

Effect of Peer Tutoring and Play-Way Methods on Students' Academic Achievement and Retention in Telecommunications in Colleges of Education in North-East, Nigeria

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ABSTRACT

This study determined the effect of peer tutoring and play-way methods on students' academic achievement and retention in telecommunications course in colleges of education in north-east, Nigeria. The study used quasi-experimental design which employed non-equivalent pre-test, post-test control group design. The instrument for data collection was Telecommunications Achievement and Retention Test (TART) which comprises of 50 questions. Three experts validated the instrument which had a reliability coefficient index of 0.78. The population of the study comprised of twenty two (22) students in Federal College of Education (Technical) Potiskum and nine (9) students in College of Education Hong which made up a total of 31, for the 2021/2022 session. The entire population was used as a sample. The data for the study was collected by the tutors after administering the instrument for the pretest prior to the commencement of the experiment and for the posttest after the treatment was completed within six weeks. Meanwhile, two weeks after the completion of the experiment, a retention test was also administered by the researcher with the help of two research assistants. The Statistical Package for Social Sciences (SPSS) was used for analyzing the data. The findings of the study among which are: students taught telecommunications with peer tutoring had a higher mean achievement score than those students taught using the lecture teaching method in the achievement test, Students taught telecommunications with play-way had a higher mean retention score than those students taught using the lecture teaching method in the test for retention of learning. The recommendations of the study are among others; more attention should be accorded with peer tutoring teaching method in the colleges of education, technical teachers of telecommunications in north-east, Nigeria, should adopt the use of play-way methods to teach telecommunications, curriculum planners in National Commission for Colleges of Education (NCCE) should consider review of curriculum for telecommunications

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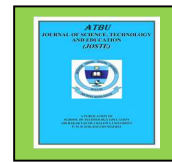
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for colleges of education with a view to incorporating the peer tutoring and play-way methods.

INTRODUCTION

Technical Education is the central tendency of every Technical skill, which is the aspect of education that leads to the acquisition of practical skills and knowledge. It is the type of Education operated at all levels of Education from Primary School to University level with the aim of preparing individuals for useful occupations. The Federal Republic of Nigeria (FRN) (2013) stated the objectives of Technical Education among others as: (a) producing people who can apply scientific knowledge to the improvement and solution of environmental problems for convenience of man, (b) enabling of young men and women to have an intelligent understanding of the increasing complexity of technology.

The Federal Government set up the National Commission for Colleges of Education (NCCE) to supervise the training of individuals of distinct disciplines including Technical Education, as teachers who will be taught various concepts for them to understand those concepts and inculcate them to the learners for achieving its objectives. The National Commission for Colleges of Education (NCCE) in Nigeria was established by an Act in 1989 to supervise the colleges of education in Nigeria. Its mandate includes the laying down of minimum standards for all programmes of teacher education and accrediting their certificates (Adamu, 2020).

Among the programmes offered in colleges of education is Technical

Education through which various skills are learned, are Automobile Technology, Building Technology, Electrical and Electronic Technology, Metalwork Technology and Woodwork Technology. Each of these skill areas or trades has courses for students to learn from NCE I to III. Telecommunications is one of the courses that the students offer in NCE III Electrical/Electronic Technology.

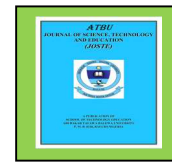
Telecommunications refers to sending, receiving and processing of information by electronic means. Information is sent via a space in the form of electromagnetic signals (Kennedy, 2016). In the same vein, telecommunications refers to the sending, receiving and processing of information by electronic means, which started with the wire telegraphy in the eighteen forties, developing with telephony some decades later and radio in the beginning of twentieth century (Abdulfatau, 2020). Abdulfatau further stated that, the main function of any telecommunications system is the transmission of electronic signals across long distances, which enables people around the world to contact one another, to access information instantly, and to communicate from remote areas. The transmission can either be unidirectional as in the case of sound and T.V. transmission or bi-directional as in the case of radio telephony. At the transmitting end, the transmitter generates radio waves. A microphone or other mechanism converts messages, like sounds or other data, into electronic impulses. The transmitters change, or modulate, the radio waves so they can carry the impulses, and then transmit the

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modulated radio signals across distances. Radio receivers pick up these signals and decode them back into the original messages.

However, almost all the topics to be learnt by students in telecommunications are with the invisible internal operation that requires different methods in teaching the course for students to understand better. The way topics in telecommunications are taught appears to lack instructional procedure that creates interactive style. Augustine and Elizabeth (2021) noted that the implication is that the instructions are not logically sequenced to fit the ability of the learners as teachers could not provide teacher-led practice to engage in reciprocal teaching.

Many students often get low performance in telecommunications in NCE III compared with the rest of electrical courses they are studying in NCE III. Despite the adoption of lecture method in teaching the courses, students perform well in rest of the courses. Onojah, Olumorin and Abimbola (2020) also observed that, teaching telecommunications nowadays is in a snag, where students' performance is drastically becoming low. Similarly, in 2015/2016, there was 45% of E-F grade of students' performance in telecommunications from FCE (T) Potiskum, FCE (T) Gombe and COE Azare; 48% in 2016/2017, 49% in 2017/2018, 56% in 2018/2019 and 57% in 2019/2020 sessions (Exams office, 2021).

Telecommunications being a practical/abstract oriented course, it requires the need to adopt appropriate methods of teaching it so as to facilitate students' understanding. But the low performance of the students attributes causal factor as revealed by Augustine &

Elizabeth (2021) who stated that, if the instructions are not logically sequenced to fit the ability of the learners, the teachers could not provide teacher-led practice to engage in reciprocal teaching. If the situation is not tackled, the objective of telecommunications may be rendered unsuccessful. Therefore, for the objectives of teaching telecommunications to be achieved, its teaching methods, the course teachers, the students of the course to remain effective, there is need to examine the effect of using various learner-centered methods in teaching telecommunication, and it is in consonance with Tumba and Chinda (2014) that different methods of teaching expose students to active learning. Since students' performance as revealed by records to be low, there is the need to explore the use of other (alternative) methods in teaching telecommunications in colleges of education, otherwise students' performance in the course will keep on declining, such that on graduation, they may not be able to contribute to the nations technological development.

Meanwhile, peer tutoring is a teaching and learning method that uses students to act as tutors, as Kaleem, Ullah and Tabassum (2018), Tutoring is the process in which experts and trained people help and support other people who are less skilled and have low level of knowledge or expertise in an interactive meaningful organized way. Usually shy students learn effectively through tutoring by sharing their thoughts with classmates. While, Play-way method of teaching is one of the methods of teaching and learning that is especially applicable in primary school, to enable the overall development of child by developing his/her feelings, intellect and

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skills. Play-way is not restricted to child learning but applicable to adult with different modality of operation from the former. As Mystakidis, Fragkaki and Filippousis (2021) stressed that, teachers should develop different customized learning activities by creating a joyful environment and shall plan the activities ranging from simple to complex, what can be best for child in preschool cannot be for post primary and in elevation.

Students' academic achievement therefore, is the performance of students in a school subject as designated by a score or mark obtained in an achievement test. Achievement is quantified by a measure of the students' academic understanding in relation to those of other students of his/her age. According to Abubakar, et al. (2017) achievement is dependent upon several factors like instructional method, the learning environment, motivation as well as retention. Hence, the academic achievement of students in Telecommunications also depends on the retention capability of the students in the subject. Tatal (2021) confirmed that achievement in education is directly connected to knowledge retention. Hence, retention of learning refers to a repeated performance by a student earlier acquired, elicited after an interval of time (Limon, (2022).

With predominant issue of lecture teaching method, that teaching telecommunications in Colleges of Education in the north-east, Nigeria is done mostly by using traditional (lecture). This trend in learning electronic courses might bring about students' retardation in their academic achievement and retention, as Tumba and Chinda (2014) connected the difficulty of students' understanding of

the principle and application of electronics to the use of lecture method of teaching. Therefore, the researcher sought to find out the effectiveness of peer tutoring and play-way method in teaching telecommunications on students' academic achievement and retention in Colleges of Education in the north-east, Nigeria.

Research Question

The study sought to the following research questions

1. What is the mean score of students on achievement test in telecommunications when taught using the Peer tutoring and those with Lecture methods?
2. What is the mean score of students on achievement test in telecommunications when taught using the Play-way and those with Lecture methods?
3. What is the mean score of students on retention test in telecommunications when taught using Peer tutoring and those with Lecture methods?
4. What is the mean score of students on retention test in telecommunications when taught using Play-way and those with Lecture methods?

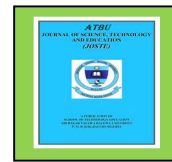
Research Hypotheses

The following null hypotheses were tested at 0.05 level of significance.

Ho₁: There is no significant difference between the mean achievement scores of students taught telecommunications using Peer tutoring and those taught using Lecture method.

Ho₂: There is no significant difference between the mean achievement scores of students taught telecommunications using Play-way and those taught using Lecture method.

Ho₃: There is no significant difference between the mean retention scores of



students taught telecommunications using Peer tutoring and those taught using Lecture method.

Ho₄: There is no significant difference between the mean retention scores of students taught telecommunications using Play-way and those taught using Lecture methods.

THEORETICAL FRAMEWORK

The study used Social Constructivism Theory on peer tutoring method and Psychoanalytic Theory of Play on play-way method. The social constructivism theory which was propounded by Vygotsky (1978). He stated that social interaction between teacher-students and student-students plays a fundamental role in learning. Teaching can be made more efficient when learners engage in activities within a supportive environment and receive guidance mediated by appropriate teaching methods (Pawlak, Derakhshan, Mehdizadeh and Kruk, 2021). Vygotsky emphasized the social nature of learning, and suggested the use of mixed-ability learning groups to promote conceptual change. He is of the opinion that teachers cannot simply give students knowledge; Students must construct knowledge in their own minds. The teacher can facilitate this process by teaching in ways that make information meaningful and relevant to students, by giving students opportunities to discover or apply ideas themselves, and by teaching students to be aware of and consciously use their own strategies for learning. Teachers can give students ladders that lead to higher understanding, yet the students themselves must climb these ladders. Suhendi, Purwarno and Chairani (2021) stressed that social constructivist sees learners must individually discover and

transform complex information, checking new information against old rules and revising rules when they no longer work. This view has profound implications for teaching, as it suggests more active role of students in their own learning in order to comprehend and reproduce what they have learnt. Therefore, the use of peer tutoring in teaching telecommunications propels the teachers to be actively involved in providing their students with cognitive tools needed for continued growth by motivating them to construct their understanding in their peer teaching and learning social interaction by making them to be tutor and tutees.

However, the theoretical framework on Play-way Method was based on Psychoanalytic Theory of Play which was proposed by Freud (1909). Freud used the pretend play of children as the medium for understanding their conscious and unconscious wishes and fears. His theory of play was based on the idea of internal conflict, and postulated that play is cathartic for children because it allows them to resolve negative feelings that may result from traumatic experiences. Fler, Veresov and Walker (2020) believed that children use play to dramatize the past, present, and future, and to resolve conflicts that they experience in each stage of their development. Bopp, Müller, Aeschbach, Opwis and Mekler (2019) thought that learners' imitations of life in their play were caused by feelings of love, admiration of what intimacy they have from their role models. Therefore, Psychoanalytic Theory of Play proposed by Sigmund Freud is important and related in teaching telecommunications where many aspect of the course seem to be difficult that require technique of play

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in handling students to comprehend the concept as suggested by Bopp, Müller, Aeschbach, Opwis and Mekler (2019) that, learners' imitations of life in their play were caused by feelings of love, admiration of what intimacy they have from their role models.

METHODOLOGY

The study used quasi-experimental design which employed non-equivalent pre-test, post-test control group design. The target population of the study comprised of all the NCE III Electrical students of the two (2) participating colleges of education, because the effect of only two methods was examined. Therefore, twenty two (22) students in Federal College of Education (Technical) Potiskum and nine (9) students in College of Education Hong which made up a total population of 34, for the 2021/2022 session and the entire population was used as a sample. The instrument used for data collection was Telecommunications Achievement and Retention Test (TART) which comprised of 50 questions that fell into the following four topics: Modulation technique and Needs for Modulation, AM and FM Modulation, Principles of Antenna and Radio Wave Propagation. Students' achievement and retention were assessed with test questions which were multiple choice objective questions with four options each, which were

developed by the researcher. The questions were developed from the current minimum standard of Telecommunications of the colleges of education by the National Commission for Colleges of Education (2020).

The instrument was trial tested in College of Education Azare, since it was not part of the study, but was from the same region. The reliability was assessed by using Kuder-Richardson Method (KR-21), having a coefficient of 0.78 index of the instrument. The data was collected by the tutors after administering the Telecommunications Achievement and Retention Test (TART) for the pretest prior the commencement of the experiment and for the posttest after the treatment was completed within six weeks. Meanwhile, two weeks after the completion of the experiment, a retention test was also administered by the researcher with the help of research assistants. The Statistical Package for Social Sciences (SPSS) was employed for analyzing the data. Mean and Standard deviation were used to answer the research question 1-4.

RESULTS AND FINDINGS

Research Question 1: What is the mean score of students on achievement test in telecommunications when taught using the Peer tutoring and those with Lecture methods?

Table 1: Mean and Standard Deviation of Pre-test and Post-test Mean Achievement Scores of Students Taught using Peer tutoring and Lecture Method of Teaching in Telecommunications.

Variable		Pre-test		Post-test		Mean Gain
Teaching Method	N	X	SD	X	SD	
Peer Tutoring Method	13	13.38	2.87	24.69	6.06	11.31
Lecture Method	9	12.11	2.42	21.22	5.95	9.11

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Key: N= Number of Students; $\bar{X}$ = Mean and SD = Standard Deviation

Results in Table one shows that the group taught using peer tutoring method had a pre-test achievement mean of 13.38 with a standard deviation of 2.87 and a post-test achievement mean of 24.69 with a standard deviation of 6.06. The difference between the pre-test and post-test mean was 11.31. The group taught using lecture method of teaching had a pre-test achievement mean of 12.11 with a standard deviation of 2.42 and a post-test achievement mean of 21.22 with a standard deviation of 5.95. The difference between the pre-test and post-test mean was 9.11. However, for each of

the groups, the post-test means were greater than the pre-test means, the group taught using peer tutoring method has higher mean gain of 11.31. This indicates that peer tutoring method of teaching has more effect on students' achievement in telecommunications than the lecture method.

Research Question 2: What is the mean score of students on achievement test in telecommunications when taught using the Play-way and those with Lecture methods?

Table 2: Mean and Standard Deviation of Pre-test and Post-test Mean Achievement Scores of Students Taught using Play-way and Lecture Method of Teaching in Telecommunications.

Variable			Pre-test		Post-test		Mean Gain
			N	$\bar{X}$	SD	$\bar{X}$	
Teaching Method							
Play-Way	Method	4	13.75	3.20	28.00	7.75	14.25
Lecture	Method	5	12.80	1.92	22.00	4.06	9.2

Key: N= Number of Students; $\bar{X}$ = Mean and SD = Standard Deviation

Results in Table two showed that the group taught using play-way method had a pre-test achievement mean of 13.75 with a standard deviation of 3.20 and a post-test achievement mean of 28.00 with a standard deviation of 7.75. The difference between the pre-test and post-test mean was 14.25. The group taught using lecture method of teaching had a pre-test achievement mean of 12.80 with a standard deviation of 1.92 and a post-test achievement mean of 22.00 with a standard deviation of 4.06. The difference between the pre-test and post-test mean was 9.2. However, for each of

the groups, the post-test means were greater than the pre-test means, the group taught using play-way method has higher mean gain. This indicates that play-way method of teaching has more effect on students' achievement in telecommunications than the lecture method.

Research Question 3: What is the mean score of students on retention test in telecommunications when taught using Peer tutoring and those with Lecture methods?

Table 3: Mean and Standard Deviation of Students' Achievement Scores and Test for Retention in Peer Tutoring and Lecture Methods of Teaching in Telecommunications.

Variable	Post-test	Test for Retention
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Teaching Method	N	X	SD	X	SD
Peer Tutoring Method	13	24.69	6.06	20.23	5.12
Lecture Method	9	21.22	5.95	18.67	3.97
Mean Difference		3.47		1.56	

Key: N= Number of Students; X = Mean and SD = Standard Deviation

Results in Table four shows that experimental group taught telecommunications with peer tutoring method had a post-test mean achievement score of 24.69 and a mean retention score of 20.23 in the test for retention of learning, while the students in the control group taught telecommunications with lecture method had a post - test mean achievement score of 21.22 and a mean retention score of 18.67 in the test for retention of learning.

The result therefore indicates that students taught telecommunications with peer tutoring method retained their learning better than those taught with the lecture teaching method.

Research Question 4: What is the mean score of students on retention test in telecommunications when taught using Play-way and those with Lecture methods?

Table 4: Mean and Standard Deviation of Students' Achievement Scores and Test for Retention in Play-Way and Lecture Methods of Teaching in Telecommunications.

Variable			Post-test		Test for Retention	
Teaching Method		N	X	SD	X	SD
Play-Way	Method	11	28.00	7.75	27.00	6.22
Lecture	Method	10	22.00	4.06	19.60	3.36
Mean Difference			6.00		7.40	

Key: N= Number of Students; X = Mean and SD = Standard Deviation

Results in Table four shows that experimental group taught telecommunications with play-way method had a post-test mean achievement score of 28.00 and a mean retention score of 27.00 in the test for retention of learning, while the students in the control group taught telecommunications with lecture method had a post-test mean achievement score of 22.00 and a mean retention score of 19.60 in the test for retention of learning.

The result therefore indicated that students taught telecommunications with play-way method retained their learning better than those taught with the lecture teaching method.

Hypothesis 1: There is no significant difference between the mean achievement scores of students taught telecommunications using Peer tutoring and those taught using Lecture method.

Table 5: t-test Statistic of Difference between the Mean Achievement Scores of Students Taught Telecommunications with Peer Tutoring Method and Those Taught with Lecture method.

Variables	N	Df	X	SD	t-cal	t-crit	Remarks
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Peer tutoring Method	13	24.69	6.06	-0.245	2.080	Accept
Lecture Method	9	21.22	5.95			

Key: N= Number of Students; X = Mean and SD = Standard Deviation

Table seven tested Research Hypothesis one. The t-test analysis in table seven was carried out to test whether significant difference exists between the post-test mean academic achievement scores of telecommunications students when taught using peer tutoring and lecture method of teaching. The result shows that there was significant difference in the post-test mean academic achievement scores of telecommunications students when taught using peer tutoring and lecture

method of teaching. Hence, the t-cal of -0.245 was less than the critical value of 2.080 at 0.05 level of significance. The null hypothesis (H_{01}) was therefore accepted, that the effect of peer tutoring method on students' academic achievement was slightly no difference from the lecture method.

Hypothesis 2: There is no significant difference between the mean achievement scores of students taught telecommunications using Play-way and those taught using Lecture method.

Table 6: t-test Statistic of Difference between the Mean Achievement Scores of Students Taught Telecommunications with Play-Way Method and Those Taught with Lecture Method.

Variables	N	Df	X	SD	t-cal	t-crit	Remarks
Play-way Method	4	8	28.00	7.75	1.294	2.306	Accept
Lecture Method	5		22.00	4.06			

Key: N= Number of Students; X = Mean and SD = Standard Deviation

Table six tested Research Hypothesis two. t-test analysis in table six was carried out to test whether significant difference exists between the post-test mean academic achievement scores of telecommunications students when taught using Play-way and lecture method of teaching. The result showed that there was no significant difference in the post-test mean academic achievement scores of telecommunications students when taught using Play-way and lecture

method of teaching. Hence, the t-cal of 1.294 was less than the critical value of 2.306 at 0.05 level of significance. The null hypothesis (H_{02}) was therefore accepted, that the effect of Play-way method on students' academic achievement was slightly no difference with the lecture method.

Hypothesis 3: There is no significant difference between the mean retention scores of students taught telecommunications using Peer tutoring and those taught using Lecture method.

Table 7: t-test Statistic of Difference between the Mean Retention Scores of Students Taught Telecommunications with Peer Tutoring Method and Those Taught with Lecture Method

Variables	N	Df	X	SD	t-cal	t-crit	Remarks
Peer tutoring Method	13	21	20.23	5.12	-1.077	2.080	Accept
Lecture Method	9		18.67	3.97			

Key: N= Number of Students; X = Mean and SD = Standard Deviation

Table ten tested Research Hypothesis four. The t-test analysis in table ten was carried out to test whether significant difference exists between the post-test mean academic retention scores of telecommunications students when taught using peer tutoring and lecture method of teaching. The result showed that there was no significant difference in the post-test mean academic retention scores of telecommunications students when taught using peer tutoring and lecture method of teaching. Hence, the t-cal of -1.077 was less than the critical

value of 2.080 at 0.05 level of significance. The null hypothesis (H_{04}) was therefore accepted, that the result showed there was no significant difference in mean retention scores of telecommunications students when taught using peer tutoring and lecture method of teaching.

Hypothesis 4: There is no significant difference between the mean retention scores of students taught telecommunications using Play-way and those taught using Lecture methods.

Table 8: t-test Statistic of Difference between the Mean Retention Scores of Students Taught Telecommunications with Play-Way Method and Those Taught with Lecture Method.

Variables	N	Df	X	SD	t-cal	t-crit	Remarks
Play-way Method	4	8	27.00	6.22	1.882	2.306	Accept
Lecture Method	5		19.60	3.36			

Key: N= Number of Students; X = Mean and SD = Standard Deviation

Table eight tested Research Hypothesis four. The t-test analysis in table eight was carried out to test whether significant difference exists between the post-test mean academic retention scores of telecommunications students when taught using Play-way and lecture method of teaching. The result showed that there was no significant difference in the post-test mean academic retention scores of telecommunications students when taught using Play-way and lecture method of teaching. Hence, the t-cal of

1.882 was less than the critical value of 2.306 at 0.05 level of significance. The null hypothesis (H_{04}) was therefore accepted, that the result showed there was no significant difference in mean retention scores of telecommunications students when taught using play-way and lecture method of teaching.

FINDINGS OF THE STUDY

The following findings emerged from the study based on the data collected and analyzed

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1. Students taught telecommunications with peer tutoring had a higher mean achievement score than those students taught using the lecture teaching method in the achievement test.
2. Students taught telecommunications with play-way had a higher mean achievement score than those students taught using the lecture teaching method in the achievement test.
3. Students taught telecommunications with peer tutoring had a higher mean retention score than those students taught using the lecture teaching method in the test for retention of learning.
4. Students taught telecommunications with play-way had a higher mean retention score than those students taught using the lecture teaching method in the test for retention of learning.
5. There was no significant difference between the mean achievement scores of students taught telecommunications using Peer tutoring and those taught using Lecture method.
6. There was no significant difference between the mean achievement scores of students taught telecommunications using Play-way and those taught using Lecture method.
7. There was no significant difference between the mean retention scores of students taught telecommunications using Peer tutoring and those taught using Lecture teaching method in the test for retention,
8. There was no significant difference between the mean retention scores of students taught telecommunications using play-way and those taught using Lecture teaching method in the test for retention,

RECOMMENDATIONS

Based on the findings of this study, the following recommendations were made;

1. More attention should be accorded with play-way teaching method in the colleges of education.
2. Technical teachers of telecommunications in north-east, Nigeria, should adopt the use of peer tutoring and play-way methods to teach telecommunications.
3. Further empirical studies should be carried out on the use of peer tutoring and play-way methods for instructional purposes, on different subjects and at different levels to provide sound basis for the integration of peer tutoring and play-way methods in Nigerian colleges of education.
4. Curriculum planners in National Commission for Colleges of Education (NCCE) should consider review of curriculum for telecommunications for colleges of education with a view to incorporating the peer tutoring and play-way methods.
5. Since the findings of this study showed that students who were taught with the peer tutoring and play-way methods performed better than those whom were taught with the lecture teaching method, students should be aware of the impact of peer tutoring and play-way methods to develop interest and emulate their teachers in the use of peer tutoring and play-way methods.

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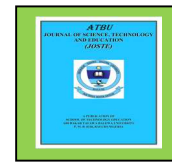
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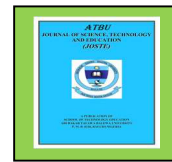
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