning skills and the finding showed a significant improvement in lesson planning skills. This development of planning skills showcase the level of their activeness during induction and expertise advancement in preparing a lesson plan.

2.3.3 Buzz session strategy and Pre-service Teachers Teaching skills

Olajide (2015) revealed a high level of student satisfaction in using Buzz session strategy. Okurumeh (2009) supported the use of Buzz session by saying that this strategy allows students to engage or involve in the teaching process and it also create a learning environment where students become an autonomous learner and solution provider. Novitasari and Wardhani (2018), reported buzz group in ESP class to improve students' speaking skills by integrating audio visual media into buzz teaching strategy in order to enhance students' speaking skills. They adopted

classroom action research (CAR) which involves: planning, doing, observing and reflecting. Data were collected during the doing stage of the cycle. The score of the students' speaking skills were compared to the criterion of success. It was revealed that buzz strategy improved students' speaking skills.

Sahan(2017)reported the opinions of student teachers pedagogical development programmeonfacilitators' teaching skills. 220 student teachers partook in the programme. Opinions of Teaching Skills Scale (OTSS) was designed and used for data collection. Data were analysed using ANOVA to determine level of significant between student teachers perception, gender and subject area considered. Findings revealed that student teachers opinion of facilitator is often prove act of teaching skills. Also, comparison level existed between subject facilitators and pedagogy based on overall facilitators conducts on the whole processes. Though, they exhibited greater regularities to field facilitators based on their conducts. Gender was significantly decisive element on student teachers opinions concerning overall facilitators conducts. While, relative effect of subject area was on student teachers opinion of conduct in the warm up stage only.

2.3.4 Adaptive Learning Environment strategy and Pre-service Teachers Pedagogical Knowledge

Murray and Perez(2015) reported comparison between adaptive learning andconventional learning based on level of effectiveness. It investigatedaccomplishmentlevel and task marks for learnersexposed to adaptive learning activities and relates them to those expose to conventional learning in a university digital literacy course. The studyused the hypothesis that adapting teaching to an individual's style of learning produce effective performance. For quite a while ICT has proffersolution to difficulties and high financial implications of individualized teaching. Adaptive learning is peddled as a possible game-changer in tertiary institutions, a remedyexplore bycitadel of learningto tackle puzzle of the quality, price, and access. The study observed that adaptive learning systems have insignificantinfluence on performance. Undoubtedly, other studysuch as this, in the area of adaptive learning systems as enlighteningschemes, is desirabletowards attaininginnovative learning systems.

Dziuban,Moskal, Parker, Campbell, Howlin and Johnson (2018) carried out research work on adaptive teaching at two higher institutions of learning in different areas of students' specialization and they discovered that the strategy had significant effect on the instruction. Likewise, Siddique et al. (2019) in their study, they are of the view that previous experience, students' memory and styles of learning characterized adaptive learning. The finding revealed that learners taught with an adaptive strategy, performed better to others not taught with the strategy.

2.3.5 Adaptive Learning Environment strategy and Pre-service Teachers Lesson Planning skills

Milosevic, Brkovic and Bjekic(2006)worked on designing lesson content in adaptive learning environments (ALE) stated that ICT instruction broadly increasing and ALE advance its possibilities. Usually we create situation on ALE in respect of individual learner style of assimilation and subject content. Ontology-based learners' model often employ forstorageof learners data. The situation of designing lesson content structuredtowardseach learner'sdesires is offered as a cross segment of style of assimilation and inspiration level, based on the behavioural objectives. Our forthcomingeffortwould be to offerresearch and to evaluatesuggestedprocedures in order to get response on how learners view ALEstructured to each student's style of assimilation and inspirational characteristics.

2.3.6 Adaptive Learning Environment (ALE) strategy and Pre-service Teachers Teaching skills

Gavrilovic, Arsic, Domazet and Mishra (2018) worked on Algorithm for ALE and promoting skills in java software design language. They reported that ALE help in bringing learning to the individual needs, enhancing students' awareness, skilfulness in java software design and finding answers to actionable exercise. ALE assisted the students in providing drive to measure students' knowledge in tackling actionable exercise java software design coding. ALE, in this study enable the students to relate

knowledge obtain in tackling actionable exercise and in using instructional materials effectively. Lastly, it work on striking effect of java software design coding and drive for awareness of students based on their belief and scores.

2.3.7 Mode of Entry and Pre-service Teachers Pedagogical Knowledge

Irtwange, et al (2010) reported comparisoninvestigationof JAMBITE and former-remedial students in a tertiary institution of Agriculture in Benue State. Result of their research work shows those former-remedial learners performed better steadily and foreseeable than JAMBITES. Musa and Saliu (2016), revealed that learners that came in through direct entry (300 level) had outstanding performance in ADS than those that came in through Universities Matriculation Examinations(100 level) while those that came in through direct entry (200 level) had the lowest learning outcome.

Emaikwu (2012) worked on evaluation of the effects of learners' entrance level into tertiary institutions and their academic performance in Nigeria. Expo-factor research design was used, four research questions were raised and answered whileand four hypotheses were formulated and tested at 0.05 level of significant. Proportionate stratified random sampling techniques was used to select 253 samples from two Universities in Benue State. Data obtained were analysed using analysis of variance and t-test. The finding revealed that there was statically insignificant difference in the mean score of learners entered into the university by UTME, remedial programme and direct admissions while there was significant difference with respect to gender, malelearners performed better than their female learners among three means of admissions into tertiary institutions. It was recommended that the three means of admissions should be employed by tertiary institutions on proportionality and institutions should discourage element of discrimination among the learners in order to promote academic excellent and better products.

2.3.8 Mode of Entry and Pre-service Teachers Lesson Planning skills

Adeyemi (2009) opined that an examination results can be used to determine future learning outcome and he concluded that level of entrance into an institutions determines students' performance.

Benjamin (2004) worked on science teachers' belief about effective science teaching, their pedagogical content knowledge and how it is affecting their classroom

teaching behaviours in Nigeria Junior Secondary Schools. The research work occurred in two sections: section A, compose of all Junior Secondary School Science Teachers with total number of 70 participants from 30 Secondary Schools in two Local Educational District of Lagos State. Second section consisted of purposefully 3 Science Teachers. Data were obtained through interview, classroom performance session and document analysis. Results shown that teachers had shallow knowledge about the nature of science and reasons for teaching science in schools, teacher's dominant of classroom interaction where learners play insignificant role in the classroom interaction. So, evaluation of learners was based on unstandardized test where teachers had traditional knowledge of pedagogy. The study also revealed inadequacy of relevant science textbooks, lack of teaching facilities and high enrolment of learners in the classroom.

2.3.9 Mode of Entry and Pre-service Teachers Teaching skills

Agoro (2012) reported that the performance of the pre-service teachers' entrance level into colleges of education examined, had no difference but research showed that Prelim student teachers' performance was better in science process skills examined than their counterparts that came in through direct entry. The increase in performance of prelim group maybe associated with their spending one year ahead of the direct entry group in the college. That is, the duration of their stay in the college might have contributed to their improved performance in science process skills.

Study of Musa and Saliu (2016), revealed that learners that came in through direct entry at 300 level had outstanding performance in ADS than those that came in through Universities Matriculation Examinations at 100 level while those that came in through direct entry at 200L had the lowest learning outcome. Also, Dodds, et al. (2010) carried out a study on medical students in United Kingdom and Irish medical schools and discovered that graduate entrants had better achievement to their direct entrants' colleagues in the aspect of clinical skills and practice. While, Duggan, et al(2014) discovered that graduate entrants had better achievement to their direct entrants' colleagues in the aspect research based performance.

2.3.10 Pre-service Teachers Self Efficacy and Pre-service Teachers Pedagogical Knowledge

Depaepe and Konig (2018) worked on General Pedagogical knowledge (GPK), self-efficacy (SE) and instructional practice (IP) unravel their relations in pre-service teachers' education. Professionalism consisted of cognitive (professional knowledge) and affective (professional beliefs) constituent. The work employed connection between GPK and SE on 342 pre-service teachers sampled. Finding revealed insignificant relationship between GPK and SE on IP.

Abbitt (2011) worked on comparison between technological pedagogical content knowledge (TPCK) and self-efficacy of pre-service on technological incorporation. Pretest-posttestsingle-group design was employed with correlational analysis of TPCK model to obtain various knowledge areas. Multiple regression analysis was used foe data analysis. Results revealed significant correlation of TPCK and SE on technological incorporation and also shown important areas of knowledge in TPCK that affects pre-service teachers' views on technology incorporation.

Muntaha (2016), who reported Indonesian EFL (English as a foreign language) Classroom onBuzz Session and Self-Esteem on Teaching Listening. His study involvedsystematic manipulation of experimental condition and factorial design was employed. Two classes were sampled using cluster random sampling technique and 60 students constituted the total population for the study. Test and questionnaire were used for data collection. Data collected were analysed using ANOVA. The finding revealed the effect of teaching techniques on listening skill depends on the degree of self-esteem, Buzz strategy is more effective than the lecturing method for teaching listening skill and students with high self-esteem have better listening skill to those with low self-esteem.

2.3.11 Pre-service Teachers Self Efficacy and Pre-service Teachers' Lesson Planning skills

Constructivist teaching styles was not based on individual lesson plans. Though, the main point in lesson plan are the behavioural objectives and duration of presentation to meet learners need and mode of learning. Fink, (2005) was of the opinion that making learners aware of what will happen in the classroom setting will enable them to be readily prepared for the classroom activities. This can be enhanced

by giving learners course outline of the subject matter. The main work of the facilitator is to set up instructional objectives that will enable the learners aware of their classroom activities. Wolfe, (2006) asserted that a well prepared lesson note help in achieving the aims of the lesson while teaching pre-service teachers how to write and develop lesson plan. He also emphasised that, objective of lesson plan should be stated in behavioural term and must be within the level of cognition of the learner.

Giles, Byrd and Bendolph (2016) determined the comparison between elementary pre-service teachers' self-efficacy and mathematics teaching. 41 participants were drawn from one University. Mathematics teaching efficacy beliefs instrument (MTEBI) of 21 items using a five-point likert scale for data collection. The instruments was further divided into two personal mathematics teaching efficacy belief (PMTEB) and mathematics teaching outcome expectant (MTOE). Findings from PMTEB (mean = 51.08, SD = 5.17) shows significant correlation. Likewise, findings on MTOE (mean = 29.32, SD = 3.29) reveals significant expectations of learners mathematic learning. They concluded that self-efficacy should be incorporated into teacher preparations programme in order to produce professional teachers.

Sural (2019), who examinedstudent teachers' competencies in lesson planning.His finding revealed that student teachers' competency level in lesson planning wasinsignificant. Also, both public and private school instructors' answers to open-ended questions illustrated that facilitators' theoretical and practical skills in lesson planning were not okay.Lee and Lee (2014) carried out research work on promotingstudent teachers' self-efficacy beliefs for technology integration through lesson planning practice and their findings revealed that lesson planning skills was seen as the only significant determinant for pre-service teachers' self-efficacy for technology integration. Also, König, et al. (2020) worked on enhancing student teachers' lesson planning skills and the finding showed a significant improvement in lesson planning skills. This development of planning skills showcase the level of their activeness during induction and expertise advancement in preparing a lesson plan.

2.3.12 Pre-service Teachers Self Efficacy and Pre-service Teachers' Teaching skills

Elsevier (2009) carried out structural correlational study between self-efficacy, academic aspiration and delinquency on the performance of 935 learners between ages

11 to 18 years in Australia. The findings revealed insignificant relationships of self-efficacy ondelinquency and a significant relationship effects on academic performance. While, academic and social self-efficacy revealed mixed effects on academic aims and performance of the learners. Koura and Zahran (2017) carried out a research work in Egypt on the impact of sheltered instruction observation protocol model on student teachers' teaching skills and self-efficacy using pretest-posttest quasi-experimental design control group. They sampled 22 EFL (English as a foreign language) student teachers and developed two instruments for data collection. Data were analysed using Wilcoxon-Signed Ranks test to compare the mean scores of the experimental group pre-post observation. The findings revealed that there was gradual improvement in student teachers' teaching skills and self-efficacy. Also, student teachers' lesson preparation was significant.

Mahyuddin, Elias, Cheong, Muhamad, Noordin and Abdullah (2006) carried out a research on comparison between learners' self-efficacy and their performance in English Studies. One thousand, one hundred and forty-six samples of form four learners were selected from eight secondary schools in a district at Selangor. Stratified random sampling technique was used to select subjects. Six hundred and forty-six of the sample were males while four hundred and ninety-nine were females. Concerning ethnic group four hundred and ninety-one samples from Malaysia, three hundred and seventy-four from China, two hundred and forty-eight from India and twenty-five other countries. On school location, four hundred and nineteen sample were from urban schools while seven hundred and twenty-seven were from rural schools. Descriptive correlation design was used and self-efficacy scale (SES) developed by Bandura was adopted which include academic performance, meeting other prospects, co-curricular exercise, individualised learning, self-aggressiveness, encouragement and self-operation. Correlational analysis run revealed positive significant relationship between self-efficacy and academic performance in English Studies. The scopes are academic performance, self-efficacy, other prospects and self-gracefulness.

Colson, Sparks, Berridge, Frimming and Willis (2017)worked student teachers and self-efficacy to produce effective teachers to improve learners' performance in schools. This study was carried out in Midwestern tertiary institution to compare the classroom interaction of student teacher exposed to one year teaching practice exercise and student teachers exposed to a term teaching practice exercise in order to make

prospective teachers acquire adequate classroom management skills and experience of school setting. Teacher sense of efficacy scale of 24-items and 9-demographic questions were used to obtain data on student teachers attitude to work with learner, learner engagement, pedagogical strategies, classroom administration, individualised teaching, response to learners need and learners involvement in the classroom interaction. Thus, the findings revealed that student teachers in one year teaching practice exercise perform better than their colleagues in one term teaching practice exercise.

2.3.13 Conventional Instructional Strategy and Pre-service Teachers'Pedagogical Knowledge

Obviously, competence has to do with demonstration of skill and knowledge. Draves (2013*)* identified student teachers' skills, pedagogical content knowledge, and reflective practice as three important variables in successful classroom performance by pre-service teachers. This indicates that the skill possessed by the teacher is a valuable aspect of successful instruction. Such skills include personal skills and teaching skills which have been rated as significantly more important in successful teaching. In a study comparing the response of student teachers and in-service teachers on the skills and behaviours that are vital to fruitful music coaching in the leading 3-years of practise, found that the twosetsappraisedindividualexpertise and instructional skills as significantly more imperative to musical skills.

Pinamang (2016) worked on Wesley College of Education andMampong Technical College of Educationstudent teachers content knowledge (CK) and pedagogical content knowledge (PCK) in facilitating geometric transformation (GT)instruction in Ghana. Eight-five samples were used; consisting of eight-two student teachers and three mathematical instructors. Research design of mixed method was adopted. GT test, interview and questionnaire were used for data collection. Findings shown that student teachers had good mastery of GT content than pedagogical content. Correlational analysis done on relationship between student teachers content and pedagogical knowledge in GT shown a weak positive significant relationship. He recommended practical approach to be used in teaching GT content and pedagogical courses at Colleges of Education. He added, teaching should involve what student teachers will encounter in the field during teaching practice.

Botha and Reddy (2011) reported experienced teachers' perceptions of student teachers' knowledge areas in science. The research centred on experienced science teachers observations of student teachers in teaching practice exercise. Data were collected through semi-structured interview with set of open ended questions for 4-weeks of teaching practice exercise. The result revealed that experienced teachers scored student teachers greatly in some areas of knowledge and negatively in other areas. They suggested that the curriculum of teacher education should include innovative strategies to enhancestudent teachers knowledge area and PCK for production of quality teacher.

2.3.14 Conventional Instructional Strategy and Pre-service Teachers Lesson Planning skills

Student teachers are expected in their course of training to be academically and professionally prepared for their role as teachers in the classroom. They are expected to acquire knowledge and lesson planning skills to favourablyexamine and comprehendthe presentclassroom anomalies and proffer remedies to the prevailing situations. This opportunity is provided to teachers in training through teaching practice exercise. As noted teaching practice is an integral aspect of teacher education for effective preparation. Teaching practice provides student teachers with the necessary skills such as lesson planning and teaching skills for adequate classroom activities. (Feiman-Nemser, 2017). This will undoubtedly help the competence of pre-service teachers when they get to the field. However, the mastery of pedagogical knowledge or skills at this level might be minimal. This was corroborated by Freiberg (2002) who asserted that many teachers enter the teaching field directly from university teacher preparation programs, where they mastered minimal pedagogical knowledge or skills. Thus,student teachers are likely to have minimal competence in handling classroom situations.

2.3.15 Conventional Instructional Strategy and Pre-service Teachers Teaching skills

The importance of training in teaching skills acquisition is further stressed by the findings of a study byDymondandBentz (2006) reported the significance of training student teachers in teaching skill while working on efficiency of tertiary institutions facilitators training from twenty-two citadel of learning across eight

countries. There were two groups: experimental group consisted of facilitators and their learners under training for one year while the control group consisted of facilitators and their learners without training for the duration covered. Both groups were examined and the finding revealed significant effect of treatment on experimental group than the control one.

Nzilano (2013) worked on student teachers' teaching proficiencies during teaching practice exercise in secondary schools and teachers Colleges of Education in Tanzania. The aims of the research were to work on classroom preparation and efficiency in classroom interaction by student teachers during teaching practice. Sample consisted of thirty student teachers and eight educational officers. Data were collected through questionnaire, semi-structured interviews, portfolio reviews and classroom observation. Findings revealed that student teachers had low proficiency in classroom interaction. He recommended that, curriculum of teacher education should be reformed to enhance teachers' performance to aid quality education to the citizen.

Elias (2018) worked on student teachers techniques to the efficiency of micro-teaching in teaching practice exercise. The study was carried out in a College of Education in Eritrea Institute of Technology on diploma learners in the year 2015/2016 session. The aims were to examine facilitators' attitudes and views about micro-teaching in teaching practice exercise. Semi-structured interview instrument was used to obtained data after the training to evaluate their views about general method of teaching in the classroom. Findings revealed that student teachers felt that micro-teaching enabled them to assess their potentials and lowness areas in the classroom interaction. It also, indicated that student teacher acquire skills of planning, questioning, evaluating, classroom management control and positive attitude towards teaching as a profession.

2.4 Appraisal of the Literature Reviewed

Literature had been reviewed on Conventional Strategy asteacher-centred and describedas open teaching. Open teaching involves presenting materials, speaking loudly by the instructor, demonstrating, listening and answering the questions from the learners. The instructor dominates the classroom interaction and decides when

teaching and learning process will take place while learner played passive roles in the classroom which invariably affects their academic performance in the subject.

Moreover, the reviewed literature has shown that student teachers' pedagogical knowledge, lesson planning and teaching skills were not improved based on the use of conventional strategy. Aina (2013) reported that student teachers' pedagogical knowledge cannot promote good technological development. Likewise, Gbolagade (2009) emphasised the importance of using appropriate instructional strategies to develop science skills and pedagogical knowledge of student teachers. It also revealed students' knowledge of various subject matter especially in science subjects had dropped in tertiary institutions which accounted for their low performance during teaching practice exercise.

Also, literature reviewed on self-efficacy hasrevealed levels of beliefs of person's capability to harness and accomplisha given task that will produce expected results. It revealed that pre-service teachers with high self-efficacy performed better than their counterpart with low self-efficacy.Ogunbameru and Uwameiye (2012) identified low self-efficacy of student teachers as a factor responsible for their low performance. They suggested that if self-efficacy of student teachers can be enhanced, it will invariably improve their performance.

Pre-service teachers' mode of entry was also considered.Agoro (2012) reported insignificant difference in the student teachers' performance in relation to their mode of entry into the colleges of education. While, Musa and Saliu (2016), revealed that learners that came in through direct entry (300 level) had outstanding performance in ADS than those that came in through Universities Matriculation Examinations(100 level) while those that came in through direct entry (200 level) had the lowest learning outcome. Studies have shown the effectiveness of buzz session and adaptive learning environment instructional Strategies. This study, therefore concerned itself on training ofIntegrated Science pre-service teachers on buzz session and adaptive learning environment instructional Strategies as determinants of their pedagogical knowledge, lesson planning and teaching skills. It also, investigated the regulating effects of self-efficacy and their mode of entry into the colleges of education on the three dependent measures.

CHAPTER THREE

METHODOLOGY

3.1 Research Design

The research adopted 3x2x2 factorial matrix of pretest-posttest control group quasi-experimental design. It involved instructional strategy at three levels, Pre-service teachers' efficacy at two levels and mode of entry also at two levels.

The design is presented structurally below

Experimental Group	1	O_1	X_1	O_4
Experimental Group	2	O_2	X_2	O_5
Control Group	3	O_3	X_3	O_6

Where O_1, O_2 and O_3 are the pre-test scores of treatment groups and control group while O_4, O_5 and O_6 are the post-test scores of treatment groups and control group.

X_1, X_2 and X_3 are the Buzz Session Instruction; Adaptive Learning Environment Instruction and Conventional Instructional Strategy respectively.

Table 3.1: Schematic Illustration of the 3 x 2 x 2 Factorial Matrix

Treatment	Mode of Entry	Pre-service Teachers' Self-efficacy	
		High	Low
Buzz Session Teaching	Direct (UTME)		
	Pre-NCE		
Adaptive Learning Environment	Direct (UTME)		
	Pre-NCE		
Conventional Instructional Strategy	Direct (UTME)		
	Pre-NCE		

3.2 Variables of the study

Independent Variable

Thiswas the instructional strategy manipulated at three levels:

i. Buzz Session Teaching Strategy
ii. Adaptive learning Environment Strategy
iii. Conventional Instructional Strategy

Moderator Variables

These are:

(a) Pre service teacher's Self efficacy at two levels (High and Low)

(b) Mode of Entry at two levels (UTME and Pre-NCE).

Dependent Variables

These were the learning outcomes:

(a) Pedagogical knowledge;

(b) Lesson Planning Skills; and

(c) Teaching Skills

3.3 Population and Sample Selection

All 200-level integrated science pre-service teachers in colleges of education in southwestern Nigeria served as population for the study.

3.3.1 Selection of Participants

Simple random sampling technique was used to select three (3) colleges of education in southwestern Nigeria and these three (3) colleges of education were randomly assigned to each strategy.

Colleges of education	Strategy	No of participants
A	Buzz session strategy	120
B	Adaptive learning environment strategy	126
C	Conventional strategy	112
Total		**358**

3.3.2 Selection of Contents

The content selected were some concepts of Integrated Science Education course code ISC 212 titled Science Education II as contained in the NCE course outline and adapted from the NCCE minimum standard and taught at NCE II level at colleges of education in Nigeria.

3.4 Research Instruments

The instruments used in this study were:

1. Pre-service Teachers PedagogicalKnowledge Test (PTPKT)
2. Pre-service Teachers Lesson Planning Skills Scale (PTLPSS)
3. Pre-Service Teachers Teaching Skills Scale (PTTSS)
4. a) Pre-service Teachers Self Efficacy Scale (PTSES)
   b) Pre-service Mode of Entry Demographic Scale (PMEDS)
5. Teachers' Instructional Guide forBuzz Session Teaching Strategy (TIGBSTS)
6. Teachers'InstructionalGuide for Adaptive Learning Environmental Strategy (TIGALES)
7. Teachers'InstructionalGuide for Conventional Instructional Strategy (TIGCIS)
8. Evaluation Sheet for Assessing Teachers (ESAT)
   a. Evaluation Sheet for Assessing Buzz Session Teaching Strategy
   b. Evaluation Sheet for Assessing Adaptive Learning Environment Strategy
   c. Evaluation Sheet for Assessing Conventional Instructional Strategy

3.4.1 Pre-service Teachers Pedagogical Knowledge Test (PTPKT) (Appendix II)

The instrument measured Pre-service Teachers'pedagogical Knowledge. Initially, the Test had fifty (50) multiple choice items with four options labelled a-d.

The fifty (50) multiple choice items were given to two science education experts to ascertain the face and content validity based on some specified criteria such as adequacy, relevance, appropriateness, language, etc. Only thirty-five (35) items survived scrutiny. The thirty-five (35) multiple choice questions were given to my supervisor for final correction and modification and only thirty (30) items survived scrutiny using discrimination indices of 0.4 – 0.6.

Validationof PTPKT

The 30 items were administered in another neutral college which was not part of the colleges for the study and the items were found to be content and face valid. Also, to check for the reliability Kuder-Richardson formula KR20 was used, which gave reliability indexof 0.85.

3.4.2Pre-service Teachers' Lesson Planning Skills Scale (PTLPSS)(Appendix III)

The Pre-service Teachers Lesson Planning Skills Scale (PTLPSS) had two sections. Section A was demographic information. Section B was based on Likert scale of 1,2,3,4 and5 which stands for poor, Fair, Good, Very good and Excellent respectively. This section was further divided into different sections and sub-sections.These was to check the Pre-service teachers' teaching technique, appropriateness of lesson, fundamental strategies and class management/control using the Likert scale as explained above to get the needed information.

Validationof Pre-service Teachers' Lesson Planning Skills (PTLPSS)

Three professionals in Science Education were given copies of the modified PTLPSS, for corrections in respect of language level, difficulty, suitability and over all face and content validity of the instrument. Thereafter,based on their input, necessary corrections were effected. The instrument was also given to my supervisor who read through to make the final modifications. The instrument was then administered to 30 N.C.E II that were not part of the main study. The reliability coefficient of the instrument was calculated by using Scott pie (π) interrater analysis, which gave a reliability coefficient of 0.88.

3.4.3Pre-Service Teachers' Teaching Skills Scale (PTTSS)(Appendix I)

Pre-Service Teachers Teaching Skills Scale (PTTSS) had two sections. Section A,was demographic information. Section B was based on Likert scale of 1,2,3,4 and5 which stands for poor, Fair, Good, Very good and Excellent respectively. This section was further divided into different sections and sub-sections. These was to check the Pre-service teachers' teaching skills.

Validation of Pre-Service Teachers' Teaching Skills Scale (PTTSS)

Copies of the modified instrument were given to three professionals in Science Education for corrections in respect of language level, suitability and over all face and content validity of the instrument. Thereafter, based on their input, necessary corrections were effected. The instrument was also given to my supervisor who read through to make the final modifications. The instrument was then administered to 30 N.C.E II that were not part of the main study. The reliability coefficient of the

instrument wascalculated by using Scott pie (π) interrater analysis and 0.76 reliability coefficient was obtained.

3.4.4a Pre-service Teachers Self-Efficacy Scale (PTSES) (Appendix IV)

The instrument was adapted from Lisa-Looney (2003) and modified for the purpose of this study. This instrument was designed to measure Pre-service Teachers' Self-efficacy in teaching Basic science. This instrument consisted of twenty (20) items graded based on four-point Likert scale ranging from Strongly Agree, Agree, Disagree and Strongly Disagree. The positive statements were graded 4,3,2,1, respectively while the reverse was the case for the negative statement. The undecided column was cleared out in order to commit Pre-service students to either the positive or negative side of the issues.

Validity of Pre-service Teachers Self Efficacy Scale (PTSES)

The modified instrumentwas given to three experts of Science Education for their expert advice in respect to the language level, suitability and over all face and content validity of the instrument. Thereafter, based on their input, necessary corrections were effected. The instrument was also given to my supervisor who read through to make the final modifications. The instrument was then administered to 30 N.C.E II that were not part of the main study. The reliability coefficient of the instrument was calculated using the Cronbach alpha and 0.81index value was obtained.

3.4.4b Pre-service Mode of Entry Demographic Scale (PMEDS)

The Pre-service Mode of Entry Demographic Scale (PMEDS) was a demographic scale that was added to section A of all the instruments administered. The scale was at two levels and these are PRELIM and DIRECT.

3.4.5. Operational Guide for Buzz Session Teaching Strategy (OGBSTS)

Stages	Time	Activities
1.	5mins	**Review of Previous Work** Students' revised previous work done on the last topic while Lecturer watches
2.	5mins	**Group Discussion** Studentteachers brainstorm questions in groups
3.	5mins	**Facilitator and students interaction** Lecturer short talk on set questions while the students answer the questions
4.	9mins	**Setting New Task (1)** Student teachers were given new task
5.	6mins	**Lecturers Summary** Lecturer: summarizes student teachers presentations
6.	7mins	**StudentTeachersTask (2)** Studentteachers were given harder task, working in group
7.	11mins	**Lecturers Contribution** The facilitator made some clarifications on student teachers areas of difficulties
8.	12mins	**StudentTeachers Group Work** Student teachers group work continues

3.4.6. Operational Guide for Adaptive Learning Environment Strategy (OGALES)

1 Revision and Introduction:

i. Facilitator revised the previous lesson and introduced the new topic through questioning techniques

ii. Students answer the questions

2 Presentation:

Students explain and illustrate the concept being taught;

3 Guided practice:

Student teachers carryout task given to them and the facilitator guide by clarifying difficult areas;

4 Self-determiningexercise:

Student teachers engaged in an individual task in the classroom and thereafter,as homework.

3.4.7. Operational Guide for Conventional Instructional Strategy (OGCIS)

The strategy involves the following steps:

i. Lecturer introduces the lesson
ii. Lecturer explains theoretical basis for the topic
iii. Lecturer solves problems with examples and application
iv. Lecturer solicits questions from the class and gives class work
v. Lecturer marks the students' work.

Validation of Instructional Strategies Assessment Scale (CISAS)

The reliability of the instruments was determined by given them to three experts of Science Education for their expert advice in respect of suitability and over all face and content validity of the instrument. Thereafter, based on their input, necessary corrections were effected. The instrument was also given to my supervisor who read through to make the final modifications. The instrument were then administered to 30 N.C.E II that were not part of the main study. The reliability coefficient was obtained using interrater Scott pie (π). The reliability indices of 0.78, 0.79 and 0.79 were obtained for OGBSTTS, OGALES and OGCTS respectively.

3.4.8. Evaluation Sheet for Assessing Facilitatorson Adequate Application of the Packages (ESAF)

The instruments was used to evaluate the facilitators on the adequateapplication of the 3 strategies.

1. Buzz session Teaching Strategy

2. Adaptive learning Environment Strategy

3. Conventional Instructional Strategy

The rating scale comprise 2 parts

SECTION A:Consists of facilitators' information.

SECTION B: has to do with items to be assessed which are placed on Likertscale, rating from 5, 4, 3, 2, and 1 which stands for very good,good, average, poor and very poor respectively.

Validation of ESAF

The validation and reliability of the evaluation sheets was done by Science Education Experts. Thereafter, based on their input, necessary corrections were effected.

3.5 Research Procedure

Procedure for data collection was divided into three stages; pre-treatment stage, treatment stage and post-treatment stage.

Action Plan for Period of Data Collection

Data collection was conducted over a period of twelve (12) weeks as follows:
1 week for visitation to colleges of education used for the research.
1 week for training of research assistants on the use of the instructional guides
2 weeks for Pretest (first PTSES followed by PTPKT, PTLPSS, and PTTSS)
6 weeks for Treatment (using OGBST, OGALES and OGCIS)
2 weeks for Posttest (PTPKT, PTLPSS, and PTTSS)

3.5.1 Pre-treatment Stage

This stage lasted for four (4) weeks. It involved the pilot testing of the instruments and familiarization visits to the selected colleges.The researcher obtained introduction letter from the department to the appropriate Heads of Departments.Thereafter, training of Basic science facilitators that guided the pre-service teachers during treatment and application of pre-test instrument. Copies of the selected NCE II Integrated science time-tables were obtained to enable the Researcher to properly plan the data collection.

3.5.2 Training of Teachers/ Facilitators

The researcher used (1) week to trained the facilitators (the lecturers in the three colleges of education used for the study and they were lecturers teaching the course ISC 212 (Science Education II) on the use of Buzz session and Adaptive learning Environment Strategy in the teaching of Concepts in Basic science. The facilitators were trained on how to guide the student teachers on the use of these packages for teaching purposes. Areas of difficultieswere thoroughly explained and the facilitators' knowledge on the use of the packages was tested to ensure that the packages were effectively used for the purpose they were designed. The facilitators were assessed using the evaluation sheet. Facilitators that did not meet the standard required were re-trained to further eliminate the areas of disparity.

3.5.3 Administration of Pre-test

The researcher used a period of two (2) weeks as pre-test period in all the selected Colleges. Pre-test took place in both experimental and control groups using the stipulated instruments. Pre-service Teachers Self Efficacy Scale (PTSES) was administered first followed by Pre-service Teachers Pedagogical knowledge Test (PTPKT) on Buzz session and Adaptive learning Environment Strategy followed by the Pre-service Teachers Lesson planning skills Scale(PTLPSS) based on individual pre-service teachers lesson plan written on selected concepts in Basic science and lastly Pre-service Teachers Teaching skills Scale(PTTSS) on individual pre-service teacher micro-teaching in selected concepts in Basic science.

3.5.4 Treatment Stage

This stage lasted for six weeks within the first semester of 2018/2019 session. Buzz session wasused on experimental group I, while Adaptive learning Environment Strategy wasused on experimental group II and conventional strategy to control group.

Experimental Group I:Buzz session

Stages	**Time**	**Activities**
1.	5mins	**Review of Previous Work**

		Students' revised previous work done on the last topic while Lecturer watches
2.	5mins	**Group Discussion** Studentteachers brainstorm questions in groups
3.	5mins	**Facilitator and students interaction** Lecturer short talk on set questions while the students answer the questions
4.	9mins	**Setting New Task (1)** Student teachers were given new task
5.	6mins	**Lecturers Summary** Lecturer: summarizes student teachers presentations
6.	7mins	**Student Teachers Task (2)** Studentteachers were given harder task, working in group
7.	11mins	**Lecturers Contribution** The facilitator made some clarifications on student teachers areas of difficulties
8.	12mins	**StudentTeachers Group Work** Student teachers group work continues

Experimental Group 2 Adaptive learning Environment Strategy

1 Revision and Introduction:

iii. Facilitator revised the previous lesson and introduced the new topic through questioning techniques

iv. Students answer the questions

2 Presentation:

Students explain and illustrate the concept being taught;

3 Guided practice:

Student teachers carryout task given to them and the facilitator guide by clarifying difficult areas;

4 Self-determining exercise:

Student teachers engaged in an individual task in the classroom and thereafter,as homework.

Control Group:

Conventional lecture Method. Here, the lecturers used the instructional guide containing the lesson as follows;

i. Lecturer introduces the lesson
ii. Students explains theoretical basis for the topic
iii. Lecturer solves problems with examples and application
iv. Lecturer solicits questions from the class and gives class work
v. Lecturer marks the students work.

3.5.5 Administration of Posttest

This stage lasted for two (2) weeks. The posttest instruments Pre-service Teachers Pedagogical knowledge Test (PTPKT) on Buzz session and Adaptive learning Environment Strategies were administered first followed by the Pre-service Teachers Lesson planning skills Scale(PTLPSS) on the individual pre-service teachers lesson plan written on selected concepts in Basic science. Lastly, Pre-service Teachers Teaching skills Scale (PTTSS) based on individual pre-service teacher micro-teaching in selected concepts in Basic science was administered.

3.5 Method of Data Analysis

Data obtained were analysed using Analysis of Covariance (ANCOVA) and Estimated Marginal Means (EMM). Scheffe' Post Hoc Analysiswas used anywhere significant main effects exist in order to ascertain the bases of such significant differences. Graphical illustrations were usedto explain significant interaction effects that exist.

CHAPTER FOUR

RESULTS AND DISCUSSION

Results of the study were presented in order of hypotheses set as well as the discussion of the result. Section A contains the demographic analysis and section B contains the analysis of the hypotheses.

4.1 Demographic Data Analysis

Table 4.1: Pre-service Teachers' Self-efficacy

Self-efficacy	**Frequency**	**Percentage**
High	189	53
Low	169	47
Total	**358**	**100**

Result in Table 4.1 shows categories of pre-service teachers' self-esteem levels, the table reveals that many of the pre-service teachers have high self-esteem which accounted for 53% of the sampled population, while only 47% of the pre-service teachers have a low self-esteem.

Table 4.2: Pre-service Teachers' Mode of Entry

Mode of Entry	**Frequency**	**Percentage**
Direct	232	65
Indirect	126	35
Total	**358**	**100**

Result in Table 4.2 reveals the mode of entry of student teachers, the table reveals that 232 student teachers entered through a direct mode to the college which accounted for 65% of the sampled population, while only 126 or 47% of the pre-service teachers entered through an indirect means. It implies that student teachers with direct mode of entry are more represented in the study.

4.2: Testing the Null Hypotheses

H_o1: There will be no significant main effect of treatment on integrated sciencepre-service teachers'

(a) Pedagogical Knowledge

Table 4.3: Summary of Analysis of Covariance (ANCOVA) Showing Effect of Treatment, Self-efficacy and Mode of entry on pre-service Teachers Post Pedagogical Knowledge in Integrated science

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	15904.377[a]	12	1325.365	67.774	.000	.702
Intercept	13141.095	1	13141.095	671.987	.000	.661
Pre_PCK	230.448	1	230.448	11.784	.001	.033
One Way Interraction						
Treatment	13648.972	2	6824.486	348.979	.000*	.669
Self-efficacy	1.641	1	1.641	.084	.772	.000
Mode of entry	.292	1	.292	.015	.903	.000
Two Way Interraction						
Treatment * Self-efficacy	41.891	2	20.945	1.071	.344	.006
Treatment * Mode of entry	2.564	2	1.282	.066	.937	.000
Self-efficacy * Mode of entry	37.473	1	37.473	1.916	.167	.006
Three Way Interraction						
Treatment * Self-efficacy * Mode of entry	20.346	2	10.173	.520	.595	.003
Error	6746.674	345	19.556			
Total	130372.000	358				
Corrected Total	22651.050	357				

a. R Squared = .702 (Adjusted R Squared = .692)

Results in Table 4.3 reveals a significant main effect of treatment on integrated sciencepre-service teachers' pedagogical knowledge ($F_{(2;345)}=348.979;P<0.05;\eta^2=0.67$). 67.0% accounted for effect size, hence, the null hypothesis 1a was rejected. In order to determine the magnitude of the significant main effect across the treatment groups, the estimated marginal means of the treatment groups is presented in Table 4.3.1

Table 4.3.1: Showing the Estimated Marginal Means Score of Integrated sciencePre-service teachers' Pedagogical Knowledge across all Treatment Groups

Treatment	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Adaptive Instructional Strategy	19.338[a]	.508	18.338	20.337
Conventional Strategy	7.775[a]	.472	6.846	8.704
Buzz Instructional Strategy	24.014[a]	.449	23.131	24.898
Intercept				
Pre-score Knowledge	10.4665	-		
Post-score knowledge	17.042	.255		

Results in Table 4.3.1 reveals that pre-service teachers exposed to Buzz instructional strategy had the highest mean score ($\bar{x}$ =24.01), followed by those in Adaptive instructional strategy($\bar{x} = 19.34$), while those in conventional strategy group had the lowest mean score($\bar{x} = 7.78$). The table also reveals that the general performance of integrated sciencepre-service teachers' pedagogical knowledge at post-test known to be post behaviour ($\bar{x} = 17.04$) is higher than their performance at the pre-test score ($\bar{x} = 10.47$) which is also known as the entry behaviour. The significance of this is that those in Buzz session performed better than those in Adaptive learning strategy, while performance of those in Adaptive learning strategy group outweighs those in conventional group. These performance across all groups are hereby presented in figure 4.1 as a bar chart.

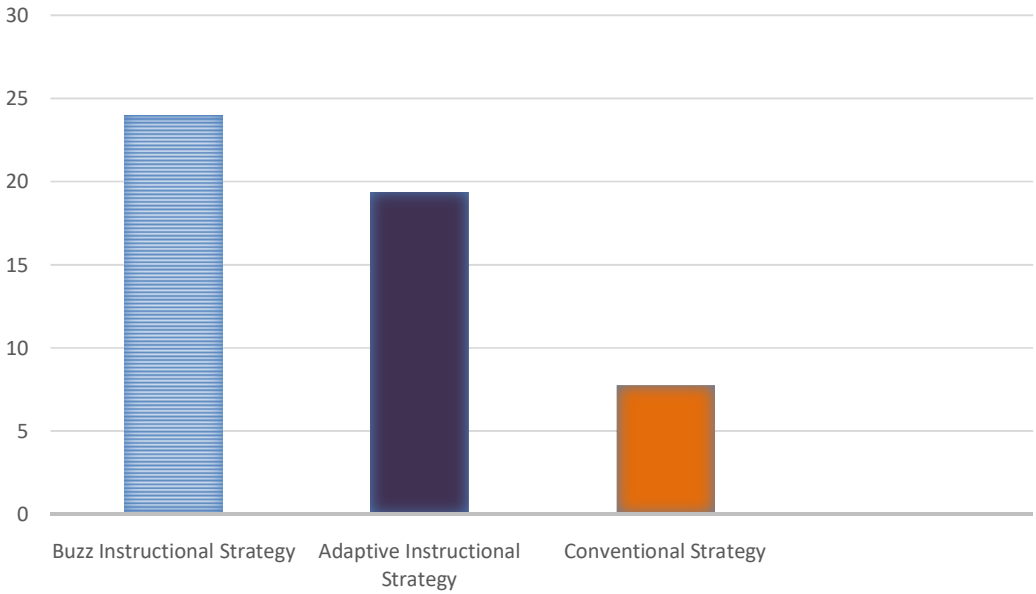


Fig. 4.1: Performance of Integrated sciencePre-service Teachers'Pedagogical Knowledge across all Treatment Groups

In order to determine the sources of significance, table 4.3.2 presents the pair wise comparisons of Scheffe' Post Hoc Analysis.

Table 4.3.2: Pair wise Comparisons of Scheffe' Post hoc Analysis on Pre-service Teachers Pedagogical Knowledge

Treatments	Adaptive Instructional Strategy	Buzz Instructional Strategy	Conventional Strategy
Adaptive Instructional Strategy		*	*
Buzz Instructional Strategy	*		*
Conventional Strategy	*	*	

*Note: * denotes a significant difference*

Result in Table 4.3.2 indicates the significant main effect that existed in table 4.3 is a result of the significant difference between:

i. Adaptive and Buzz Instructional Strategies
ii. Adaptive and Conventional Strategies
iii. Buzz and Conventional Strategies

(b) Lesson Planning Skills in Integrated Science

Table 4.4: Summary of Analysis of Covariance (ANCOVA) Showing the Effect of Treatment, Self-efficacy and Mode of entry on Lesson Planning Skills in Integrated Science

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	77701.164[a]	12	6475.097	140.397	.000	.830
Intercept	12306.926	1	12306.926	266.846	.000	.436
Pre-lessonskill	.866	1	.866	.019	.891	.000
One Way Interaction						
Treatment	65548.075	2	32774.037	710.626	.000*	.805
Self-efficacy	377.179	1	377.179	8.178	.004*	.023
Mode of entry	87.262	1	87.262	1.892	.170	.005
Two Way Interraction						
Treatment x Self-efficacy	309.528	2	154.764	3.356	.036*	.019
Treatment x Mode of entry	137.735	2	68.867	1.493	.226	.009
Self-efficacy x Mode of entry	425.941	1	425.941	9.236	.003*	.026
Three Way Interaction	496.496	2	248.248	5.383	.005*	.030
Treatment x Self-efficacy x Mode of entry	15911.386	345	46.120			
Error	994121.000	358				
Total	93612.550	357				
Corrected Total						

a. R Squared = .830 (Adjusted R Squared = .824)

Result in Table 4.4 shows a significant main effect of treatment on Integrated Sciencepre-service teachers' lesson planning skills ($F_{(2;345)}=_{710.626}$;$P<0.05$;$\eta^2=0.81$). 81.0% accounted for the effect size, consequently, the null hypothesis 1b was rejected. In order to determine the magnitude of significant main effect across the treatment groups, the estimated marginal means of the treatment groups is presented in Table 4.4.1

Table 4.4.1: Showing the Estimated Marginal Means Score of Integrated SciencePre-service teachers' Lesson Planning Skills across all Treatment Groups

Treatment	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Adaptive Instructional Strategy	49.585[a]	.686	48.236	50.933
Conventional Strategy	31.202[a]	.688	29.849	32.555
Buzz Instructional Strategy	67.414[a]	.666	66.105	68.723
Intercept				
Pre-score Knowledge	28.187	-		
Post-score knowledge	49.400	.392		

Results in Table 4.4.1 shows that pre-service teachers exposed to Buzz instructional strategy had highest mean score ($\bar{x}$ =67.41), followed by those in Adaptive instructional strategy($\bar{x}$ = 49.59), while those in the conventional strategy group had the lowest mean score($\bar{x}$ = 31.20). The table also reveals that the general performance of Integrated Sciencepre-service teachers' lesson planning skills at post-test ($\bar{x}$ = 49.40) is higher than their performance at the pre-test score ($\bar{x}$ = 28.19). The significance of this is that those in Buzz instructional strategy performed better than those in the Adaptive group, while performance of those in Adaptive group outweighs those in conventional group. These performance across all groups are hereby presented in figure 4.2 as a bar chart.

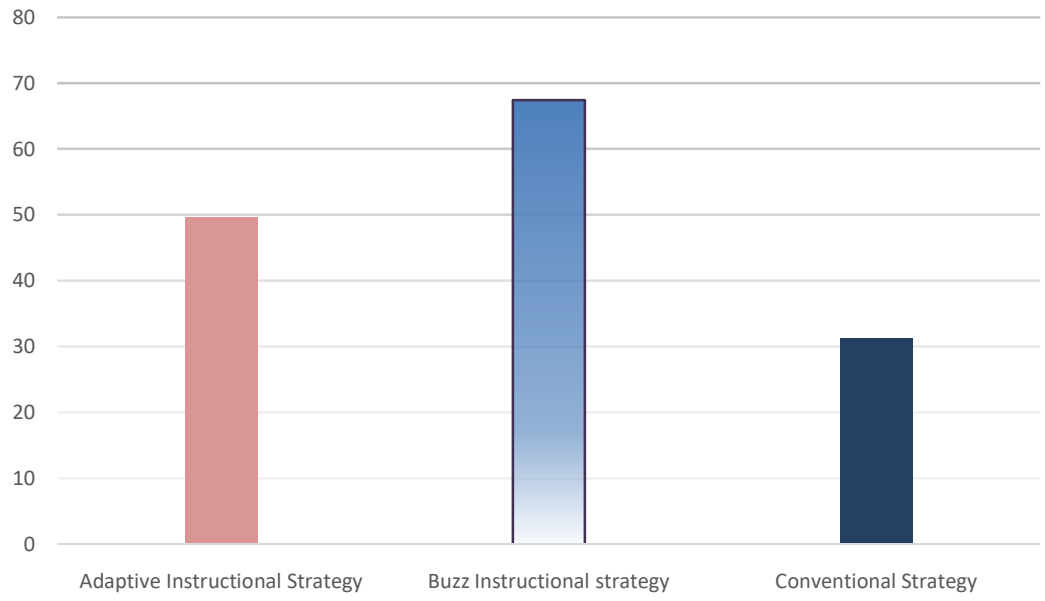


Fig. 4.2: Performance of Integrated SciencePre-service Teachers'Lesson Planning Skills across all Treatment Groups

In order to determine the sources of significance, table 4.4.2 presents the pair wise comparisons of Scheffe' Post Hoc Analysis.

Table 4.4.2: Pair wise Comparisons of Scheffe' Post hoc Analysis on Pre-service Teachers Lesson Planning Skills

Treatments	Adaptive Instructional Strategy	Buzz Instructional Strategy	Conventional Strategy
Adaptive Instructional Strategy		*	*
Buzz Instructional Strategy	*		*
Conventional Strategy	*	*	

*Note: * denotes there is a significant difference*

Results in Table 4.4.2 reveals the significant main effect that was indicated by table 4.4 was due to significant difference between:

i. Adaptive Instructional Strategy and Buzz Instructional Strategy
ii. Adaptive Instructional Strategy and Conventional Strategy
iii. Buzz Instructional Strategy and Conventional Strategy

(c) Teaching Skills in Integrated science

Table 4.5: Summary of Analysis of Covariance (ANCOVA) Showing the Effect of Treatment, Self-efficacy and Mode of entry on Integrated sciencePre-service Teachers'Teaching Skills

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	54076.151[a]	12	4506.346	40.212	.000	.583
Intercept	6382.926	1	6382.926	56.957	.000	.142
Pre_teaching_skill	692.182	1	692.182	6.177	.013	.018
One Way Interraction						
Treatment	45874.580	2	22937.290	204.678	.000*	.543
Self-efficacy	609.188	1	609.188	5.436	.020*	.016
Mode of entry	21.096	1	21.096	.188	.665	.001
Two Way Interraction						
Treatment x Self-efficacy	186.653	2	93.327	.833	.436	.005
Treatment x Mode of entry	279.832	2	139.916	1.249	.288	.007
Self-efficacy x Mode of entry	484.669	1	484.669	4.325	.038*	.012
Three Way Interraction						
Treatment x Self-efficacy x Mode of entry	981.728	2	490.864	4.380	.013*	.025
Error	38662.463	345	112.065			
Total	977170.000	358				
Corrected Total	92738.615	357				

a. R Squared = .583 (Adjusted R Squared = .569)

Results in Table 4.5 shows a significant main effect of treatment on Integrated sciencepre-service teachers' teaching skills ($F_{(2;345)}=_{204.678}$;$P<0.05$;$\eta^2=0.54$). 54.0% accounted for the effect size, hence, the null hypothesis 1c was rejected. In order to determine the magnitude of significant main effect across the treatment groups, the estimated marginal means of the treatment groups is presented in Table 4.5.1

Table 4.5.1: Showing the Estimated Marginal Means Score of Integrated SciencePre-service teachers' Teaching Skills across all Treatment Groups

Treatment	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Adaptive Instructional Strategy	47.820[a]	1.069	45.718	49.922
Conventional Strategy	35.094[a]	1.069	32.992	37.197
Buzz Instructional Strategy	65.026[a]	1.034	62.991	67.060
Intercept				
Pre-score Knowledge	29.858	-		
Post-score knowledge	49.313	.610		

Result in Table 4.5.1 shows that pre-service teachers exposed to Buzz instructional strategy had highest mean score ($\bar{x}$ =65.03), followed by those in Adaptive instructional strategy($\bar{x}$ = 47.82), while those in the conventional strategy group had the lowest mean score($\bar{x}$ = 35.09). The table also reveals that the general performance of Integrated sciencepre-service teachers' teaching skills at post-test ($\bar{x}$ = 49.31) is higher than their performance at the pre-test score ($\bar{x}$ = 29.86). The significance of this is that those in Buzz session group performed better than those in the Adaptive group, while performance of those in Adaptive group outweighs those in conventional group. These performance across all groups are presented in figure 4.3 as a bar chart.

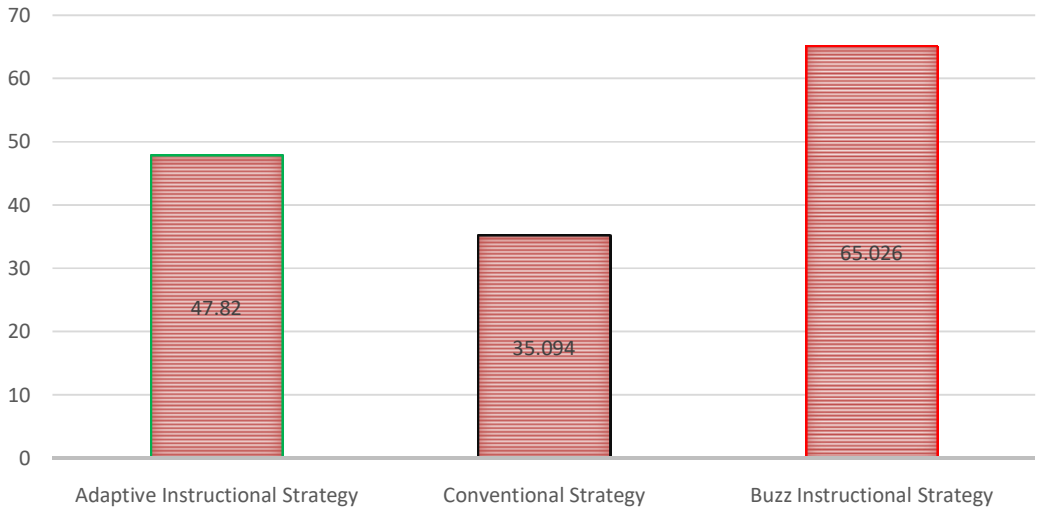


Fig. 4.3: Performance of Integrated SciencePre-service Teachers'Teaching Skills across all Treatment Groups

In order to determine the sources of significance, table 4.5.2 presents the pairwise comparisons of Scheffe' Post Hoc Analysis.

Table 4.5.2: Pair wise Comparisons of Scheffe' Post hoc Analysis on Pre-service Teachers Lesson Planning Skills

Treatments	Adaptive Instructional Strategy	Buzz Instructional Strategy	Conventional Strategy
Adaptive Instructional Strategy		*	*
Buzz Instructional Strategy	*		*
Conventional Strategy	*	*	

*Note: * denotes significant difference*

Results in Table 4.5.2 reveals the significant main effect that was indicated by table 4.5 was due to significant difference between:

i. Adaptive Instructional Strategy and Buzz Instructional Strategy
ii. Adaptive Instructional Strategy and Conventional Strategy
iii. Buzz Instructional Strategy and Conventional Strategy

H_o2: There was no significant main effect of self-efficacy on integrated science pre-service teachers'

(a) Pedagogical Knowledge

Results in Table 4.3 indicates that there is no significant main effect of self-efficacy on integrated science pre-service teachers' pedagogical knowledge ($F_{(1,345)}$=0.084;P>0.05;η^2=0.00).Therefore, hypothesis 2awas not rejected.

(b) Lesson Planning Skills

Results in Table 4.4 reveals a significant main effect of self-efficacy on integrated science pre-service teachers'Lesson Planning Skills ($F_{(1;345)}$=8.178;P<0.05;η^2=0.023).Consequently, hypothesis 2b was rejected. In order to know which category of the self-efficacy has the higher lesson planning skills, estimated marginal means was performed and its summary presented in table 4.6 below.

Table 4.6: Estimated Marginal Means Score of Integrated SciencePre-service Teachers' Lesson Skills across Self-efficacy

Self-efficacy	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
High	48.279	.556	47.187	49.372
Low	50.521	.552	49.434	51.607

The table above shows that pre-service teachers with low self-efficacy had higher lesson skills mean score ($\bar{x}$ =50.52) than those with a high self-esteem ($\bar{x}$ =48.28). This is graphically represented in a bar chart in figure 4.4

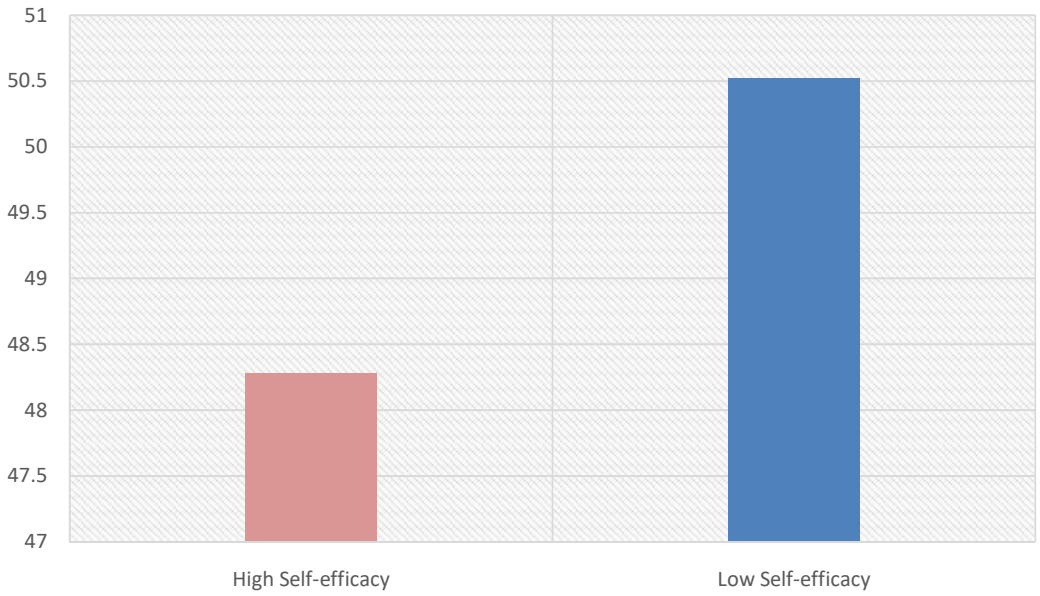


Fig 4.4: Performance of Integrated SciencePre-service Teachers Lesson Skills across Self-efficacy

(c) Teaching Skills

Result in Table 4.5 reveals a significant main effect of self-efficacy on Integrated Science pre-service teachers' teaching skills($F_{(1;345)}=_{5.436}$;$P<0.05$;$\eta^2=0.016$). Hence, hypothesis 2c was rejected. In order to know which category of the self-efficacy has the higher teaching skills, a summary of the estimated marginal means is in table 4.7 below.

Table 4.7: Estimated Marginal Means Score of Integrated SciencePre-service Teachers' Teaching Skills across Self-efficacy

Self-efficacy	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
High	47.887[a]	.867	46.182	49.593
Low	50.739[a]	.861	49.046	52.433

The table above reveals that pre-service teachers with low self-efficacy had higher teaching skills mean score ($\bar{x}$ =50.74) than those with a high self-esteem ($\bar{x}$ =47.89). This is graphically represented in a bar chart in figure 4.5

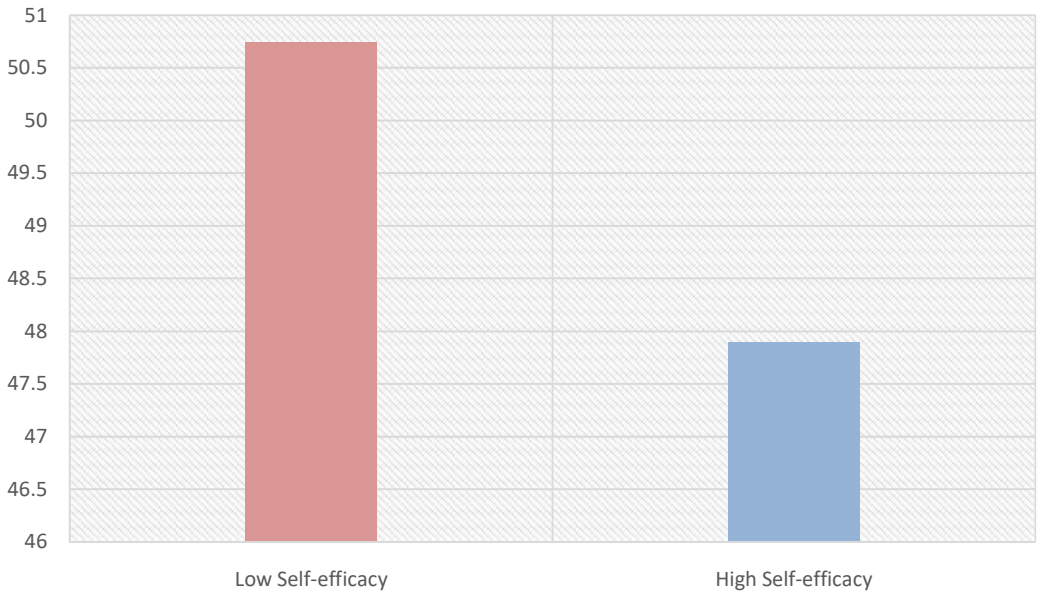


Fig 4.5: Performance of Integrated SciencePre-service Teachers Teaching Skills across Self-efficacy

H_o3: There was no significant main effect of mode of entry on integrated science Pre-service teachers'

(a) Pedagogical Knowledge

Result in Table 4.3 reveals that,there will be no significant main effect of mode of entry on integrated science pre-service teachers' pedagogical knowledge ($F_{(1;345)}$=0.015;P>0.05;η^2=0.00).Therefore, hypothesis 3awas not rejected.

(b) Lesson Planning Skills

Result in Table 4.4 indicates that there will be no significant main effect of mode of entry on integrated science pre-service teachers' lesson planning skills ($F_{(1;345)}$=1.89;P>0.05;η^2=0.17). Hence, hypothesis 3bwas not rejected.

(c) Teaching Skills

Result in Table 4.5 reveals that there will be no significant main effect of mode of entry on integrated science pre-service teachers' teaching skills ($F_{(1,345)}$=5.44;P>0.05;η^2=0.00). Consequently, hypothesis 3cwas not rejected.

H_o4: There was no significant interaction effect of treatment and self-efficacy on integrated science pre- service teachers'

(a) Pedagogical Knowledge

Result in Table 4.3 indicates there will be no significant interaction effect of treatmentand self-efficacy on integrated sciencepre-service teachers' pedagogical knowledge ($F_{(2,345)}$=1.07;P>0.05;η^2=0.01).Therefore, hypothesis 4awas not rejected.

(b) Lesson Planning Skills

Result in Table 4.4 reveals a significant interaction effect of treatmentand self-efficacy on integrated sciencepre-service teachers'Lesson Planning Skills ($F_{(2,345)}$=3.36;P<0.05;η^2=0.02). Hence, hypothesis 4b was rejected.Figure 4.6 is a line graph showing the line of interaction between treatmentand self-efficacy.

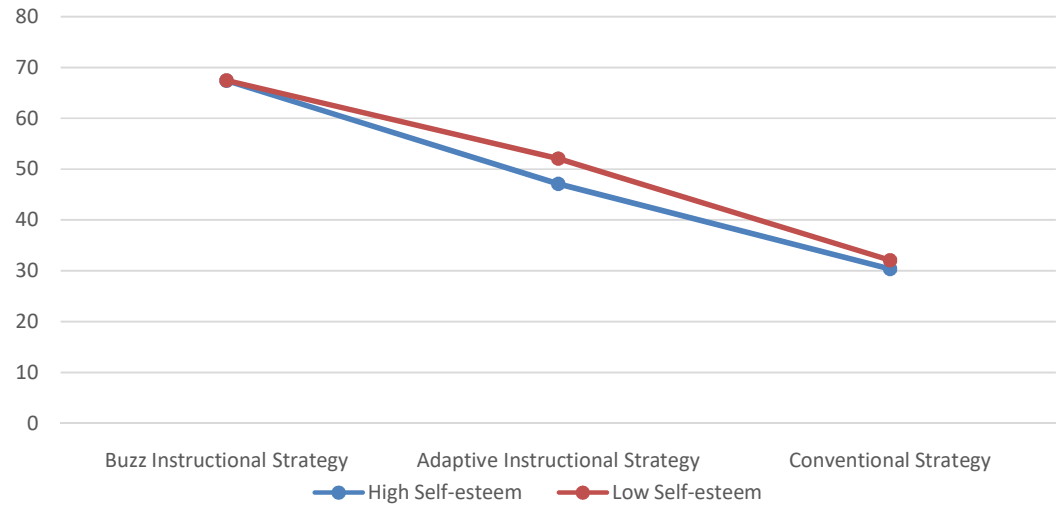


Fig. 4.6: Line Graph showing the Interaction between Treatmentand Self-efficacy

(c) Teaching Skills

Result in Table 4.5 reveals there will be no significant interaction effect of treatmentand self-efficacy on integrated sciencepre-service teachers' teaching skill ($F_{(2,345)}=0.83$;$P>0.05$;$\eta^2=0.01$).Therefore, hypothesis 4cwas not rejected.

H_o5: There was no significant interaction effect of treatment and mode of entry on integrated science pre-service teachers'

(a) Pedagogical Knowledge

Result in Table 4.3 indicates no significant interaction effect of treatmentand mode of entry on integrated sciencepre-service teachers' pedagogical knowledge ($F_{(2;345)}=0.07$;$P>0.05$;$\eta^2=0.00$). Consequently, hypothesis 5awas not rejected.

(b) Lesson Planning Skills

Result in Table 4.4 reveals there was no significant interaction effect of treatmentand mode of entry on integrated sciencepre-service teachers' lesson planning skills ($F_{(2;345)}=1.49$;$P>0.05$;$\eta^2=0.01$). Hence, hypothesis 5bwas not rejected.

(c) Teaching Skills

Result in Table 4.5 reveals there wasno significant interaction effect of treatmentand mode of entry on integrated sciencepre-service teachers' teaching skills ($F_{(2;345)}=1.23$;$P>0.05$;$\eta^2=0.01$).Therefore, hypothesis 5cwas not rejected.

H_o6: There was nosignificant interaction effect of self-efficacy and mode of entry on integrated science pre-service teachers'

(a) Pedagogical Knowledge

Result in Table 4.3 indicates no significant interaction effect of self-efficacyand mode of entry on integrated sciencepre-service teachers'pedagogical knowledge ($F_{(1;345)}=1.92$;$P>0.05$;$\eta^2=0.01$). Consequently, hypothesis 6awas not rejected.

(b) Lesson Planning Skills

Result in Table 4.4 reveals there was a significant interaction effect of self-efficacy and mode of entry on integrated sciencepre-service teachers'Lesson Planning Skills ($F_{(1;345)}=9.24$;$P<0.05$;$\eta^2=0.03$). Hence, hypothesis 6b was rejected.

Table 4.8 Estimated Marginal Means of the Interaction of Self-efficacy and mode of entry

Dependent Variable: post-lesson skills

Self-efficacy	Mode of entry	Mean	Std. Error	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
High	Indirect	49.727[a]	1.076	47.612	51.843
	Direct	51.744[a]	1.341	49.106	54.382
Low	Indirect	49.408[a]	.942	47.555	51.262
	Direct	46.377[a]	1.455	43.516	49.238

a. Covariates appearing in the model are evaluated at the following values: Pre-Lesson skills = 29.8575.

The table 4.8 showed that pre-service teachers with high self-efficacy and were admitted directly through UTME had a highest lesson planning mean score (51.744) this is followed by those who had a high self-efficacy but came in through pre-NCE programme(49.72). Figure 4.7 is a line graph showing the line of interaction between self-efficacy and mode of entry.

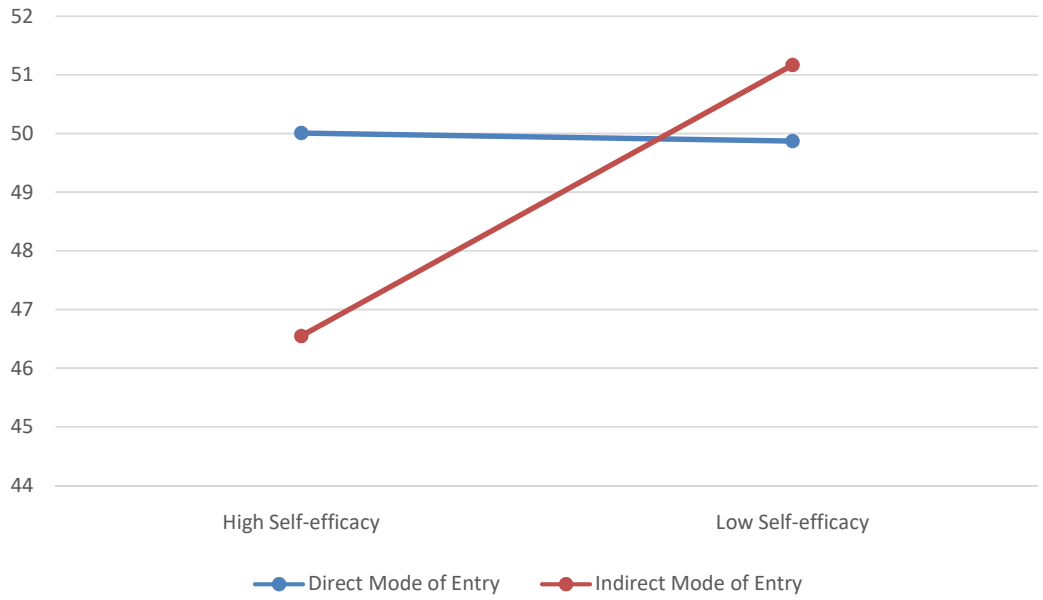


Fig. 4.7: Line Graph showing the Interaction between Self-efficacy and Mode of Entryon Lesson Planning Skills

(c) Teaching Skills

Results in Table 4.5 reveals there was a significant interaction effect of self-efficacy and mode of entry on integrated sciencepre-service teachers' teaching Skills ($F_{(1;345)}=_{4,33}$;$P<0.05$;$\eta^2=0.01$).Therefore, hypothesis 6c was rejected.

Table 4.9 Estimated Marginal Means of the Interaction of Self-efficacy and mode of entry

Dependent Variable: post-teachingskills

Self-efficacy	Modeofentry	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
High	Indirect	49.902[a]	.691	48.543	51.260
	Direct	51.056[a]	.864	49.356	52.756
Low	Indirect	49.984[a]	.606	48.792	51.176
	Direct	46.674[a]	.936	44.832	48.516

a. Covariates appearing in the model are evaluated at the following values: Pre-teachingskills = 28.1760.

Results in Table 4.9 showed that high self-efficacy pre-service teachers who were admitted through UTME (51.05) had the highest post-test teaching skills. Followed by those who were admitted through pre-NCE and have low self-efficacy (49.98). Figure 4.8 is a line graph showing the line of interaction between self-efficacy and mode of entry.

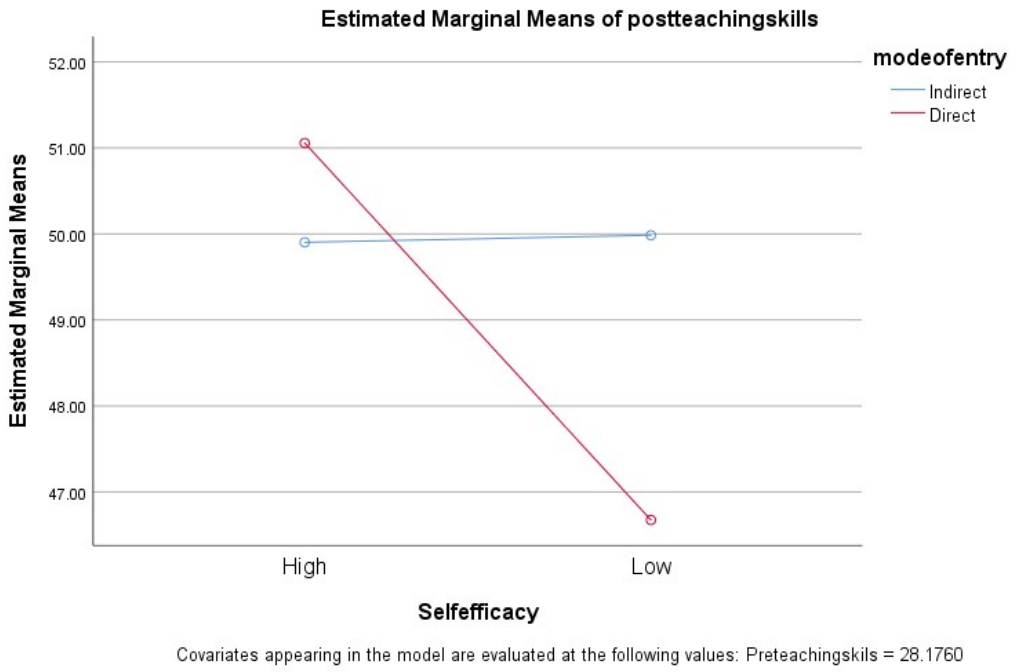


Fig. 4.8: Line Graph showing the Interaction between Self-efficacy and Mode of Entry onTeaching Skills

H_o7: There was no significant interaction effect of treatment, self-efficacy and mode of entry on integrated science pre-service teachers'

(a) Pedagogical Knowledge

Results in Table 4.3 reveals there was no significant interaction effect of treatment,self-efficacyand mode of entry on integrated sciencepre-service teachers' pedagogical knowledge ($F_{(2;345)}=5.20$;$P>0.05$;$\eta^2=0.00$).Therefore, hypothesis 7awas not rejected.

(b) Lesson Planning Skills

Results in Table 4.4 indicates a significant interaction effect of treatment, self-efficacy and mode of entry on integrated sciencepre-service teachers'Lesson Planning Skills ($F_{(2;345)}=5.38$;$P<0.05$;$\eta^2=0.03$).Therefore, hypothesis 7b was rejected.

Table 4.10: Interaction between Treatment,Self-efficacy and Mode of Entry on Lesson Planning Skills

Dependent Variable: post-lessonskills

Treatment	Self-efficacy	Modeofentry	Mean	Std. Error	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
Adaptive Instructional Strategy	High	Indirect	48.627[a]	1.532	45.614	51.640
		Direct	50.381[a]	2.082	46.286	54.475
	Low	Indirect	47.881[a]	1.699	44.539	51.224
		Direct	44.403[a]	2.936	38.628	50.179
Control	High	Indirect	39.606[a]	1.974	35.724	43.488
		Direct	35.026[a]	2.209	30.680	39.371
	Low	Indirect	33.230[a]	1.599	30.086	36.374
		Direct	32.516[a]	2.647	27.310	37.722
Buz Session Instructional Strategy	High	Indirect	60.949[a]	2.038	56.941	64.957
		Direct	69.826[a]	2.648	64.617	75.035
	Low	Indirect	67.114[a]	1.597	63.973	70.255
		Direct	62.212[a]	1.844	58.585	65.840

a. Covariates appearing in the model are evaluated at the following values: Pre-Lessonskills = 29.8575.

Results in Table 4.10 shows that high self-efficacy pre-service teachers who were admitted through UTME, and exposed to Buzz Session Instructional Strategy (69.83) had the highest lesson planning skills, this is followed by those with low-self efficacy and were admitted through pre-NCE exposed to the same Buzz session (67.11). This is closely followed by the pre-service teachers with low-self efficacy admitted through UTME (62.21). Figure 4.9a and b, are linesof graphs showing the lines of interaction between treatment, self-efficacy and mode of entry.

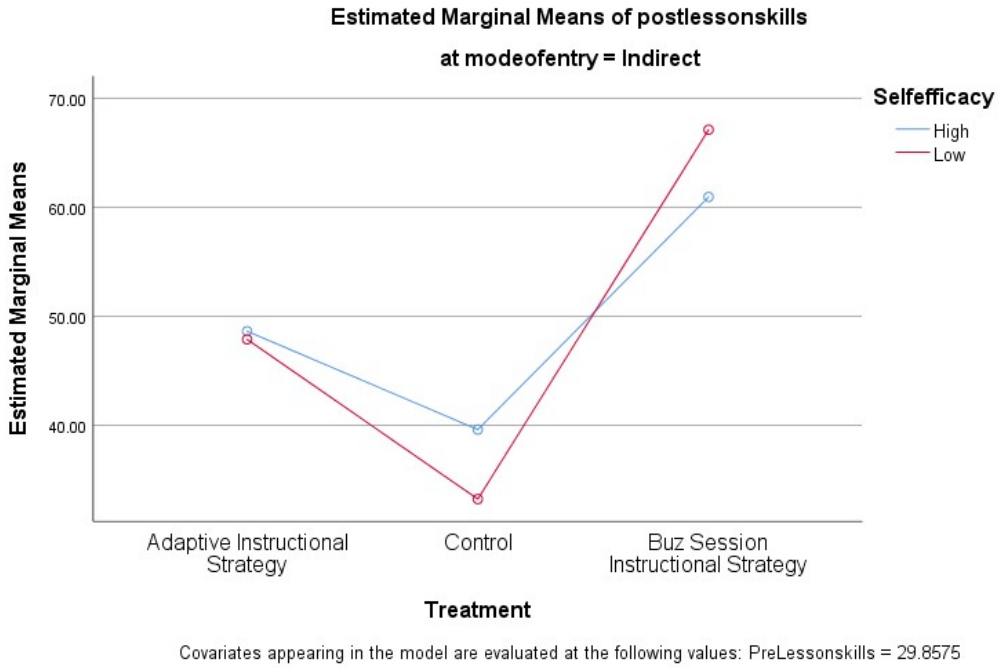


Fig. 4.9a Line Graph showing the Interaction between Treatment,Self-efficacy and Mode of Entry (Pre-NCE) on Lesson Planning Skills

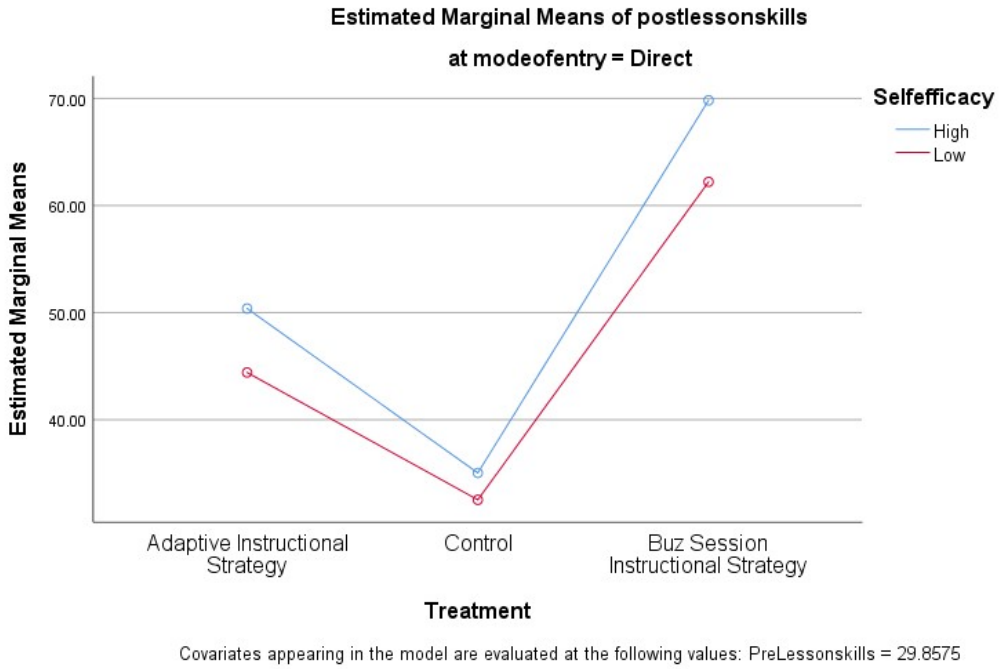


Fig. 4.9b Line Graph showing the Interaction between Treatment,Self-efficacy and Mode of Entry (UTME) on Lesson Planning Skills

(c) Teaching Skills

Results in Table 4.5 reveals a significant interaction effect of treatment, self-efficacy and mode of entry on integrated sciencepre-service teachers' teaching Skills ($F_{(2,345)}=_{4.38}$;$P<0.05$;$\eta^2=0.03$).Therefore, hypothesis 7c was rejected.

Table 4.11: Interaction between Treatment, Self-efficacy and Mode of Entry on Teaching Skills

Dependent Variable: post-teachingskills

Treatment	Self-efficacy	Modeofentry	Mean	Std. Error	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
Adaptive Instructional Strategy	High	Indirect	50.812[a]	.984	48.877	52.748
		Direct	53.040[a]	1.338	50.408	55.672
	Low	Indirect	51.384[a]	1.092	49.237	53.532
		Direct	43.151[a]	1.893	39.428	46.875
Control	High	Indirect	32.446[a]	1.269	29.949	34.943
		Direct	31.693[a]	1.425	28.889	34.497
	Low	Indirect	30.066[a]	1.032	28.036	32.096
		Direct	30.627[a]	1.706	27.272	33.982
Buz Session Instructional Strategy	High	Indirect	66.447[a]	1.315	63.860	69.033
		Direct	68.436[a]	1.705	65.082	71.790
	Low	Indirect	68.503[a]	1.033	66.471	70.534
		Direct	66.245[a]	1.190	63.904	68.585

a. Covariates appearing in the model are evaluated at the following values: Pre-teachingskills = 28.1760.

Pre-Service teachers with low self-efficacy, admitted through pre-NCE exposed to Buzz Session Instructional Strategy (68.503), followed by high self-efficacy admitted UTME (68.436), High-Self efficacy who were admitted through pre-NCE in the treatment (66.47).Figure 4.10a and b, are lines of graphs showing the lines of interaction between treatment, self-efficacy and mode of entry.

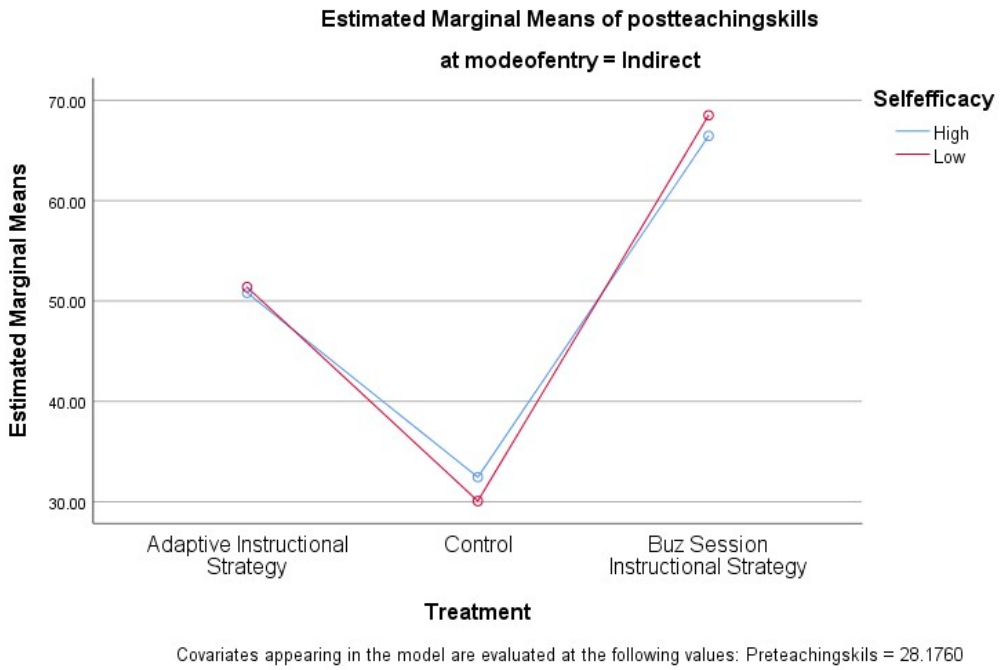


Fig. 4.10a Line Graph showing the Interaction between Treatment,Self-efficacy and Mode of Entry (Pre-NCE) on Teaching Skills

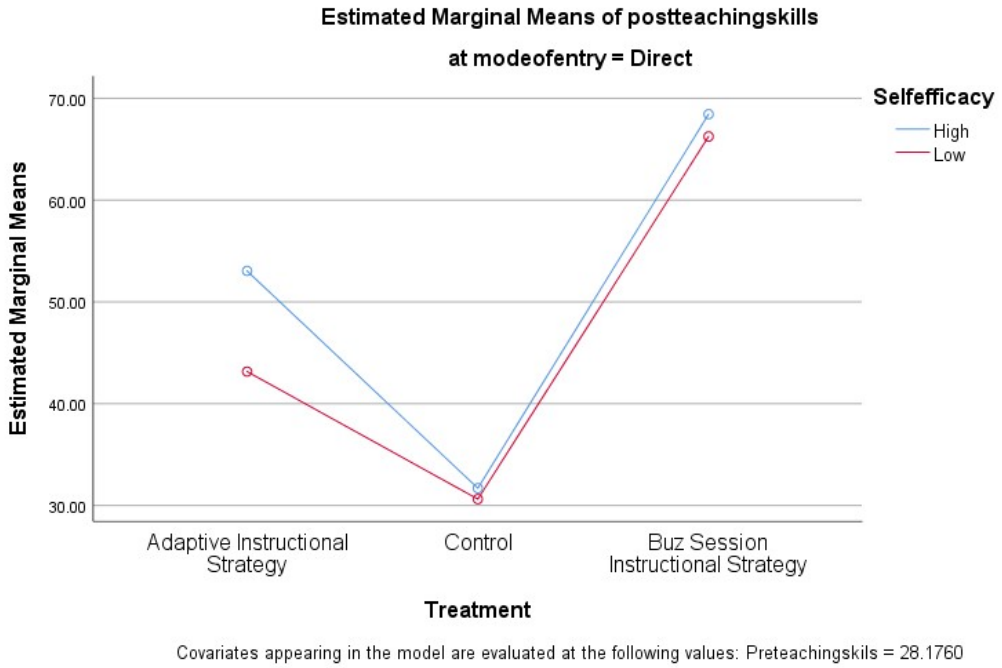


Fig. 4.10b Line Graph showing the Interaction between Treatment,Self-efficacy and Mode of Entry (UTME) on Teaching Skills

4.3 Discussion of Results

4.3.1 Impact of Treatment on Integrated science Pre-service Teachers' Pedagogical Knowledge

Findingsrevealedthat treatment (BS and ALES) had significant main effect on integrated science pre-service teachers' pedagogical knowledge and the effect size accounted for 67.0%. This finding is in agreement with Stronge (2007) assertion that there is anaffirmativeconnection between teachers' unwrittencapability, pedagogical knowledge and student performance. Pedagogical knowledge has been measured asparameter of teachers' competence. Likewise, Cochran-Smith (2001) opined that there are 3-ways to evaluate teachers' education programmes by researchers and policy makers. Majorly, long-term results effect, refers to the interactions between teacher proficiency on the utilization of teaching strategy and student learning.

Pinamang and Penrose (2017) reported Ashanti student teachers' pedagogical knowledge in teaching geometric transformation (GT)in Ghana. Sample consisted of 82student teachers from two Colleges of Education. It was an empirical study which engaged survey method of investigationusingGT-Achievement Test(GTAT) as instrument for data collection. GTAT was administered on student teachers to ascertain their level ofexperienceon pedagogical knowledge in GT. Findingsconfirmed low level of pedagogical knowledge among student teachers in GT. Correlation analysis revealed a weak positive significant relationship between student teachers' content and pedagogical knowledge. Therefore,it was recommended that GT content and pedagogical courses be treated practically in order for student teachers to sufficientlypractise on their own ahead of the task that await them.

4.3.2 Impact of Treatment on Integrated Science Pre-service Teachers' Lesson Planning Skills

Findings revealedthat treatment had significant main effect onIntegrated Scienceteachers' lesson planning skills and the effect size accounted for 81.0%. The finding is in agreement with Kablan (2012) who asserted that lesson plan preparation contributes immensely towards teachers' instructional delivery and learning outcome.

Sahin-Taskin (2017) reported student teachers' perceptions of lesson planning in primary education. Eighteen student teachers on teaching practice exercise at

primary schools were used as sample. Semi-structured interviews was employed for data collection andcontent analysis for analyses. Two groups were discovered as difficulties of planning and functions of lesson plans. Results revealed that, primary student teachers are conscious of planning lessons significance; but encountered problems at the course of planning. They argue that, time limitation constrained them from attending to pupils desires as expected which had negative impact on their preparation. Thus, the researcher concluded that, student teachers need ample time/period to familiarise themselves with the pupils for effective pedagogy.

4.3.3 Impact of Treatment on Integrated Science Pre-service Teachers' Teaching Skills

Thefindings reveals that main effect of treatment was significant on Integrated Science pre-service teachers' teaching skills and the effect size accounted for 54.0%. The finding aligned with the study of Olajide (2015) which revealed a high level of student satisfaction in using Buzz session strategy while Okurumeh (2009) supported use of Buzz session by saying that students'engagement in teaching process is of immense important and it mould them to become an autonomous learner and solution provider.

Sahan (2017) reported the opinions of student teachers pedagogical development programmeonfacilitators' teaching skills. 220 student teachers partook in the programme. Opinions of Teaching Skills Scale (OTSS) was designed and used for data collection. Data were analysed using ANOVA to determine level of significant between student teachers perception, gender and subject area considered. Findings revealed that student teachers opinion of facilitator is often prove act of teaching skills. Also, comparison level existed between subject facilitators and pedagogy based on overall facilitators conducts on the whole processes. Though, they exhibited greater regularities to field facilitators based on their conducts. Gender was significantly decisive element on student teachers opinions concerning overall facilitators conducts. While, relative effect of subject area was on student teachers opinion of conduct in the warm up stage only.

4.3.4 Impact of Self-efficacy on Integrated Science Pre-service Teachers' Pedagogical Knowledge

The finding shows that the main effect of self-efficacy on integrated science pre-service teachers' pedagogical knowledge was insignificant. The finding is in support of the study of Depaepe and Konig (2018) that reported General Pedagogical knowledge (GPK), self-efficacy (SE) and instructional practice (IP) unravel their relations in pre-service teachers' education. Professionalism consisted of cognitive (professional knowledge) and affective (professional beliefs) constituent. The work employed connection between GPK and SE on 342 pre-service teachers sampled. Finding revealed insignificant relationship between GPK and SE on IP.

4.3.5 Impact of Self-efficacy on Integrated Science Pre-service Teachers' Lesson Planning Skills

The finding reveals that there is a significant main effect of self-efficacy on Integrated Science pre-service teachers' Lesson Planning Skills. The finding is in agreement with the study of Giles, Byrd and Bendolph (2016) determined the comparison between elementary pre-service teachers' self-efficacy and mathematics teaching. 41 participants were drawn from one University. Mathematics teaching efficacy beliefs instrument (MTEBI) of 21 items using a five-point likert scale for data collection. The instruments was further divided into two personal mathematics teaching efficacy belief (PMTEB) and mathematics teaching outcome expectant (MTOE). Findings from PMTEB (mean = 51.08, SD = 5.17) shows significant correlation. Likewise, findings on MTOE (mean = 29.32, SD = 3.29) reveals significant expectations of learners mathematic learning. They concluded that self-efficacy should be incorporated into teacher preparations programme in order to produce professional teachers.

4.3.6 Impact of Self-efficacy on Integrated Science Pre-service Teachers' Teaching Skills

The findingrevealsthat the main effect of self-efficacy on Integrated Science pre-service teachers' teaching skills was significant. The finding concur with the study of Colson, Sparks, Berridge, Frimming and Willis (2017)that worked on student teachers and self-efficacy to produce effective teachers to improve learners'

performance in schools. This study was carried out in Midwestern tertiary institution to compare the classroom interaction of student teacher exposed to one year teaching practice exercise and student teachers exposed to a term teaching practice exercise in order to make prospective teachers acquire adequate classroom management skills and experience of school setting. Teacher sense of efficacy scale of 24-items and 9-demographic questions were used to obtain data on student teachers attitude to work with learner, learner engagement, pedagogical strategies, classroom administration, individualised teaching, response to learners need and learners involvement in the classroom interaction. Thus, the findings revealed that student teachers in one year teaching practice exercise perform better than their colleagues in one term teaching practice exercise.

4.3.7 Impact of Mode of Entry on Integrated Science Pre-service Teachers' Pedagogical Knowledge

The finding shows that the main effect of mode of entry on integrated science pre-service teachers' pedagogical knowledge was not significant. This finding aligned with the study of Emaikwu (2012) who worked on evaluation of the effects of learners' entrance level into tertiary institutions and their academic performance in Nigeria. Expo-factor research design was used, four research questions were raised and answered and four hypotheses were formulated and tested at 0.05 level of significant. Proportionate stratified random sampling techniques was used to select 253 samples from two Universities in Benue State. Data obtained were analysed using analysis of variance and t-test. The finding revealed that there was statically insignificant difference in the mean score of learners entered into the university by UTME, remedial programme and direct admissions while gender shows significance difference in the means score, male learners performed better than their female learners among three means of admissions into tertiary institutions. It was recommended that the three means of admissions should be employed by tertiary institutions on proportionality and institutions should discourage element of discrimination among the learners in order to promote academic excellent and better products.

4.3.8 Impact of Mode of Entry on Integrated Science Pre-service Teachers' Lesson Planning Skills

The finding reveals that the main effect of mode of entry on integrated science pre-service teachers' lesson planning skills was not signficant. This finding aligned with Opoko, Alagbe, Aderonmu, Ezema and Oluwatayo (2014) research work, which revealed no significant relationship between entry requirements and learning outcome of learners of architecture in building construction. While, Newton and Newton (2009) opined that reasonable number of student teachers were not confidence in formulating science lessons and waste much period, most especially on topics not treated with them.

4.3.9 Impact of Mode of Entry on Integrated Science Pre-service Teachers' Teaching Skills

The findingrevealsinsignificant main effect of mode of entry on integrated science pre-service teachers' teaching skills. The finding aligned with the finding of Agoro (2012) who reported that the performance of the pre-service teachers' entrance level into colleges of education examined, had no difference but research showed that Prelim student teachers' performance was better in science process skills examined than their counterpart. The increase in performance of prelim group maybe associated with their spending one year ahead of the direct entry group in the college. That is, the duration of their stay in the college might have contributed to their improved performance in science process skills. Likewise, study of Musa and Saliu (2016), revealed that learners that came in through direct entry at 300 level had outstanding performance in ADS than those that came in through Universities Matriculation Examinations at 100 level while those that came in through direct entry at 200L had the lowest learning outcome. Also, Dodds, et al. (2010) carried out a study on medical students in United Kingdom and Irish medical schools and discovered that graduate entrants had better achievement to their direct entrants' colleagues in the aspect of clinical skills and practice. While, Duggan, et al(2014) discovered that graduate entrants had better achievement to their direct entrants' colleagues in the aspect research based performance.

4.3.10 Interaction Effect of Treatment and Self-efficacy on Integrated science Pre-service Teachers' Pedagogical Knowledge

The findingreveals that interaction of treatmentand self-efficacy on integrated sciencepre-service teachers' pedagogical knowledge was not significant. This finding corroborate the study of Gbolagade (2009) who emphasised the importance of using appropriate instructional strategies to develop science skills and pedagogical knowledge of student teachers. It also revealed students' knowledge of various subject matter especially in science subjects had dropped in tertiary institutions which accounted for their low performance during teaching practice exercise.

Also, literature reviewed on self-efficacy has revealed that pre-service teachers with high self-efficacy performed better than their counterpart with low self-efficacy.Ogunbameru and Uwameiye (2012) identified low self-efficacy of student teachers as a factor responsible for their low performance. They suggested that if self-efficacy of student teachers can be enhanced, it will invariably improve their performance.

4.3.11 Interaction Effect of Treatment and Self-efficacy on Integrated Science Pre-service Teachers' Lesson Planning Skills

Thefinding reveals a significant interaction effect of treatmentand self-efficacy on Integrated Science pre-service teachers'Lesson Planning Skills. The finding is in support of the study of Anderson and Maninger(2007); Chen(2010) and Teo(2008) who discovered self-efficacy as an important factor of purpose/goal. Anderson and Maninger (2007) reported student teachers' intentions to explore different soft-gadget and discovered students views and abilityas important factors. Ogunbameru and Uwameiye (2012) have identified low ability of NCE student teachers as a factor responsible to their performance deficiencies. Thus, if pre-service teachers' self-efficacy could be enhanced, their performance deficiencies would be remediated.

Afifah (2019) carried out research on buzz group technique to enhance learners'understanding of concepts. He used quasi experimental research design. Test was used to for data collection. Paired t-test and independent t-test were used for data analyses. The finding revealed that there was positive improvement on learners taught using buzz group strategy compared to conventional method.

4.3.12 Interaction Effect of Treatment and Self-efficacy on Integrated Science Pre-service Teachers' Teaching Skills

The findingrevealsinsignificant interaction effect of treatmentand self-efficacy on integrated sciencepre-service teachers' teaching skill. This finding is contrary to the study of Mahyuddin, Elias, Cheong, Muhamad, Noordin and Abdullah (2006) carried out a research on comparison between learners' self-efficacy and their performance in English Studies. One thousand, one hundred and forty-six samples of form four learners were selected from eight secondary schools in a district at Selangor. Stratified random sampling technique was used to select subjects. Six hundred and forty-six of the sample were males while four hundred and ninety-nine were females. Concerning ethnic group four hundred and ninety-one samples from Malaysia, three hundred and seventy-four from China, two hundred and forty-eight from India and twenty-five other countries. On school location, four hundred and nineteen sample were from urban schools while seven hundred and twenty-seven were from rural schools. Descriptive correlation design was used and self-efficacy scale (SES) developed by Bandura was adopted which include academic performance, meeting other prospects, co-curricular exercise, individualised learning, self-aggressiveness, encouragement and self-operation. Correlational analysis run revealed positive significant relationship between self-efficacy and academic performance in English Studies. The scopes are academic performance, self-efficacy, other prospects and self-gracefulness.

4.3.13 Interaction Effect of Treatment and Mode of Entry on Integrated Science Pre-service Teachers' Pedagogical Knowledge

The findingrevealsinsignificant interaction effect of treatmentand mode of entry on integrated sciencepre-service teachers' pedagogical knowledge.

4.3.14 Interaction Effect of Treatment and Mode of Entry on Integrated Science Pre-service Teachers' Lesson Planning Skills

The finding revealsinsignificant interaction effect of treatmentand mode of entry on integrated sciencepre-service teachers' lesson planning skills. The finding aligned with the views of Tashevska (2008) who reviewed literatures and asserted thatstudent teachers experienced difficulties in harnessing materials for lesson note irrespective of their mode of entry. Which means that lesson planning skills can be

difficult to a novice teacher who will prepare the lesson from textbooks or from browsing from the internet. Also, Senior (2006) after searching through literatures concluded that pre-service teachers' or novice teachers spent most of their time planning lessons and found the planning process to be difficult as most of the materials that is needed could not be readily available for the novice teachers to peruse, therefore taking them time to prepare a lesson.

4.3.15 Interaction Effect of Treatment and Mode of Entry on Integrated Science Pre-service Teachers' Teaching Skills

The findingreveals insignificant interaction effect of treatmentand mode of entry on integrated sciencepre-service teachers' teaching skills. This finding is contrary to reviewed literatures ofSurel (2010) who compared the different teaching styles from different faculties in higher institution and revealed that the teaching skills of these faculties can contribute to the teaching and training of more quality teachers. Also, the study of Liu et al. (2017) reported adaptive strategy on college students at remedial classes and they got mixed result, which they attributed to time duration.

4.3.16 Interaction Effect of Self-efficacy and Mode of Entry on Integrated Science Pre-service Teachers' Pedagogical Knowledge

The findingrevealsinsignificant interaction effect of self-efficacyand mode of entry on integrated sciencepre-service teachers' pedagogical knowledge. The finding aligned with the study of Opoko, Alagbe, Aderonmu, Ezema and Oluwatayo (2014), they observed no relationship between entry requirements and learning outcome of learners of architecture in building construction. The finding is contrary to the study of Adewale and Adhuze (2014), whoreported a low significant relationship between learning outcome of architecture students with their entry qualification in Physics and Mathematics.

4.3.17 Interaction Effect of Self-efficacy and Mode of Entry on Integrated Science Pre-service Teachers' Lesson Planning Skills

The finding reveals significant interaction effect of self-efficacy and mode of entry on Integrated Science pre-service teachers'Lesson Planning Skills. The result revealed that pre-service teachers with high self-efficacy performed better in lesson planning skill irrespective of their mode of entry. The result is in support of Schippera,

Goeia, Vries and Veen (2018), they carried out a research on developing teachers' self-efficacy and adaptive teaching strategy through lesson study. Mixed methods design of quasi-experimental was used to compare pretest and posttest data of intervention and comparison group teachers (N=48). Data were collected using immediate stimulated recall interviews, teacher self-efficacy questionnaire and international comparative analysis of learning and teaching observation instrument were used for. Data were analysed using ANOVA. The finding revealed a significantdifferent between experimental and control groups in terms of efficacy in learners involvement, classroom administration and instructional strategy.Also, Dodds, et al. (2010) observed medical students in United Kingdom and Irish medical schools and discovered that graduate entrants had better achievement to their direct entrants' colleagues in the aspect of clinical skills and practice. While, Duggan et al., (2014) discovered that graduate entrants had better achievement to their direct entrants' colleagues in the aspect research based performance.

Lee and Lee (2014) carried out research work on promotingstudent teachers' self-efficacy beliefs for technology integration through lesson planning practice and their findings revealed that lesson planning skills was seen as the only significant determinant for pre-service teachers' self-efficacy for technology integration. Also, König, Bremerich-Vos, Buchholtz, Fladung and Glutsch (2020) worked on enhancing student teachers' lesson planning skills and the finding showed a significant improvement in lesson planning skills. This development of planning skills showcase the level of their activeness during induction and expertise advancement in preparing a lesson plan.

4.3.18 Interaction Effect of Self-efficacy and Mode of Entry on Integrated Science Pre-service Teachers' Teaching Skills

The finding shows that there is a significant interaction effect of self-efficacy and mode of entry on integrated science pre-service teachers' teaching skills. The result revealed pre-service teachers with high self-efficacy performed better in teaching skill notwithstanding their mode of entry. The finding is support of the study of Pendergast, Garvis and Keogh (2011), they carried out research on teacher education programme and asserted that teachers' self-efficacy maybe improved by training programme of pre-service teachers. Likewise, Hemmings (2015) opined that

studentteachers and their lecturers werecognizant of implications and relationship between self-efficacy and teaching proficiency.

Musa and Saliu (2016), revealed that learners that came in through direct entry at 300 level had outstanding performance in ADS than those that came in through Universities Matriculation Examinations at 100 level while those that came in through direct entry at 200L had the lowest learning outcome. Also, Dodds, et al. (2010) carried out a study on medical students in United Kingdom and Irish medical schools and discovered that graduate entrants had better achievement to their direct entrants' colleagues in the aspect of clinical skills and practice. While, Duggan, et al(2014) discovered that graduate entrants had better achievement to their direct entrants' colleagues in the aspect research based performance.

4.3.19 Interaction Effect of Treatment, Self-efficacy and Mode of Entry on Integrated Science Pre-service Teachers' Pedagogical Knowledge

The findingreveals insignificant interaction effect of treatment,self-efficacyand mode of entry on integrated sciencepre-service teachers' pedagogical knowledge. The finding is in support of Omeodu (2019),who worked on a survey in River State on instructional strategies used as mode of instruction by physics teachers in senior secondary schools.The finding revealed that Buzz instructional strategy was rated as one of the strategies not employed by the facilitatorsfor instruction in physics. Contrary toAkudolu and Umenyi (2016) research, theyworked on institutionalizing culture of peace in basic education through appropriate curriculum implementation.The finding revealed that Buzz session is one the interactive strategies often employed to facilitate instruction.

4.3.20 Interaction Effect of Treatment, Self-efficacy and Mode of Entry on Integrated Science Pre-service Teachers' Lesson Planning Skills

The findingreveals significant interaction effect of treatment, self-efficacy and mode of entry on Integrated Science Pre-service Teachers' Lesson Planning Skills. The finding reveals that pre-service teachers in Buzz group performed better in lesson planning skills irrespective of their levels of self-efficacy and mode of entry, this reveals the effects of social interaction in Buzz session strategy which enhance the performance of pre-service teachers in lesson planning skills than their counterparts in other groups. The finding aligned with the study of Muntaha (2016), who reported Indonesian EFL (English as a foreign language) Classroom onBuzz Session and Self-Esteem on Teaching Listening. His study involvedsystematic manipulation of experimental condition and factorial design was employed. Two classes were sampled using cluster random sampling technique and 60 students constituted the total population for the study. Test and questionnaire were used for data collection. Data collected were analysed using ANOVA. The finding revealed the effect of teaching techniques on listening skill depends on the degree of self-esteem, Buzz strategy is more effective than the lecturing method for teaching listening skill and students with high self-esteem have better listening skill to those with low self-esteem. Contrary toSural (2019), who examinedstudent teachers' competencies in lesson planning.His finding revealed that student teachers' competency level in lesson planning

wasinsignificant. Also, both public and private school instructors' answers to open-ended questions illustrated that facilitators' theoretical and practical skills in lesson planning were not okay.

Dziuban, et al. (2018) carried out research work on adaptive teaching at two higher institutions of learning in different areas of students' specialization and they discovered that the strategy had significant effect on the instruction. Likewise, Siddique et al. (2019) in their study, they are of the view that previous experience, students' memory and styles of learning characterized adaptive learning. The finding revealed that learners taught with an adaptive strategy, performed better to others not taught with the strategy. While, the study of Musa and Saliu (2016), revealed that learners that came in through direct entry (300 level) had outstanding performance in ADS than those that came in through Universities Matriculation Examinations(100 level) while those that came in through direct entry (200 level) had the lowest learning outcome.

4.3.21 Interaction Effect of Treatment, Self-efficacy and Mode of Entry on Integrated Science Pre-service Teachers' Teaching Skills

The finding reveals a significant interaction effect of treatment, self-efficacy and mode of entry on integrated science pre-service teachers' teaching Skills. The result reveals pre-service teachers in Buzz group performed better in teaching skills irrespective of their levels of self-efficacy or mode of entry, thisreveals the effects of social interaction in Buzz session strategy which improvepre-service teachers' performance in teaching skills than their counterparts in other groups.This finding aligned with the study of Gavrilovic, Arsic, Domazet and Mishra (2018) who worked on Algorithm for ALE and promoting skills in java software design language. They reported that ALE help in bringing learning to the individual needs, enhancing students' awareness, skilfulness in java software design and finding answers to actionable exercise. ALE assisted the students in providing drive to measure students' knowledge in tackling actionable exercise java software design coding. ALE, in this study enable the students to relate knowledge obtain in tackling actionable exercise and in using instructional materials effectively. Lastly, it work on striking effect of

java software design coding and drive for awareness of students based on their belief and scores.

Novitasari and Wardhani (2018), reported buzz group in ESP class to improve students' speaking skills by integrating audio visual media into buzz teaching strategy in order to enhance students' speaking skills. They adopted classroom action research (CAR) which involves: planning, doing, observing and reflecting. Data were collected during the doing stage of the cycle. The score of the students' speaking skills were compared to the criterion of success. It was revealed that buzz strategy improved students' speaking skills.

Koura and Zahran (2017) carried out a research work in Egypt on the impact of sheltered instruction observation protocol model on student teachers' teaching skills and self-efficacy using pretest-posttestquasi-experimental design control group. They sampled 22 EFL (English as a foreign language) student teachers and developed two instruments for data collection. Data were analysed using Wilcoxon-Signed Ranks test to compare the mean scores of the experimental group pre-post observation. The findings revealed that there was gradual improvement in student teachers' teaching skills and self-efficacy. Also, student teachers' lesson preparation was significant.

4.4 Summary of Findings

1. There is a significant main effect of treatment on integrated sciencepre-service teachers' pedagogical knowledge and the effect size accounted for 67.0%.
2. The main effect of treatment on integrated sciencepre-service teachers' lesson planning skills was significantand the effect size accounted for 81.0%.
3. Themain effect of treatment on integrated sciencepre-service teachers' teaching skills was significantand the effect size accounted for 54.0%.
4. Themain effect of self-efficacy on integrated sciencepre-service teachers'lesson planning skills was significant.
5. Themain effect of self-efficacy on integrated sciencepre-service teachers' teaching skills was significant.
6. Theinteraction effect of treatmentand self-efficacy on integrated sciencepre-service teachers'lesson planning skills was significant.
7. Theinteraction effect of self-efficacy and mode of entry on integrated sciencepre-service teachers'lesson planning skills was significant

8. Theinteraction effect of self-efficacy and mode of entry on integrated sciencepre-service teachers' teachingskills was significant.
9. Theinteraction effect of treatment, self-efficacy and mode of entry on integrated sciencepre-service teachers'lesson planning skills was significant.
10. Thesignificant interaction effect of treatment, self-efficacy and mode of entry on integrated sciencepre-service teachers' teachingskills was significant.

Chapter Five

CONCLUSION AND RECOMMENDATIONS

5.1 Summary

This study examined the Buzz session and Adaptive learning instructional strategies on integrated science pre-service teachers' pedagogical knowledge and skills. It employed pretestposttest, control group quasi experimental design. Three (3) colleges of education were used in Southwest with samples of 358 pre-service teachers. Seven (7) hypotheses formulated and tested at 0.05 level of significance. Eight (8) research instruments were developed for collection of data. Collected data were analysed using descriptive statistics of percentage count on demographic data of pre-service teachers' self-efficacy and mode of entry while inferential statistics of analysis of covariance was used to determine the main effect of treatment on integrated science pre-service teachers' pedagogical knowledge and skills, estimated marginal means was used to determine the magnitude of significant main effect and pairwise comparisons of Scheffe Post Hoc analysis was used to determine the sources of significance.

Major findings revealed, there were significant main effects of treatment on integrated science pre-service teachers' pedagogical knowledge, lesson planning and teaching skills and there were significant main effect of self-efficacy on integrated science pre-service teachers' lesson planning and teaching skills but not significant on pre-service teachers' pedagogical knowledge while insignificant main effect of mode of entry on integrated science pre-service teachers' pedagogical knowledge, lesson planning and teaching skills was observed.

Furthermore, insignificant interaction effects of treatment and self-efficacy on integrated science pre-service teachers' pedagogical knowledge and teaching skills was observed but significant interaction effect occurred on lesson planning skills of integrated science pre-service teachers. Likewise, significant interaction effects of treatment and mode of entry occurred on integrated science pre-service teachers'

pedagogical knowledge, lesson planning and teaching skills. Also, insignificant interaction effects of self-efficacy and mode of entry was observed on pre-service teachers' pedagogical knowledge but significant interaction effects occurred on lesson planning and teaching skills of integrated science pre-service teachers in integrated science.

The three way interaction effects of treatment, self-efficacy and mode of entry on pre-service teachers pedagogical knowledge was not significant but significant interaction effect occurred on lesson planning and teaching skills of integrated science pre-service teachers.

5.2 Conclusion

The study determined the effects of buzz session and adaptive learning environment strategies on pedagogical knowledge, lesson planning and teaching skills of integrated science pre-service teachers with moderating effect of self-efficacy and mode of entry. The strategies improved the pedagogical knowledge and skills of pre-service teachers in integrated science, these strategies should be employed along with conventional method in teaching of pre-service teachers in colleges of education.

5.3 Implications of Findings

The study determined the effect of Buzz session and Adaptive environment instructional strategies as the determinants of integrated science pre-service teachers' pedagogical knowledge, lesson planning and teaching skillsin Southwestern, Nigeria. The findings has implication for lecturers in College of Education to employ the two innovative strategies in teaching science education courses to student teachers in order to acquire requisite knowledge and skills relevant in writing lesson plan and in the delivery of lesson to students.

5.4 Contribution to Knowledge

The study has added to existing knowledge as follows:

1. It is evident that, the use of Buzz Session and Adaptive Strategies as alternative methods of instruction at the college level would make effective impact.
2. Both Buzz Session and Adaptive could enhance integrated science student teachers learning outcome than the traditional method that is often used.

3. Both Buzz Session and Adaptive strategies enhanced integrated science student teachers' pedagogical knowledge, lesson planning and teaching skills.
4. Self-efficacy had main effect on lesson planning and teaching skills. This would also improves their level of confidence when writing lesson plan and facing the class during teaching.
5. Mode of entry is negligible on pre-service teachers' pedagogical knowledge, lesson planning and teaching skills.

5.5 Recommendations

In view of summarised discoveries above, and researcher's experience in the course of the work, the following recommendations were considered to be germane.

1. Lecturers should be encouragedto employ learner–centred instructional strategies, such as Buzz Session and Adaptive Environment strategies which are activity based along with conventional method. The use of innovative strategies that are activity based would promote high level learning performance and also enabling the student teachers to acquire necessary skills during training.
2. Governmentshould provide necessary facilities for re-training of teachers in the use of innovative techniques in science instruction through conferences, seminars and workshops.
3. Curriculum planners to include innovative teaching strategies in the curriculum especially for the NCE programme.

5.6 Suggestion for Further Study

Considering the findings of this work, suggestions were made for further studies as follows:

The research should be carried out in other geo-political zone of the country and in other field of study such as Agricultural Science Education, Physics Education, Chemistry Education and etc.

Studies on Buzz Session and Adaptive Environment could be carried out in other colleges of education and universities in Nigeria.

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APPENDIX I

PRE-SERVICE TEACHERS TEACHING SKILLS SCALE

This test is meant to assess the pre-service teachers teaching skills.

The investigator is expected to fill the test paper as possible by ticking ( ) where appropriate and complete the gap where necessary.

SECTION A

Personal Information (Biodata)

Name of Institution:

Mode of Entry: DIRECT( ) PRELIM( )

Level: _____

Pre-service Teacher Self Efficacy: High( ), Low( )

SECTION B

The continuum below was used to rate skills.

1 = Poor; 2 = Fair; 3 = Good; 4 = Very Good; 5 = Excellent.

1	**Set Induction Skill**	
	i. Ensuring all facilities (chalk, duster, etc.) are available	1 2 3 4 5
	ii. Securing students attention and interests	1 2 3 4 5
	iii. Greeting and accepting greeting	
	iv. Revision of previous lesson	1 2 3 4 5
		1 2 3 4 5
	Sub-total	
2	**Stimulus Variation Skill**	
	i. Use of gestures (Body movement e.g. hand, head, leg etc.)	1 2 3 4 5
	ii. Shifting sensory channels	1 2 3 4 5
	iii. The use of pause	
	iv. Movement within the classroom	1 2 3 4 5
		1 2 3 4 5
	Sub-total	
3	**Non-Verbal Communication**	
	i. Physical arrangement of the class and teacher movement	1 2 3 4 5
	ii. The use of head and arm movements	1 2 3 4 5
	iii. Exhibits facial gesture or expressions	
	iv. Good time management	1 2 3 4 5
		1 2 3 4 5
	Sub-total	

4	**Questioning Skill**	
	i. Questions relevance to the topic	1 2 3 4 5
	ii. Provision of quality thinking time	1 2 3 4 5
	iii. Correcting wrong answers immediately	
	iv. Putting the class at work	1 2 3 4 5
	Sub-total	1 2 3 4 5
5	**Reinforcement Skill**	
	i. The use of verbal reinforcement	1 2 3 4 5
	ii. The use of non-verbal reinforcement	1 2 3 4 5
	iii. Reinforcement proportion to the task executed	
	iv. Not being partial in giving reinforcement	1 2 3 4 5
	Sub-total	1 2 3 4 5
6	**Instructional Media Skill**	
	i. Appropriateness of the instructional media	1 2 3 4 5
	ii. Good handling of the instruction media	1 2 3 4 5
	iii. Instructional media used at the correct time	
	iv. Quality of the instructional media	1 2 3 4 5
	Sub-total	1 2 3 4 5
7	**Examples and Illustration Skill**	
	i. Relevance and simplicity	1 2 3 4 5
	ii. Use of verbal and graphic illustrations	1 2 3 4 5
	iii. Illustrations not too elaborate	
	iv. Use of concrete day-to-day life examples	1 2 3 4 5
	Sub-total	1 2 3 4 5
8	**Planned Repetition Skill**	
	i. Repeating difficult ideas several times/dwelling	

	excessively on obvious points	1 2 3 4 5
	ii. Periodically summarizing points previously made	1 2 3 4 5
	iii. Repetition purposeful and intentional	
	iv. Repetition not confusing the learners	1 2 3 4 5
	Sub-total	1 2 3 4 5
9	**Closure Skill**	
	i. Summarizing points previously made	1 2 3 4 5
	ii. Evaluation of the learners level of attainment of lesson objectives	1 2 3 4 5
	iii. Encouraging students to ask questions	1 2 3 4 5
	iv. Relevance of assignment given to the learners	1 2 3 4 5
	Sub-total	
	Grand Total:	

Note: (a) Each Pre-service Teacher should be allowed to be demonstrate five skills in two or three presentation

(b) Each skill has 20 marks, totalling 100 marks

_____

Facilitator's Name & Signature Campus/Dept:_____

APPENDIX II

PRESERVICE TEACHERS'PEDAGOGICAL KNOWLEDGE TEST

This test assessed pre-service teachers' Pedagogical knowledge.

The investigator is expected to fill the test paper as possible by ticking ( ) where appropriate and complete the gap where necessary.

SECTION A

Personal information (Bio data)

Name of Institution:

Mode of Entry: DIRECT ( ) PRELIM ( )

Level: _____

Teaching Efficacy: High ( ), Low ( )

QUESTION ON ISC 212

1. The planner of learning environment is _____ (a) Government (b) Teacher (c) Student (d) Supervisor
2. The centre of learning environment is _____ (a) subject matter (b) teacher (c) learners (d) curriculum
3. The schematic structure of what the teacher will do in the class is _____ (a) lesson plan (b) lesson note (c) syllabus (d) scheme of work
4. _____ should be stated in achievable terms (a) Test (b) Essay (c) lesson plan (d) objectives
5. ____ and ____ are resources that a science teacher will manage in the school setting (a) Lesson note and scheme (b) Diary and record (c) Human and non-human (d) curriculum and syllabus
6. The most important human resources that the science teacher will manage are (a) learners (b) typists (c) laboratory technologists
7. All the following are qualities of a good science teacher except (a) competence (b) indolence (c) desire to teach (d) creativity and resourcefulness
8. _____ is the breaking down of syllabus into teachable units (a) curriculum (b) examination syllabus (c)scheme of work (d) lesson not
9. The three questions a science teacher would ask while preparing for lesson are (a)where, which, when (b) what, why and how (c) why, how, when (d) where, what and why
10. _____ is someone who is trained and specialized in the art of imparting scientific knowledge, skills and values to younger ones (a) principal (b) science teacher (c) laboratory technologists (d) medical doctors
11. The question what implies _____ (a) concept to be taught (b) methodology (c) reason (d) objectives
12. The format for writing references in lesson note is (a) ANOVA (b) ANCOVA (c) APA (d) Bibliography
13. Grouping method can be ____ and ____ (a) internal and external (b) implicit and explicit (c)overt and covert (d) homogenous and heterogeneous
14. Cognitive domains deal with (a) attitude (b) knowledge (c)skills (d) emotion

15. The question why in planning lesson implies (a) objectives (b) evaluation (c) reference (d) conclusion
16. For good class management and control science teacher should establish _____ with the students (a) fear (b0 anxiety (c)good report (d) unnecessary familiarity
17. Heterogeneous grouping provides the following except (a) better social integration (b) loneliness (c) divergent opinions (d) effective participation
18. To make learning learners centered science teacher should concretize his lesson with _____ (a) instructional maternal (b)objectives (c) evaluation questions (d) summary note
19. The question how in planning lesson is referred to as _____ (a) topic (b) methodology (c) reasons (d) evaluation
20. A course of study is called (a) scheme of work (b) curriculum (c) syllabus (d) lesson plan
21. Thee cognitive domain was divided into _____ levels by bloom (a) six (b) four (c) eight (d) ten
22. Entry behaviour refers to as _____ (a) residual knowledge (b) general knowledge about the new concept (previous lesson (d) body of knowledge
23. Filling in the details involve _____ stages (a) three (b) five (c) ten (d) two
24. After the planning stage the next stage is _____ (a) Presentation (b) Filling in the details (c) Evaluation (d) Conclusion
25. The breaking down of syllabus to teaching unit is _____ (a) curriculum (b) Lesson note (c) Lesson plan (d) Scheme of work
26. The course of study is _____ (a) Curriculum (b) Planning (c) Syllabus (d) Evaluation
27. The frame of work of schematic preparation of lesson is called _____ (a) Lesson note (b) Lesson plan (c) Unit note (d) Syllabus
28. The first human resources that science teacher would manage in the class is _____ (a) Principal (b) Captain (c) Learner (d) Technologist
29. The nucleus of a lesson note is (a) Instructional objectives (b) Conclusion (c) Date (d) Topic
30. A form of evaluation used to determine the entry behaviour of the student is _____

(a) Formative evaluation (b) Diagnostic evaluation (c) Summative evaluation (d) Compound evaluation

APPENDIX III

PRE-SERVICE TEACHERS LESSON PLANNING SKILLS SCALE

This test assessed integrated science pre-service teachers' lesson planning skills.

Investigator is expected to fill the test paper as possible by ticking ( ) where appropriate and complete the gap where necessary.

SECTION A

Personal information (Bio data)

Name of Institution:

Mode of Entry: DIRECT ( ) PRELIM ( )

Level: _____

Teaching Efficacy: High ( ), Low ( )

SECTION B

The continuum below was used to rate skills.

1 = Poor; 2 = Fair; 3 = Good; 4 = Very Good; 5 = Excellent.

Aspect	Rating Scale				
A. Teaching Technique	1	2	3	4	5
1. Clarify lesson objectives					
a. Stated in an easy and clear language					
b. Stated based on what learners are expected to learn at the end of the lesson					
c. Attainable within a given time					
2. **SUITABILITY OF LESSON IN TERMS OF:**					
Introduction					
a) Assisting students to pay attention on lesson					

Content b) Inspiring c) Relating to prior lesson and daily encounter					
Content					
a) Connected to studentspriorknowledge					
b) Directed towards students level					
c) Employdifferent teaching strategies (Service learning, Moral dilemma, Role play, Field trip and Action learning)					
d) Teacher mastery of content					
Gender					
a) Gender bias exempted in examples					
b) Problemsassignedequally					
c) Encouraging gender involvement and sharing of responsibilitiesin exercise					
Instructional Language					
a) Clarifiedideasin an easyand correct language					
b) Passionate, kept eye connection and suitable gestures					
3. Stress on keyideas					
a) Clarification and expansion of key ideas.					
b) Provision of activities and opportunities help develop process skill (Observation, manipulation, communication, thinking and recording)					
4. Lesson summary					
a) Guide learners to summarize main point of lesson thought byprudentlyorganised questions					
b) Linking activities with key ideas					
c) Adequateperiod for students to ask questions and seek clarification					
5. Attainment of stated objectives					
a) Activities					
b) Teachers interrogations					
c) Learners answers					

d) Learners questions						
e) Level of pupils interest						
A. FUNDAMENTAL STRATEGIES	1	2	3	4	5
1. Learnersinvolvement in classroom activities						
a) learners be inspired to ask and answer questions						
b) Stimulated individual involvement in both group and class deliberations						
c) Learners importantlyinvolved in learning activities						
d) The activities planned to stimulate and maintain curiosity						
2. Suitability and demonstration of instructional materials						
a) Materials and demonstrations are correct for its aims						
b) Proof of worthyusage of instructional materials						
c) Proper and logicalusage of the chalkboard						
3. Teachers attitude and expression						
a) Facilitatorseems to be delightedwith teaching						
b) Facilitator is compassionate to the desires and difficulties of the students						
c) Facilitatortolerate and is firm with the students						
B. CLASSROOM MANAGEMENT AND CONTROL	1	2	3	4	5
1. Time Allocation						
Time is appropriatelyallocated in:						
a) lesson plan						
b) lesson delivery						
2. Classroom control						
a) Facilitatorcertifiesstudentsinvolvement in appropriate learning activities						
b) Facilitatorcurbtroublesomeactionsproperly						
3. Learners'views/thoughts						

• Facilitatorkeenlyimplores the learners views on topicstreated					
• Facilitatorconnect learners views with topics treated					
• Facilitatorconverses and modifieslearnersmisunderstandings					
4. Lesson Evaluation					
• Assessmentfused in the lesson plan					
• Formative assessment was done					

Additional comments

_____

_____

_____

_____

_____

Date_____

Observers name_____ GSM No_____Sign_____

APPENDIX IV

PRE-SERVICE TEACHERS SELF EFFICACY SCALE (PTSES)

This questionnaire seeks to investigate your self-efficacy in Basic Science

SECTION A: Personal data

Name: ----------

Mode of Entry.: ----------

SECTION B

The following statements are based on some aspects of your Basic science efficacy. Please read each statement very carefully and indicate your honest opinion with a tick (√) in the appropriate column,

Strongly Agree = SA; Agree = A; Disagree = D and Strongly Disagree = SD

Thanks for your sincere cooperation.

S/N	ITEM	SA	A	D	SD
1	I can always solve difficult problems in Basic science.				
2	I get excited when I am challenged in Basic science.				
3	It is easy for me to stick to my objectives and achieve my objectives in Basic science.				
4	I am confident when I handle practical in Basic science.				
5	I cannot apply situation in Basic science to my real-life situation.				
6	I can solve most problems in Basic science;when I invest the necessary efforts and patience.				
7	I cope well in team work in Basic science.				
8	I am confident in my ability to proffer solutions to whatever problems I am confronted with in Basic science.				
9	I am always afraid of Basic science classes.				
10	I cannot do well in Basic science. .				

11	I can express my opinions, even when other classmates disagree with me				
12	I succeed well in cheering myself up when an unpleasant event has happened				
13	I can study a chapter well for a test in Basic science.				
14	I believe I can work well in harmony with my classmates in Basic science. Classes				
15	I pay attention well during every Basic science. class				
16	I believe I can succeed well in passing a test in Basic science.				
17	I believe I can guide students in constructing their knowledge during Basic science classes.				
18	I believe I am self-efficient in ensuring students participation in Basic science classes				
19	I believe I am self-efficient about providing daily life examples that suit students'previous experiences during Basic science classes.				
20	I am confident in my ability to be the best in Basic science in spite of any difficulties				

APPENDIX V

OPERATIONAL GUIDE FOR BUZZ SESSION STRATEGY

PREPARED BY

AMINAT ADEKEMI, AHMED

MATRIC NO: 131265

MANUAL

Buzz Session Model

Buzz session is a teaching strategy that is essential for building genuine pragmatic situation which assist institutions to effectively train teachers as professionals thereby meeting societal demand. Dr Donald conceived and developed Buzz session as a method in a citadel of learning in the United State of America. He divided class into group of six to brainstorm for six minutes about a certain concept. Soon this method was known as Phillips 66 technique.Buzz session teaching, like other forms of discussion, benefits from significant teaching principle, "interaction". Small groups buzz together and everyone is expected to contribute to a thought-provoking topic and thereafter present to entire class.

Buzz session requires more preparation time to achieve a certain task, answer questions and set context for the lecture. It may be images, data, multiple answer or over-head projector transparency. Moderate time is required probably a couple of hours including planning. The gain is the time spent in preparation and having less content material for the lecture. It is advantageous when learners interact and brainstorm with one another guided by their facilitator (https://bible.org/seriespage/8-using-buzz-groups-your-teaching).

The Operation guide on Buzz session is as follows:

Stages	Time	Activities
1.	5mins	**Review of Previous Work** Students' revised previous work done on the last topic while Lecturer watches
2.	5mins	**Group Discussion** Studentteachers brainstorm questions in groups
3.	5mins	**Facilitator and students interaction** Lecturer short talk on set questions while the students answer the questions
4.	9mins	**Setting New Task (1)** Student teachers were given new task
5.	6mins	**Lecturers Summary** Lecturer: summarizes student teachers presentations
6.	7mins	**Student Teachers Task (2)** Studentteachers were given harder task, working in group
7.	11mins	**Lecturers Contribution** The facilitator made some clarifications on student teachers areas of difficulties
8.	12mins	**StudentTeachers Group Work** Student teachers group work continues

Operation guide on Buzz session LESSON ONE: TEACHER AS PLANNER

Stages		**Activity**
1	5 mins	A revision based on previous microteaching class done in 100 level on the topic Teacher as a planner while learners are seated and attentive.
2	5mins	Studentteachers brainstorm questions in groupson teaching and the components
3	5 mins	Students display and discuss in small group the following questions What is meant by science processes? What are the necessary things to be done before, during and after teaching?
4	9 mins	Lecturer short talk on set questions while the students answer the questions
5	6 mins	Student teachers were given new taskwhich include list of models and case studies
6	7 mins	Studentteachers were given harder task, working in group
7	11 mins	The facilitator made some clarifications on student teachers areas of difficulties
8	12min	Student teachers group work continues

LESSON TWO: INSTRUCTIONAL PLANS AND PREPARATION

Operation guide on Buzz session

Stages		Activity
1	5 mins	A revision based on Teacher as a planner while learners are seated and attentive.
2	5mins	Student teachers brainstorm questions in groups on science processes and the necessary things to be done before, during and after teaching?
3	5mins	Students display and discuss in small group the following questions What is meant by Teaching objectives? What is Science Curriculum?
4	9mins	Lecturer short talk on set questions while the students answer the questions
5	6mins	Student teachers were given new task which include syllabus, scheme of work and lesson plan
6	7mins	Student teachers were given harder task, working in group
7	11mins	The facilitator made some clarifications on student teachers areas of difficulties and summarised lesson
8	12min	Student teachers group work continues by making a brief note in their books.

LESSON THREE: TEACHER AS A MANAGER

Operation guide on Buzz session

Stages		Activity
1	5 mins	Students revises previous work done on the last topic while Lecturer introduces students to the new topic.
2	5mins	Student teachers brainstorm questions in groups on teacher as a manager of classroom
3	5mins	Students display and discuss in small group the following questions What are teacher's roles in a classroom? Mention things a teacher is expected to manage in a classroom?
4	9mins	Lecturer short talk on set questions while the students answer the questions
5	6mins	Student teachers were given new task based on classroom management
6	7mins	Student teachers were given harder task, working in group
7	11mins	The facilitator made some clarifications on student teachers areas of difficulties and summarised lesson
8	12min	Student teachers group work continues by making a brief note in their books.

LESSON FOUR: TEACHER AS A FACILITATOR

Operation guide on Buzz session

Stages		Activity
1	5 mins	A revision based on Teacher as a Manager while learners are seated and attentive.
2	5mins	Student teachers brainstorm questions in groups on condition for conducive learning, sequences of lesson presentation and the use of reward and punishment in teaching.
3	5mins	Students display and discuss in small group the following questions What are the features of teaching objectives? What are the roles of Science teachers? What must a teacher do while preparing a lesson?
4	9mins	Lecturer short talk on set questions while the students answer the questions
5	6mins	Student teachers were given new task which include Classroom management and instructional strategies
6	7mins	Student teachers were given harder task, working in group
7	11mins	The facilitator made some clarifications on student teachers areas of difficulties and summarised lesson
8	12min	Student teachers group work continues by making a brief note in their books.

LESSON FIVE: TEACHER AS AN ORGANISER

Operation guide on Buzz session

Stages		Activity
1	5 mins	A revision based on Teacher as a Facilitator while learners are seated and attentive.
2	5mins	Student teachers brainstorm questions in groups on Teacher as an organiser.
3	5mins	Students display and discuss in small group the following questions How do children learn? What are necessary requirements for the development of children thinking?
4	9mins	Lecturer short talk on set questions while the students answer the questions
5	6mins	Student teachers were given new task which include development of children thinking and necessity of teacher as an organiser.
6	7mins	Student teachers were given harder task, working in group
7	11mins	The facilitator made some clarifications on student teachers areas of difficulties and summarised lesson
8	12min	Student teachers group work continues by making a brief note in their books.

APPENDIX VI

OPERATIONAL GUIDE FOR ADAPTIVE LEARNING ENVIRONMENT TEACHING STRATEGY

Adaptive Learning EnvironmentStrategy (ALES) isseen as a meeting point betweenInstructional and Computer science. ALES cutsacrossdifferentlearning aspect in order to meetsocietalneed and instructional system. ALES deals withbrandingpedagogy process to cutacross all structuredprocedures and stated objectives in the curriculum for effective teaching and learning in order to assist learners to adapt to the environment. ALES wasassessedbefore 1960s to be an adequatestrategywhichimproveslearners' level of assimilation and comprehension.

Operational guide on Adaptive Learning EnvironmentStrategy

1. **Revision and Introduction:**

i. Facilitator revised the previous lesson and introduced the new topic through questioning techniques.

ii. Students answer the questions

2 **Presentation**:

Students explain and illustrate the concept being taught;

3 **Guided practice:**

Student teachers carryout task given to them and the facilitator guide by clarifying difficult areas;

4 **Self-determining exercise:**

Studentteachersengaged in an individualtask in the classroom and thereafter,as homework.

LESSON ONE: TEACHER AS PLANNER

- **Revision and Introduction**

  Facilitator revised the previous lesson and introduced the new topic through questioning techniqueson previous microteaching class done in 100 level on the topic while students answer the questions.

- **Presentation**:
  Students explain and illustrate the concept being taughtas planner on science processes and the necessary things to be done before, during and after teaching;

- **Guided practice:**

  Student teachers carryout task given to them and the facilitator guide by clarifying difficult areas.They respond to questions, such aswhat is meant by science processes? What are the necessary things to be done before, during and after teaching?

- **Self-determining exercise:**

  Student teachers engaged in an individual task in the classroom and thereafter,as homework.

LESSON TWO: INSTRUCTIONAL PLANS AND PREPARATION

- **Revision and Introduction**

  Facilitator revised the previous lesson and introduced the new topic through questioning techniqueson teacher as a planner while students answer the questions.

- **Presentation**:
  Students explain and illustrate the concept being taughton instructional plans and preparation.

- **Guided practice:**

  Student teachers carryout task given to them and the facilitator guide by clarifying difficult areas.They respond to questions, such aswhat is meant by teaching objectives? what is science curriculum?

- **Self-determining exercise:**

Student teachers engaged in an individual task in the classroom and thereafter,as homework.

LESSON THREE: TEACHER AS A MANAGER

- **Revision and Introduction**

  Facilitator revised the previous lesson and introduced the new topic through questioning techniqueson Instructional plans and preparation.

- **Presentation**:
  Students explain and illustrate the concept being taughton TEACHER AS A MANAGER.

- **Guided practice:**

  Student teachers carryout task given to them and the facilitator guide by clarifying difficult areas.They respond to questions, such asdivide resources into HUMAN AND NON-HUMAN RESOURCES.

- **Self-determining exercise:**

  Student teachers engaged in an individual task on conducive learning, sequences of lesson presentation and the use of reward and punishment in teaching in the classroom and thereafter,as homework.

LESSON FOUR: TEACHER AS A FACILITATOR

- **Revision and Introduction**

  Facilitator revised the previous lesson and introduced the new topic through questioning techniqueson conducive learning, sequences of lesson presentation and the use of reward and punishment in teaching.

- **Presentation**:
  Students explain and illustrate the concept being taughton TEACHER AS A FACILITATOR.

- **Guided practice:**

  Student teachers carryout task given to them and the facilitator guide by clarifying difficult areas.They respond to questions, such as:

  What are the features of teaching objectives?

  What are the roles of Science teachers?

  What must a teacher do while preparing a lesson?

- **Self-determining exercise:**

  Student teachers engaged in an individual task on classroom management and control, instructional strategies and group learners for different activities in the classroom and thereafter,as homework.

LESSON FIVE: TEACHER AS AN ORGANISER

- **Revision and Introduction**

  Facilitator revised the previous lesson and introduced the new topic through questioning techniques on what are the features of teaching objectives, what are the roles of science teachers, what must a teacher do while preparing a lesson, Classroom management and instructional strategies.

- **Presentation**:
  Students explain and illustrate the concept being taughton TEACHER AS ANORGANISER.

- **Guided practice:**

  Student teachers carryout task given to them and the facilitator guide by clarifying difficult areas.They respond to questions, such as:how do children learn?What are necessary requirements for the development of children thinking?

Self-determining exercise:

Student teachers engaged in an individual task on more advanced issue on stages of children development in thinking in the classroom and thereafter,as homework.

APPENDIX VII

OPERATIONAL GUIDE FOR CONVENTIONAL INSTRUCTIONAL STRATEGY

Steps involved include:

i. Lecturer introduces the lesson
ii. Lecturer explains theoretical bases for the topic
iii. Lecturer solves problems with examples and application
iv. Lecturer solicits questions from the class and gives class work
v. Lecturer marks the students work.

LESSON ONE: TEACHER AS PLANNER

Step 1: Lecturer introduces the lesson through questions that review prerequisite knowledge on previous microteaching class done in 100 level on the topic;

Step 2: Explains theoretical bases for the topic teacher as planneron science processesand the necessary things to be done before, during and after teaching

Step 3: Solves problems with examples and application

Step 4: Solicits questions from the class and give class work
What are the necessary things to be done before, during and after teaching?

Step 5: Marks the students' work.

LESSON TWO: INSTRUCTIONAL PLANS AND PREPARATION

Step 1: Lecturer introduces the lesson by examining their background knowledge on previous work on science processes and the necessary things to be done before, during and after teaching? through questions that review prerequisite knowledge or skills

Step 2: Explains theoretical bases for the topic instructional plans and preparation;

Step 3: Solves problems with examples and application

Step 4: Solicits questions from the class and give class work
on What is meant by Teaching objectives? What is Science Curriculum?

Step 5: Marks the students' work.

LESSON THREE: TEACHER AS A MANAGER

Step 1: Lecturer introduces the lesson by asking questions to activate their background knowledge on Instructional plans and preparation.

Step 2: Explains theoretical bases for the topicTEACHER AS A MANAGER

Step 3: Solves problems with examples and application

Step 4: Solicits questions from the class and give class work on HUMAN AND NON-HUMAN RESOURCES

Step 5: Marks the students' work.

LESSON FOUR: TEACHER AS A FACILITATOR

Step 1: Lecturer introduces the lesson activate their background knowledge talk on condition for conducive learning, sequences of lesson presentation and the use of reward and punishment in teaching through questions

Step 2: Explains theoretical bases for the topicTEACHER AS A FACILITATOR

Step 3: Solves problems with examples and application on Classroom management and control, instructional strategies and Group learners for different activities

Step 4: Solicits questions from the class and give class work

a) What are the features of teaching objectives?
b) What are the roles of Science teachers?
c) What must a teacher do while preparing a lesson?

Step 5: Marks the students' work.

LESSON FIVE: TEACHER AS AN ORGANISER

Step 1: Lecturer introduces the lesson through questions that review prerequisite knowledge or skills;

a. What are the features of teaching objectives?
b. What are the roles of Science teachers?
c. What must a teacher do while preparing a lesson?

Classroom management and control, instructional strategies and Group learners fordifferent activities

Step 2: Explains theoretical bases for the topic TEACHER AS AN ORGANISER

Step 3: Solves problems with examples and application on How do children learn?

Step 4: Solicits questions from the class and give class work

How do children learn from some student groups, development of children thinking?

Step 5: Marks the students' work.

APPENDIX VIII

ASSESSMENT SHEET FOR EVALUATING LECTURER PERFORMANCE ON THE USEOF BUZZ SESSION STRATEGY (ASELP)

Section A

Name of the Lecturer ……..

Name of the College: ……

Topic taught: ……

Level taught: ……

Section B

S/N	Performance assessed	V. good (5)	Good (4)	Average (3)	Poor (2)	V. poor (1)
1	Adequacy ofperiodfused into a group exercise					
2	Appropriatenessof grouping ■Suitability in selectinga group representative					
3	*Specification of each groups task. Is it appropriate? *Engaging participants onfamiliarisation talk before commencement of exercise					
4	Facilitators ability to guide students on their areas of difficulties					
5	Suitability of assigning harder taskto each group.					

APPENDIX IX

ASSESSMENT SHEET FOR EVALUATING LECTURERS PERFORMANCE ON THE USE OF ADAPTIVE LEARNING ENVIRONMENT STRATEGY(ASETP)

Section A

Name of the Lecturer ……..

Name of the College:……

Topic taught:……

Level taught:……

Section B

S/N	Performance assessed	V. good (5)	Good (4)	Average (3)	Poor (2)	V. poor (1)
1	How well does the lecturer introduce his lesson through questioningtechniques					
2	How systematicfacilitator Explain and illustrate the concept being taught					
3	Adequacy of guided exercise					
4	Appropriateness of Self-determining exercise in the classroom and thereafter, at home					

APPENDIX X

ASSESSMENT SHEET FOR EVALUATING LECTURER PERFORMANCE ON THE USE OF CONVENTIONALSTRATEGY(ASETP)

Section A

Name of the lecturer ……..

Name of the College:……

Topic taught:……

Level taught:……

Section B

S/N	Performance assessed	V. good (5)	Good (4)	Average (3)	Poor (2)	V. poor (1)
1	**Introduction** How well does the lecturer introduce his lesson					
2	**Presentation:** • How systemic is the presentation? • Does the lecturer show mastery of subject matter					
3	**Summary** How concise as the summary					
4	**Evaluation** • (Is it appropriate)					
5	**Assignment**					

APPENDIX XI

Lesson Note 1

Topic: Teacher as a Planner of Lesson Environment

Sub-topic: Teacher as a Planner

Time: 1 hour

Instructional Objectives:by end of the lesson, students should be able to:

- Itemize three (3) main questions a science teacher must ask him/herself while preparing for a lesson.
- Describe the three (3) questions.
- Outline things to be considered when objectives had been established.
- Describe the points teacher should consider in order to make science lesson more enjoyable.

Instructional aids: Charts

Previous knowledge: Students have been taught processes of Science before.

Reference: Raimi, S.M. 2012. Teaching Methodology in Science Education. Lagos. Googall A. publishing company pp42-43.

Procedure

Introduction: Facilitator revises the previous lesson and introduces new lesson through questioning techniques.

Questions: What are the science process skills?

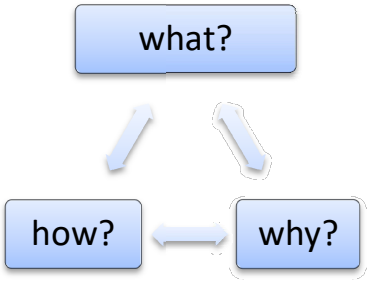
Answer: Science process skills are skills employed to solve questions in science. These are observing, measuring, identifying, classifying, experimenting, analysing, interpreting, recording etc.

Presentation

Step I: The teacher leads the students to explain the three (3) questions a resourceful teacher would ask him/herself while preparing for a science lesson.

These questions are

What, Why and How.



Step II: Facilitator guide learners to explain three (3) questions to be asked by a resourceful science teacher.

What? What does the teacher hope to teacher the learners or what does the teacher wants the learners to learn?

Answering the question 'what?' it is concerned in the topic, process or concepts with which the lesson is concerned. To answer this question properly it is based on overall scheme of work.

Why? Why does he want them to learn what he proposed? i.e. the reason why he wants them to learn a particular lesson he desired for them. This is the objective of the lesson i.e. the intended outcome which must be stressed in the lesson.

How? How does he want the learners to learn? Meaning the procedural steps, he would like to follow in imparting the knowledge on the learners. i.e. Methodology.

Step III: The teacher allows the students to ask questions and answers their questions or gives more explanation.

Step IV: The teacher leads the students to explain things to be considered when objectives had been set.

The following must be considered after establishing the objectives of the lesson.

- The stage of mental development of the learners.
- The learner's ability to comprehend what the teacher is planning to teach.
- The learner's previous knowledge which is germane to the proposed learning experience.
- The relevant materials, equipment and apparatus to be used during the lesson.
- The individual differences among the learners or the different ability groups in the class.
- The relevance of the lesson to the overall scheme of work.
- The extent of coverage of important preliminary aspects of the lesson.
- The relevance and relationship between the topic to other school subjects.

Step V:facilitator guides learners tohighlight and describe points to be considered in making science lesson more enjoyable.

The points are as follows:

- Thinking of how to make the lesson interesting and captivating.
- Use varying activities that would enhance good learning of subject matter of a science lesson.
- Embark on good planning.
- Create a friendly atmosphere that would promote learning.
- Create a very attractive looking classroom.
- Effective use of participatory learning strategy to promote learning.
- Use appropriate time in the lesson.
- Effective use of questioning technique strategies during science lesson.

Step VI: Learners were allowed to ask questions on their areas of difficulties.

Evaluation: To ascertain the level of understanding of the students, teacher asks the following questions:

1) Mention the three (3) questions a planner of lesson will ask him/herself?
2) Explain the three (3) questions to be asked while planning for a lesson.
3) State the points to be considered when objectives of the lesson had been set.
4) Explain things to be followed in order to make science lesson more enjoyable.

Summary/Conclusion: The teacher explains the salient points of the lesson again to serve as chalkboard summary.

Assignment: Read about follow up activities.

Lesson Note 2

Topic: Teacher as a planner of the learning environment.

Sub-topic: Filling in the details about the proposed lesson.

Time: 1hour.

Instructional Objectives: by end of the lesson, students should be able to:

i. State the factors that would affect the procedural steps of a science lesson.
ii. Explain the three (3) sub-stages under fill in details.
iii. Describe factors to be considered in each of the three (3) sub-stages.
iv. Describe the factors which make the science lesson to be flexible.

Instructional aids: Charts.

Previous knowledge: Students have learnt about the three questions in planning for science lesson.

Reference: Raimi, S.M. (2012) Teaching Methodology in Science Education. Lagos, Googall A. publishing company pp 44-47.

Procedure

Introduction: Facilitator revises the previous lesson and introduces new lesson through questioning techniques.

Question: What are the three questions the science teacher will ask while planning for a science lesson?

Answer: what? Why? And how?

Presentation

Step I: The teacher leads the students to state the factors which affect the procedural steps of a science lesson.

The factors are:

i. The objectives which the teacher wishes to stress.

ii. The age and mental development of the learners.
iii. The potentials of the subject matters.
iv. The kind of lesson.
v. The learner's previous knowledge.
vi. Available teaching materials equipment and apparatus.
vii. Available teaching/learning aids.

Step II: Facilitator guides learners to mention three (3) sub-stages under the filling in the details about proposed lesson.

The three (3) sub-stages are

- Before the lesson.
- The real lesson.
- Follow-up activities

Step III: Facilitator guides learners to state factors to be considered in each sub-stage.

1. Before the lesson: the teacher would take cognizance of the following before the lesson.
   - Kind of apparatus needed and the quantities involved.
   - Make sure the apparatus is ready at hand before the lesson begins.
   - Consider the condition of the laboratory.
   - If real apparatus is not available, the teacher should embark on improvisation.
   - If the apparatus is not sufficient, the teacher may group the students or learners into different groups.
   - The teacher should carry-out the activity or experiment before the lesson proper.
   - Any lesson involves visitation, the teacher should visit the place before the real excursion.
2. The lesson proper/The real lesson: The teacher should have had an idea of the basic outline of his lesson. The teacher should make sure that there is sufficient variety in the lesson sequence because of the following reasons:
   - Help the learners to concentrate and have interest in the lesson.
   - It will stimulate better learning as the events in the lesson vary.

- To remove boredom on the part of the learners.
- To enhance effective classroom management and control.
- To enhance clearer and better understanding of the lesson.

3. Follow-up activities: This is an integral part of any lesson in science. There must be a creative session where students practice what they have learnt in the class and to investigate things on their own and in their own time. There must be a demonstration table with sets of apparatus that students can work with in a less formal situation.

Step IV: The teacher leads the students to consider the factors which enable the teacher to be flexible while teaching and to adjust to new development in the already prepared lesson note/plan.

These include:

- The teacher's confidence.
- The teacher's understanding of the content.
- The facilitator's ability to identify and respect individual learners ability.
- The teacher's ability to handle question and answer session effectively.
- The teacher's experience.
- The teacher's ability to asses classroom situations.
- The teacher's ability to ask questions correctly and answer learners questions appropriately.

The teacher should have in mind that the lesson plan may take different length of time with different classes even with the same class on different occasions. This depends on:

- The teacher's style of teaching.
- The learners' response.
- The learners' intellectual ability.
- The classroom situation and so on.

Step V: Learners were allowed to ask questions on their areas of difficulties.

Evaluation: To ascertain the level of understanding of the students, the following question are asked by the teacher based on lesson taught.

Questions:

i. What are the factors affecting the procedural steps of a science lesson?
ii. Describe the three (3) sub-stages under fill in the details.
iii. Explain factors to be put into consideration under each three (3) sub-stages.
iv. What are the things teacher will put into his/her lesson to make it flexible.

Summary/Conclusion: the teacher revises the salient point again and writes the summary on the chalkboard.

Assignment: Students should read about instructional plans.

Lesson Note 3

Theme: The instructional plans and preparation.

Topic: The Science Instructional Plans

Sub-topic: The Science Curriculum and syllabus

Instructional Objectives:by end of the lesson, students should be able to:

- Explain science instructional plans.
- Provide concise definition of curriculum.
- Enumerate what should be included in a science curriculum.
- Discuss other factors that determine learning experiences to be included in the curriculum.
- Define syllabus and state its types.

Instructional Aids: NCE Curriculum, WAEC and NECO syllabi.

Previous knowledge: students have learnt about teacher as a planner of learning environment.

Reference: Adesoji F.A. (2012). Teaching Methodology in Science Education Lagos. Googall A. Publishing company. Pp48-49.

Procedure

Introduction: Facilitator revises the previous lesson and introduces new lesson through questioning techniques.

Question: Explain three (3) sub-stages in fill in details during planning of lesson environment

Answer: (i) Before the lesson (ii) the lesson proper/real lesson (iii) follow-up activities.

Presentation

Step I: The teacher leads the students to identify various instructional plans in science.

Instructional plans in science include:

(i) curriculum (ii) syllabus (iii) scheme of work (iv) unit/lesson plan (v) lesson note.

Step II: The teacher leads the students to describe curriculum and state what should be included in a science curriculum.

Science curriculum is the totality of the experiences which the learner has acquired under the direction of the school for the purpose of effecting desirable patterns of behavior by Ifejika (1990). Abdullahi (1982) defined curriculum as all the experiences learner got in school in order to help them acquired and transmit worthwhile dispositions through morally accepted ways. In other word curriculum is seen as the totality of learning experiences given to a group of students within a specified period of time in the school.

Elements of curriculum are (i) Aim and objectives (ii) contents (iii) Methodology (iv) Situation analysis and evaluation.

A good Science curriculum usually covers or includes classroom and laboratory teaching, science practical, games, fairs, quizzes, teacher/learners' activities, both in and outdoor visits to places of scientific interests and science education tours.

Step III: The teacher entertains question from the students and answers their questions properly.

Step IV: The teacher allows the students to discuss other factors which affect contents of the curriculum. These factors are (i) Societal expectation (ii) Natural overall goal (iii) Societal interest.

Step V: Facilitator guide the learners to define syllabus and explain its types.

Syllabus: is defined as a guide to academic work designed for a particular level of learners in a given period of time. It outlines the course of study in terminal or yearly basis. It is a comprehensiveplan of topics in a subject spiral coordination in order for learners for which the syllabus is meant can pass a specific examination. Both the curriculum and syllabus are designed by experts in the field at the national level.

Types of syllabi

i) Teaching/Subject syllabus

ii) Examination syllabus

Teaching syllabus is a plan of work to be done in a course persemester or a yearlybasis according to the class level. Topics are sequential order to show relationship between different topics in the syllabus.

Examination syllabus indicates units or topics to be covered for a certain examination without logical sequence of topics.

Evaluation: Following questions are asked to evaluate the lesson taught.

i) Identify the science instructional plans.
ii) Give concise definitions of curriculum.
iii) What are the elements of a good curriculum?
iv) What are the contents of a good science curriculum?
v) Explain syllabus and its types.

Summary and Conclusion: The teacher re-explains the salient points of the lesson to serve as chalkboard summary

Assignment: Read about scheme of work and lesson plan.

Lesson Note 4

Topic: The Science Instructional Plans.

Sub-topic: The scheme of work and lesson plan and note.

Objectives: by end of the lesson, students should be able to:

- Explain scheme of work.
- State factors to be considered while sketching a scheme of work out of syllabus.
- Enumerate contents of scheme of work.
- Explain lesson plan and note.
- State importance of lesson plan and note.
- Draw formats of a good lesson note.

Instructional aids: Format of a good lesson note.

Previous knowledge: Students have learnt about curriculum and syllabus before.

Reference: Adesoji, F.A. (2012) Teaching Methodology in Science Education. Lagos Googall A. publishing company pp49-53.

Procedure

Introduction: Facilitator revises the previous lesson and introduces new lesson through questioning techniques.

Question: Give concise definitions of curriculum and syllabus.

Presentation

Step I: The teacher leads the students to define scheme of work. Scheme of work is a well-planned or breakdown of topics on weekly basis of what makes up the amount of work to be done or covered during the year in question.

Step II: Facilitator guides learners to state factors to be considered when sketching scheme of work and to enumerate the formats/contents of the scheme of work.

Factors to be considered while drawing the scheme of work are:

- Necessity of spiral coordination.

- Learners' personality.
- Time factor.
- Duration for learning activities in a term or year.
- Timetable for teaching activities per week including practical hours.
- Availability and relevance of instructional materials.

Good scheme of works must possesssome formats/content i) Periods ii) Topic iii) sub-topic iv) Behavioural objectives v) contents/teacher's activities vi) Instructional aids vii) Evaluation viii) Reference.

Step III: Facilitator allows learners to ask questions and guide them properly.

Step IV: Teacher leads the students to explain lesson plan and note and state their importance.

Lesson plan: is a schematic representation of all the activities to be carried out by the teacher during a specific science lesson and within a specified period of time on the school time-table.

Importance of lesson plan

- Enables teacher to have an overview of the teaching/learning activities.
- It serves as a guide to science facilitator.
- It assists science facilitator to determine types of teaching method to be used during teaching.
- It helps the science teacher to know the kind of materials to be used.

Lesson note: is the detailed analysis of all the activities to be carried out by the teacher during a particular lesson. It expresses the details of all the questions and answers to be asked, the procedural steps, the chalkboard summary and evaluation.

The following should be considered while writing lesson note:

1. Individual learners – i) age ii) mental ability iii) special needs iv) current knowledge about new skills.
2. The subject matters in term of i) content material ii) factors and ideas.
3. The method to employ in imparting knowledge.
4. What questions will agitate the minds of the learners?
5. What textbooks are available?

6. What activities would the learners involved in during the lesson?
7. The importance of the chalkboard.
8. How will the teacher evaluate to ascertain the extent at which learning has taken place?

Importance of lesson note are:

- It enables facilitator to comprehend content of lesson.
- Generates confidence in a teacher.
- It gives the teacher ability to brainstorm on appropriate method to be employed.
- It ensures adequate preparation and sorting for instructional material.

Step V: The teacher gives the students a good format of lesson note.

Evaluation: The teacher asks the following questions based on lesson taught to ascertain the level of understanding of the students.

1. a) What is a scheme of work? b) Enumerate factors to be considered while sketching a scheme of work.
2. What is a lesson plan and a lesson note?
3. Outline the factors to be considered in writing lesson note.
4. State the importance of lesson plan and note.
5. Stateformats of lesson note?

Summary and conclusion: The teacher revise the salient point again to serve as chalkboard summary.

Assignment: Prepare a scheme of work for six weeks and write a good lesson note on any topic in Basic Science for J.S II students.

Lesson note 5

Topic 3: Teacher as a Manager.

Sub-topic: Human and non-human materials to be managed by science teacher.

Behavioural Objectives: byend of the lesson, students should be able to:

i. Describe manager.
ii. List and elucidate human and non-human resources to be managed by a science teacher.
iii. Describe factors to be considered for effective management and control of the school.
iv. State the qualities and role of a completed science teacher.

Instructional aids: Science laboratory apparatus and charts.

Previous knowledge: Students have learnt about teacher as a planner of learning environment.

Reference: Ojo, O.O. (2012) Teaching Methodology in Science Education. Lagos. Googall A. publishing company pp57-62.

Procedure

Introduction: Facilitator revises the previous lesson and introduces new lesson through questioning techniques.

Question: state importance of lesson note.

Answer: (i) it generates confidence in a teacher (ii) it ensures that the teacher knows the subject matter. (iii) it ensures adequate preparation.

Presentation

Step I: The teacher leads the students to define manager.

A manager is someone who manages, directs and controls the affairs of an organization. Science teacher can be seen as a director of activities that go on within classroom or in laboratory or science field trip or excursion.

Step II: The teacher leads the students to mention what science teacher would manage in a school setting. There are two resources science teacher would manage such asHuman and Non-human resources.

Human resources are:

i. Learners/Students are the first human resources the science teacher would manage.
ii. Other science teachers within the school environment.
iii. Other subject based teachers aside from science.
iv. The school head-teacher.
v. Laboratory workers such as technologists, technicians, assistants and attendants.

Non-human resources that the science teacher would manage in the school environment are:

- The time table for science lessons and follow-up activities.
- The time usage during his lesson.
- His teaching techniques/strategies.
- Lesson plan, lesson note and how he impacts knowledge to the students.
- The science curriculum.
- The syllabus and scheme of work.
- The laboratory/classroom.
- Excursion to places of scientific interest.
- Science quiz, assessment and evaluation of science learning by the learners.

Step III: The teacher leads the students to state factors to be considered for effective management and control of the learners during teaching/learning process. These factors are:

- Create conditions for conducive classroom interaction.
- Promote healthy student-teacher relationship (interaction) in the classroom.
- The teacher should be friendly with his learners.
- The teacher should maintain close and respectable gap between himself and his learners.

- He should vary sequence of his lesson presentation in order to avoid boredom, fear, restlessness and negative attitude to science and to help the learners to develop the right type of scientific skills.
- The teacher should use teaching strategies that will stimulate learners' effective participation in the science lesson and promote interest in the learning of science.
- The teacher should use reward and punishment judiciously.
- The teacher should maintain effective questioning behaviour in the classroom or science laboratory.
- Science teacher should dress neatly and simply to the classroom. All forms of illicit dressing such that exposes the nude of the body should be avoided. Teacher are supposed to be an embodiment of good characters worthy of emulation to uphold the ethics of the noble profession all forms of frontless, backless and dresses that are full of perforations thereby exposing the body should not be worn to class. Apart from moral implication of putting on such dresses it has the potential of distracting the attention of learners from their learning thereby limiting the attainment of the set goals for science lessons. Hard soled shoes capable of making horrible noise should not be worn to the classroom to avoid distraction. Science teachers should be moderate in their appearance before the learners to enhance good and effective classroom environment. Teachers should not dress in torn clothes or appear wretched to the classroom or science laboratory.
- The science teacher should use appropriate teaching/learning aids not distract the attention of the learners from the teaching/learning situation.

Step IV: The teacher leads the students to state the qualities and roles of a competent science teacher.

Qualities of a competent science teacher are:

- Competence in the subject being taught i.e. good mastery of subject matter.
- Mastery of instructional techniques.
- Ability to develop effective method of evaluation.
- Creativity and resourcefulness.
- Desire to teach and good human relations.

Traditional roles of a competent science teacher are

- Specialize in the art of teaching science.
- He is a guidance counsellor.
- He promotes the students' habit of acquiring the right skills.
- He trains learners to become a good problem solver.
- He is a manager of learning environment.
- He uses varying sequence of science activities to promote good learning of science.
- He is a planner and executor of science learning experience.
- He is an authority in science field and education.
- He provides friendly and conducive classroom/laboratory atmosphere for desired learning to take place.
- He uses different kinds of approaches and strategies to bring about desired learning of science.
- He ensures the safety of learners in the science laboratory.
- He engages learners in science-oriented activities which enable them to learn science.
- He follows the learners' pattern of growth in knowledge i.e. he respects individual differences among the learners.
- He uses questioning and answering techniques appropriately.
- He organizes the learning of science in a sequential manner.

Step V: Learners were allowed to ask questions on their areas of difficulties and were guided appropriately.

Evaluation: Facilitator assess lesson by asking questions on the lesson taught.

1. Explain the resources that a good science teacher would manage in the classroom setting.
2. Enumerate factors to be considered in order to manage the learners effectively in the classroom setting.
3. Discuss the qualities and traditional roles of a good competent science teacher.

Summary/conclusion: The teacher revises the salient points again and uses it as chalkboard summary.

Assignment: Read about the factors that affect the learning environment.

Lesson note 6

Theme: Teacher as an Organizer of Learning Environment.

Topic: School as an encouraging or restricting of learning environment.

Sub-topic: Factors which make school an encouraging or restricting of learning environment.

Behavioural Objectives: by end of the lesson, students should be able to:

i. Describe school factors restricting environment for learning.
ii. Enumerate/specific factors that make school an encouraging environment.
iii. Highlight the practical ways of ensuring effective class control by the teacher.
iv. Explain homogeneous and heterogeneous grouping method and its advantages.

Teaching aids: Charts, real objects.

Previous knowledge: Students have learnt about roles of traditional science teachers in the classroom.

Reference: Adeoye, I.F. and Ahmed, A.A. (2012) Teaching Methodology in Science Education. Lagos. Googall A. publishing company pp63-66.

Procedure:

Introduction: Facilitator revises the previous lesson and introduces new lesson through questioning techniques.

Questions: State five (5) traditional roles of a good science teacher

Answer: (i) he is an organizer (ii) planner (iii) manger (iv) guidance counsellor (v) specialize in art of teaching (vi) appreciate individual differences.

Presentation:

Step I: The teacher leads the students to state factors which make school a restricting environment for learning. These factors are:

- Previous academic attainment.
- Motivation.
- Examination techniques.

- Teacher's personality and disposition.
- Availability of laboratory and its equipment.
- Overloaded syllabus.
- Shortage of qualified and professionally trained teachers and laboratory workers.
- Problem of misconceptions about science acquired through African thought and other superstitions beliefs.
- The school environment in terms of adequacy of the materials such as chairs, tables, desks, benches and other instructional materials.

Step II: The teacher leads the students to outline factors which make school an enabling or conducive environment for learning science. These factors are:

- Encouragement of social integration amongst students through the use of heterogeneous grouping.
- Provision of adequate facilities in which the students will work with.
- Employment of qualified personnel in schools.
- Standard laboratory, well illuminated and furnished with scientific apparatus and materials.
- Planning of the general features of the classroom/laboratory to reflect the requirements of science teaching.
- Emphasize necessity of concrete experimental basis for science teaching forlearners to be carried along in differentexercises.
- Teacher should present himself in a way that would promote effective learning.

Step III: The teacher leads students to state practical ways of ensuring effective class control by the science teacher. These practical ways are:

- Make a science lesson very interesting and teach very well.
- Attend classes regularly and promptly.
- Evaluate lessons regularly, grade their scripts objectively, be fair on your comments on student performance and return students scripts, workbook or practical notebook in good time.
- Exhibit disciplined behaviour both inside and outside the class.
- Do not abuse, disgrace, humiliate, harass, condemn or use vulgar language on the students in class.

- Dress properly and be neat always.
- Have a good rapports with the students.
- Enforce class/school rules humanly at all times in class.
- Show interest in the welfare of the students in the class and be ready to help them always.
- Implement your plans for the lesson
- The seats and students in the class should be arranged in such a way as to enhance teacher's easy access to the students and promote the teaching/learning process.

Step IV: The teacher allows the students to ask questions and answer their questions appropriately.

Step V: Facilitator leads learners to define grouping method and state its types and advantages.

Grouping method is a method whereby students are brought together in small groups for the purpose of learning certain scientific skills cooperatively. Grouping method may be homogeneous or heterogeneous.

Homogeneous grouping is grouping when learners with equal learning abilities work cooperatively in a group for the purpose of learning certain scientific skills.

Heterogeneous grouping method learners are group without reference to their ability.

Advantages of heterogeneous grouping method over homogeneous grouping method.

- It provides far better social integration.
- Students perform better and enjoy their work more due to differences in abilities.
- It suppresses the mistakes which could arise as a result of selection.
- It allows divergent opinions on issues which demand high and mental thought processes.
- It gives room for maximum and effective participation on the part of the members of the group.

Evaluation: The teacher asks the following questions based on the lesson taught to evaluate the learners.

Questions:

i. What are the factors which can make school an encouraging or restricting learning environment?
ii. Enumerate the practical ways of ensuring effective class control by the teacher.
iii. Discuss homogeneous and heterogeneous grouping method.

Conclusion/Summary: The teacher revises the salient points again to serve as chalkboard summary.

Assignment: Read about how children can learn science.