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# Effects of flipped learning on the students' interest and learning experiences in physics

**Ganiyat Pelumi Raheem-Folayinka**
Department of Science Education, Faculty of Education, University of Lagos, Nigeria

**Veronica F. T. Babajide**
Department of Science Education, Faculty of Education, University of Lagos, Nigeria

**Isiaka Ayobi Raheem***
Department of Physics, Faculty of Science, University of Lagos, Nigeria

***Corresponding Author:** iraheem@unilag.edu.ng

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**Abstract**
The study objectively examined the effect of flipped learning on the students' interest in Physics, and students' learning experiences between a flipped classroom and a conventional classroom. A quasi-experimental pre-test/post-test control group design was adopted for this study. An intact class sample of 45 students as experimental group and 50 control group of SS 2 students that offered Physics were used as for this study. Two senior secondary schools were randomly selected from the educational district IV of Lagos state as the area of study. The Physics Students' Interest and Flip Learning Experiences Questionnaire (PSIFLEQ) with reliability coefficient (r) of 0.84 was instrumentally used for data collection for this study. Statistical Package for Social Sciences (SPSS) software used to analyze data collected from this study to get frequency counts, mean, standard deviation. The results were interpreted at $p < 0.05$ level of significance. This study's results revealed that the flipped learning method had significant effects on student's interest in Physics, and students acquired more excellent learning experiences whenever they were exposed to a flipped classroom than a conventional classroom. With reference to the findings of this study, it is highly recommended that secondary school teachers should always be ready to be utilized innovative teaching techniques that will boost students' interest in learning Physics and other subjects exceptionally, and creatively stimulate students' learning experiences in all ramifications always among others.

## INTRODUCTION

The initiation of the internet service and smart technology devices like smartboards, MOOCs, simulation, dynamic visualization, and mobile devices among others at the present time facilitates instructional activities compared to many years ago. Detections and application of innovative science and technology ideas every day dynamically renovative the mode of instructional deliveries. (Haleem et al. 2022; U.S. Department of Education, 2017). Alteration of instructional techniques and styles

towards learners' need and individual differences is currently essential and urgency matter in cutting-edge and some developing countries. (Li et al. 2016).

Teachers' teaching capability and students' subject interests and learning experiences were simplified and stimulated by the technologically driven instructional activities of science subjects entail multiple innovative teaching and learning styles that are to suit both (California State Polytechnic University, 2017). In due course, mastery of science subject concepts by students usually needs various and innovative learning styles and approaches that will facilitate and simplify the learning task for them on the real time with the use of instructional technology devices (Sunal et al., 2016). Thompson (2023) opined that outstanding instructional activities in science subjects are curtained at all situations where all necessary resource factors are available, and properly utilized for students' interest in the subject matter and broaden their learning experiences prolifically.

Oladejo (2023) highlighted that suitable instructional technology devices and facilities possess fruitful capacities to enthusiastically transform the narratives of physics learning in Nigerian Secondary Schools towards the emancipation of teachers' proficiency and students' development of interest in Physics and learning experiences. A new-fangled academic standard according to Ahmed (2016) tends to be realized whenever there is a need for instructional enhancement to meet teachers' professional capability, students' academic performance, and society's demands. Efficacious integration of technology in instructional activities as maintained by Thompson (2023) and Rymbai (2023) gives way to the emerging of innovative teaching strategies (ITS) and technology-based learning (TBI).

Flipped learning classroom method as stated by Thompson (2023) is one of the ten innovative and technology-driven teaching methods that newly emerged for better student engagement, interactions, and leaning experiences. Cam, et al. (2022) claimed that the flip learning is one of the learning methods that enormously create awareness and exploited during pandemic of the coronavirus disease-2019 (COVID-19) at individual learners' schools and homes. The education paradigm is tremendously shifted from teacher-centred to student-centred with Flip learning as one of the innovative technology-driven learning models (Thompson, 2023 & Rymbai, 2023). The flip learning model was upstretched due to the "flipped" of the whole classroom and homework paradigm (Ahmed, 2016). Students have opportunities of learning subject contents ahead of and after the face-to-face classroom activities through the Flip learning classroom applications.

Students' academic achievements in Physics were based on the student's interest in the subject, availability of enriched learning environments, and utilization of teaching styles that meet students' needs among others. (Hadzigeorgiou & Schulz, 2019). Students' interest in Physics as claimed by Djudin (2018) is a personal pathway and an integral part of the educational processes' goal. Students always learn physics exceptionally and excel in all other related subjects whenever they develop an optimum interest in it. Brakhage et al. (2023) stated that students' leisure interests in physics classes can be enhanced whenever their behavioural disengagement in Physics is reduced through enriched environments and technology-driven learning styles.

Jugović (2017) discovered that female students had an inferior self-concept of capability and lower expectations of success in Physics compared to male students. Trumper (2006) discovered that male students have a higher interest in Physics than female students. Djudin (2018) further stated that motivation, students' attitudes, knowledge, future hopes, skills, and assumptions are internal factors affecting students' interest in Physics; while instructional methods used by teachers, students' study environment condition, availability of innovative learning facilities, and family environment are external factors affecting students' interest in Physics.

## LITERATURE REVIEW

### *Concept of Flipp Learning and Classroom*

The advent of innovative technology has tremendously influenced instructional activities throughout the world positively. Thompson (2023) stated that there are 10 innovative teaching strategies for better student engagement. The strategies involve flipping the classroom, personalized learning, project-based learning (PBL), inquiry-based learning (IBL), Jigsaws, Asking open-ended questions, peer teaching, blended learning, feedback, and active learning. The flipped class model according to Memler (2017) is a relatively innovative teaching community that has been increasingly popular in the education and communication industries.

Historically, Eric Mazur of Harvard in 1990 attempted to transform his conventional teaching methods when he discovered that some of his students failed to understand fundamental concepts of Physics in his class. He initiated a Peer Instruction method that will fully establish students' interactions during class and allow students to read Physics related to notes and textbooks before class activities. During class, Manzur usually engages students in meaningful discussions, and questions and answers. (Lambert, 2012). The flipped classroom as stated by Memler (2017) was further revolutionized due to the promotion of Kaha Academy "a not-for-profit [organization] with the goal of changing education for the better by providing a free world-class education to anyone anywhere"

The flipped classroom model as discovered by Memler (2017) was based on the release of intending subjects' class activities to learners via video and/or audio and engaging learners in readings ahead of the class activities days, while the subjects' homework is done during class activities. In a nutshell, the flipped classroom according to Yildirim and Kiray (2016) is *"The Inverted Classroom"* where classroom activities are swapped with homework. Yildirim and Kiray (2016) claimed that the flipped classroom model is currently and widely utilized in STEM education because of its versatility. The model term "F-L-I-P-P-E-D" is an acronym, and each letter symbolizes subscales as follows: "F- Flexible Environments; L- Learner-Centered Approach; I- Intentional Content; P- Professional Educators; P- Progressive Networking Learning Activities; E- Engaging and Effective Learning Experiences; and D- Diversified and Seamless Learning Platforms".

The flipped classroom model as stated by Yildirim and Kiray (2016) is innovatively and flexibly consists of inquiry-based learning, blended learning, and other instructional approaches that will proffer immediate solutions to the learners' needs. Smallhorn (2017) and Ökmen & Kılıç (2021) opined that the flipped classroom model encourages learners' instructional and cooperative learning that establishes a pedagogy approach to the student-centred learning environment. The flipped classroom model grounded in active learning pedagogy, transforms the face-to-face classroom. Putri and Purwaningsih (2021) asserted that flipped classrooms transform students to be excellently active in instructional activities and assist students in decreasing their cognitive load.

The study of flipped classrooms as noted by Zainuddin and Halili (2016) was constructed on the theory of Bloom's revised taxonomy of the cognitive domain. Six levels of learning were embedded in the taxonomy. The six levels involve remembering, understanding, applying, analyzing, evaluating, and creating.

### *Concept of Students' interest in Physics and experiences between a flipped classroom and a conventional classroom.*

Physics as a science subject as discovered by the Environmental Science (2024) consists of theories that are deeply needed functional and reasonable instructional activities which will facilitate numerous opportunities for learners to develop their interest and learning experiences in all academic

events that will boost their performance exceptionally. The achievement celebration of students' academic excellence in any subject is only determined by their interest and commitment. Djudin (2018) noted that educational process goals are usually achieved through students' interest in the subjects' contents. No matter how the learning environment is or whether teachers are professionally sound, if students do not develop an interest in the subject, no academic achievements will be celebrated. Concerning students' interest in science subjects especially Physics, Djudin (2018) stated that, students' excellent performance in Physics is strongly determined by their interest and commitment to Physics.

The Perse School (2019) discovered that scientists, teachers, parents, and other educational stakeholders complain about the declining rate of students' interest and learning experiences in most science-based subjects which tremendously affects students' academic performance negatively. The influential factors that contribute to the students' disinterested in Physics as discovered by Djudin (2018) involved the unfamiliarity of students with the principles of Physics from basic schools, students perceived Physics as the most problematic science subject, perceived Physics as a subject that taught in abstract and required memorization, and Physics as a subject that as no alternative to passing except rote learning. Djudin (2018) further noted that teachers' instructional patterns, parental factors, peer group influence, lack of teaching-based technology, and absence of appropriate learning environments discourage students from developing an interest in Physics at most schools.

Research according to Brakhage et al. (2023) reveals that students' interest in science subjects due to their learning experiences through traditional teaching method declined during their school years. The introduction of students' leisure interests to foster their (situational) interest in physics was initiated by Brakhage et al. (2023) study. The study's results imply that the instructional intervention succeeded in prompting students' catch-and-hold element of situational interest during all segments of the lesson series. Trumper (2006) carried out a study on the students' attitudes toward science and technology, beliefs about science classes, and out-of-school experiences in Physics. Trumper's (2006) study's findings revealed that boys showed a higher interest than girls, and there is a strong correspondence between students' "neutral" interest in physics, and there are negative beliefs about science classes.

Jugovi (2017) carried out a study on the role of motivation for students' interest in Physics, students' intention to select Physics at the high-level school leaving exam, and students' expectancy of success in Physics. Jugovi's (2017) study findings indicated that girls had inferior self-concept of ability and lower expectancies of achievement in Physics related to boys, self-concept of Physics ability among the respondents was the strongest forecaster of Physics school grades, expectancy of success was one of the energetic predictors of girls' educational intentions, confirmation of a typically masculine gender role predicted girls' and boys' stronger purposes to select a stereotypically male educational and professional fields.

Some of the researchers like Pahalson, et al. (2014) emphasized that it is important to introduce innovative and technology-driven instructional methods to Physics Education towards the acquisition of vibrant theoretical and viable Physics experiments that will improve clarity as well as the depth of learning interest and experiences of students and teachers productively. The role of functional Physics education in the technological advancements of nations cannot be over-emphasized. Based on the foregoing, it can be concluded that innovative and technology-driven instructional methods enhance the relational understanding of Physics concepts by students extensively.

This study argues that perhaps this improved understanding can lead to students' upgrading in Physics achievements and have positive belongings on retention. Highly developed Physics education as opined by Hammack and Anderson (2022) is needed to keep on producing future engineers,

technologists, and scientists to drive the economic powered-machine of any nation. Iwuji (2012) discovered that the teaching strategy that teachers employ in science teaching has significant effects on student achievement; Activity-Based teaching strategy facilitates effective learning of Basic science concepts. Mari (1994) observed that science subjects are taught in Nigerian schools today predominantly by using the traditional method, commonly known as the lecture method. Zengele and Alemayehu (2016) opined that high-quality science and technology education in primary and secondary schools contributes to developing scientific literacy and would be expected to predispose students to study the enabling sciences at university.

***Philosophy of Physics Curriculum in Nigeria***

Physics was described by Montclair State University (2024) as one of the oldest academic natural science disciplines that focused on the understanding of the working principle of everything at its ultimate level. Physics is a natural science according to the LibreTexts libraries (2024) that concerns the logical study of matter's nature and its motion within a specific time and space. The interaction of matter with other related concepts such as energy and force were also embedded in Physics. The fundamental goal of Physics is to simplify the universe's behavior by exposing learners to the latest trend of latest developments and functionality which can be achieved through the operational implementation of the Physics curriculum at all academic institutions. The aim of Physics as mentioned by the Britannica (2024) is to discover "a unified set of laws governing matter, motion, and energy at small (microscopic) subatomic distances, at the human (macroscopic) scale of everyday life, and out to the largest distances (e.g., those on the extragalactic scale)."

Curriculum can be termed as a composition of subject matter to be instructionally presented as pieces of information to the learners at any conducive environment. The term curriculum has been portrayed in numerous ways by many scholars and researchers. The State of Rhode Island (2024) defined curriculum as the essential part of the academic institution's "blueprint" that consists of a standard-based sequence of instructional subjects' contents and objectives, appropriate teaching and learning styles, and recommended instructional materials for the subjects' contents. The functionality of the above-stated component of the curriculum concepts were strongly depends on how individual components of curriculum were implemented and interrelated.

Nigerian Educational Research Development Council (NERDC) (2019) and the Federal Republic of Nigeria (FRN) (2013) stated that the Nigerian Senior Secondary Education curriculum comprised Science and Mathematics; Technology; Business Studies and Humanities as fields of studies. The Science and Mathematics field of the curriculum was broken down into Physics, Chemistry, Physics, Further Mathematics, Health Education, Agriculture, Physical Education and Computer Studies subjects. At the Nigerian Secondary Schools, Physics is a science subject, and its curriculum is comprised of five themes. The Interaction of Matter, Space and Time are theme 1; Conservation Principles is theme 2; Field at Rest and in Motion are theme 3; Energy Quantization and Quality of Matter are theme 4; and Physics in Technology is theme 5 respectively. These five themes were recommended for full implementation for Nigerian students varying from Senior Secondary School (SSS) 1 to SSS 3. (NERDC, 2019 & FRN, 2013).

As it was stated in the National Policy on Education, "No educational system can rise above the quality of its teachers". No matter how excellent a curriculum is, its implementations' success or failure are largely dependent on the ability or inability of the teacher to implement as originally stated by the curriculum planner. Teachers are the key factor in curriculum implementation. Adeyemo (2011) stated that Physics as one of the science subjects/courses in Nigerian secondary schools, technical colleges, and higher institutions is the foundation of all scientific and technological development throughout

the World in both developed and developing countries similarly. Physics has some exceptional features that are generally admitted and believed to widen knowledge, skills and increase the horizon of understanding of Physics by the science teachers and learners.

Adeyemo (2011) further noted that the major concept which underlines and unifies the topics in the SSS Physics curriculum focuses on mechanics, motion, heat, light, and energy. Significance of the Physics topics to the society in general in terms of applications is emphasized and stressed thoroughly and logically. Usually, the approach in the Physics curriculum according to Taofeeq (2022) is to implement the topics under a unifying concept in a general form and provide some useful elaboration on the implications to advocate relevance and utilized abundant illustrations to facilitate students' understanding. Science teachers as the chief Physics curriculum implementors need to be exceptionally competent in the subject-content, pedagogical, and technology usability.

Oladejo (2023) emphasized that the narratives of physics learning in Nigerian Secondary Schools need to be improved in line with the technology innovation. The advantage of the guided discovery approach propelled by innovation has been discussed by many scholars like Ivowi. Comparable to other science subjects and courses, understanding of concept, functionality, and application are the three factors that essential to emphasized in the SSS Physics curriculum content by the science teachers. Teachers' ability to proficiently explain the subject's concepts and principles and appropriate apply them in each situation is needed at the implementation stage because of the essential role which Physics plays in the development of science and technology at all societies.

Oladejo (2023) stated further that the utilization of innovative and technology-driven instructional methods kickstarts the functionality of any subject curriculum effectively. The use of innovative and technology-driven devices, equipment and facilities will immensely expose students to the various subjects' concepts and processes and that will enable them to acquire relevant subject' skills. A high degree of accuracy is not essential in this stage but complete reliance on the precision of the instrument used needs to be stressed. Amanah, Wibowo and Astra, (2021) confirmed that adoption and applications of flip classroom for instructional purpose of Physics will tremendously empower students to develop interest in learning Physics and develop lively learning experiences in compared with students taught in traditional classrooms.

***Empirical studies of the flip learning on Students' interest in Physics and students' learning experiences between a flipped classroom and a conventional classroom.***

Mokuolu and Ojo's (2023) study examined "students' learning interest, academic achievement and learning retention in college physics based on Flipped Classroom Learning Strategy (FCLS) and Traditional Lecture Method (TLM)". The study's findings reflected that "(i) FCLS significantly heightened students' academic achievement and learning interest in college Physics better than the TLM; (ii) FCLS improved male physics students' academic achievement better than their female colleagues taught using FCLS without no significant difference between male and female students; (iii) FCLS positively stimulate students' learning retention in college physics better than the TLM without significant difference between the experimental and control groups".

***Statement of the Problem***

In spite of being at the information and communication era, instructional activities at majority of Nigerian secondaries schools are still restricted to the traditional teaching techniques by the schoolteachers and administrators. This stagnant decision has greatly been recognised as a challenge for students to develop interest in learning science subjects especially Physics. Also, students were myopic in discovering and acquiring innovative learning experiences that related to the utilization of innovative and technology-driven instructional devices and facilities.

Students are parochially in nightmare of learning concepts Physics theories and practice with dynamic technology-induced instructional activities which immensely causes students disengagement in developing interest in learning Physics and other science subjects. Therefore, this study examines the effects of flipped learning on the Students' interest in Physics and students' learning experiences between a flipped classroom and a conventional classroom.

***Purpose of the Study***

The main purpose of this study is to examine the effects of flipped learning on the Students' interest in Physics and students' learning experiences between a flipped classroom and a conventional classroom. Specifically, this study examines the:

1. effect of flipped learning on the interest of students in Physics.
2. students' learning experiences between a flipped classroom and a conventional classroom.

***Research Questions***

The following research questions were postulated to guide this study:

1. What are the effects of flipped learning on the interest of students in Physics?
2. What are the students' learning experiences between a flipped classroom and a conventional classroom?

## METHODS

***Research Design***

This research is Design and Developmental Research (DDR) which adopted a quasi-experimental pre-test/post-test control group design. The quasi-experimental design involved intact classes of experimental and control groups. The experimental group was exposed to the flip learning method while the Control Group was exposed to the traditional learning method. The research was carried out at Yaba and Lagos Mainland Local Government Areas of Educational Districts IV of Lagos State. The study covered all public senior secondary schools in the Yaba and Mainland Local Government Areas out of 9 public senior secondary schools in the local governments. (Lagos State Government Ministry of Education, 2019).

The pre-test and post-test designs are symbolically illustrated in Figure 1.

| | | | |
|---|---|---|---|
| Experimental | $O_1$ | X | $O_2$ |
| Control | $O_3$ | — | $O_4$ |

**Figure 1.** Pre-test and Post-test Design

Effect of the experimental treatment = $(O_2 - O_1) - (O_4 - O_3)$

***Sample and Sampling Technique***

The intact class of SS 2 students offering Physics at the Mainland Senior High School (MSHS), Jibowu, and Federal College of Education (Tech.) Secondary Schools, Akoka are used as samples for this study. Fifty (50) SS 2 students were used as a control group at the Mainland Senior High School (MSHS), and forty-five (45) students were used as an experimental group at the Federal College of Education (Tech.) Secondary Schools. The two SSS 2 schools selected for this study possessed the same characteristics concerning an equal number of Physics teachers, and a lack of flip learning methods to teach Physics, and both schools have been offering Physics since the year 2000 till date. There was no interference between the groups used for this study during fieldwork exercises because the experimental and control groups' schools were in educational districts II and IV of Lagos State. A purposive sampling technique was used for this study.

***Research Instruments***

The research instrument used in this study consists of the Open-Ended Questionnaire. The questionnaire was structured for the experimental group of students named as Physics Students' Interest & Flip Learning Experiences Questionnaire (PSIFLEQ). The questionnaire contains 20 items that sought for the information related to the effects of flipped learning on the interest of students in Physics, and students' learning experiences between a flipped classroom and a conventional classroom. The PSIFLEQ was appropriately validated and pilot tested at a Senior Secondary School other than the schools used for the study with Guttman Split-Half coefficient result of 0.84. The instrument was properly administered to the respondents after the instructional activities at the area of study based on the study plan.

## RESULTS AND DISCUSSION

Data collected were analyzed quantitatively by using the SPSS Software package. The descriptive statistics of standard deviation, means, and frequency counts were calculated since the nature of the study demands mean scores to determine the effects of flipped learning on the interest of students in Physics, and students' learning experiences between a flipped classroom and a conventional classroom.

***Item–by–Item analysis of the Research Instrument***

**Table 1.** Distribution of Students in Schools based on Gender

| S/N | Name of Schools | Students | | |
|---|---|---|---|---|
| | | Male | Female | Total |
| 1. | Mainland Senior High School (MSHS), Jibowu. | 32.0 | 18.0 | 50.0 |
| 2. | Federal College of Education (Tech.) Secondary School, Akoka. | 29.0 | 16.0 | 45.0 |
| | Total | 61.0 | 34.0 | 95.0 |

Table 1 shows the distribution of students used in the sampled school. It revealed that the total number of students used for this study was 95 in number. 50 students were available as the Physics intact class at the Mainland Senior High School (MSHS), Jibowu; and 45 students were available as the Physics intact class at the Federal College of Education (Tech.) Secondary School, Akoka. Out of the two schools sampled only 34 (35.79%) female students, while 61(64.21%) were males.

**Research Question 1:** What are the effects of flipped learning on the interest of students in Physics?

Table 2 shows an item-by-item analysis of questionnaire items of the experimental group Students' Interest in Flip Learning. A deducted from the table shows that experimental group students accepted that "watching physics videos improves their interest in Physics practical" (M 4.556, S.D 12.27), "they like their Physics class more with the flip learning method" (M 4.422, S.D. 11.49), "they feel interested to learn Physics extra with the new method" (M 4.662, S.D. 12.92), "flip learning method wipe out their hatred for learning Physics" (M 4.662, S.D. 12.92), "they enjoyed leaning Physics with Interactive games in flip learning method" (M 4.556, S.D. 12.27), "they fill alright to do Physics calculations after watching our teacher's shared videos" (M 4.422, S.D. 11.49), "our teacher's shared notes help me to prepare well for the Physics class" (M 4.644, S.D. 13.15), "the new method raises my passion for Physics practical activities" (M 4.667, S.D. 13.42), "they like solving Physics problems with

the flip learning method" (M 4.422, S.D. 11.49), and "learning Physics with flip method change their ideas about the World" (M 4.622, S.D. 12.92).

**Table 2.** Item-by-Item Analysis of Questionnaire of the Physics Students' Interest in Flip Learning.

| S/N | Questionnaire Items | Strongly Agree | Agree | Undecided | Disagree | Strongly Disagree | Mean ($\bar{x}$) | Standard Deviation | Decision |
|---|---|---|---|---|---|---|---|---|---|
| 1. | Watching physics videos improves my interest in Physics practical. | 26 | 18 | 01 | 00 | 00 | 4.556 | 12.27 | Accepted |
| 2. | I like my Physics class more with the flip learning method. | 23 | 20 | 00 | 02 | 00 | 4.422 | 11.49 | Accepted |
| 3. | I feel interested in learning Physics extra with the new method. | 28 | 17 | 00 | 00 | 00 | 4.622 | 12.92 | Accepted |
| 4. | The flip learning method wipes out my hatred for learning Physics. | 25 | 15 | 01 | 01 | 01 | 4.244 | 10.99 | Accepted |
| 5. | I enjoyed learning Physics with Interactive games in the flip learning method. | 26 | 18 | 01 | 00 | 00 | 4.556 | 12.27 | Accepted |
| 6. | I feel all right to do Physics calculations after watching our teacher's shared videos. | 23 | 20 | 00 | 02 | 00 | 4.422 | 11.49 | Accepted |
| 7. | Our teacher's shared notes help me to prepare well for the Physics class. | 29 | 16 | 00 | 00 | 00 | 4.644 | 13.15 | Accepted |
| 8. | The new method raises my passion for Physics practical activities. | 30 | 15 | 00 | 00 | 00 | 4.667 | 13.42 | Accepted |
| 9. | I like solving Physics problems with the flip learning method. | 23 | 20 | 00 | 02 | 00 | 4.422 | 11.49 | Accepted |
| 10. | Learning Physics with the flip method changed my ideas about the World. | 28 | 17 | 00 | 00 | 00 | 4.622 | 12.92 | Accepted |

**Research Question 2:** What are the students' learning experiences between a flipped classroom and a conventional classroom?

**Table 3.** Item-by-Item Analysis of Questionnaire of the Physics Students' Learning Experiences between a flipped classroom and a conventional classroom.

| S/N | Questionnaire Items | Strongly Agree | Agree | Undecided | Disagree | Strongly Disagree | Mean ($\bar{x}$) | Standard Deviation | Decision |
|---|---|---|---|---|---|---|---|---|---|
| 1. | The flip learning method eases my memory of Physics contents. | 26 | 18 | 01 | 00 | 00 | 4.556 | 12.27 | Accepted |
| 2. | I like my Physics class more with the flip learning method. | 23 | 20 | 00 | 02 | 00 | 4.422 | 11.49 | Accepted |
| 3. | I feel more confident to learn Physics with the flip learning method. | 25 | 15 | 01 | 01 | 01 | 4.244 | 10.99 | Accepted |
| 4. | Our teacher's shared videos and notes help me to prepare for the next class. | 26 | 18 | 01 | 00 | 00 | 4.556 | 12.27 | Accepted |
| 5. | My revision with our teacher's shared videos helps me to remember class activities. | 23 | 20 | 00 | 02 | 00 | 4.422 | 11.49 | Accepted |
| 6. | Our teacher's shared notes help me to prepare well ahead of the class activities. | 29 | 16 | 00 | 00 | 00 | 4.644 | 13.15 | Accepted |
| 7. | The new method always proffers solutions to my physics-challenged questions at any time. | 30 | 15 | 00 | 00 | 00 | 4.667 | 13.42 | Accepted |
| 8. | My success is sure in science class with the flip learning method. | 23 | 20 | 00 | 02 | 00 | 4.422 | 11.49 | Accepted |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 9. | The flip learning method improves my peer-group subjects' discussions. | 28 | 17 | 00 | 00 | 00 | 4.622 | 12.92 | Accepted |
| 10. | The flip learning method removes the fear of Physics from my body system. | 26 | 18 | 01 | 00 | 00 | 4.556 | 12.27 | Accepted |

Table 4 shows an item-by-item analysis of questionnaire items of the experimental group Students' learning experiences between a flipped classroom and a conventional classroom. A deducted from the table shows that experimental group students accepted that "the flip learning method eases their memory of Physics contents" (M 4.556, S.D. 12.27), "they like their Physics class more with the flip learning method" (M 4.422, S.D. ), "they feel more confidence to learn Physics with the flip learning method" (M 4.244, S.D. 10.99), "their teacher's shared videos and notes help them to prepare for the next class" (M 4.556, S.D. 12.27), "their revision with their teacher's shared videos helps them to remember class activities" (M 4.422, S.D. 11.49), "their teacher's shared notes help them to prepare well ahead of their class activities" (M 4.644, S.D. 13.15), "the new method always proffers solutions to their Physics challenged questions at any time" (M 4.667, S.D. 13.42), "their success are sure in science class with the flip learning method" (M 4.422, S.D. 11.49), "the flip learning method improve their peer-group subjects' discussions" (M 4.622, S.D. 12.92), and "the flip learning method remove fear of Physics from their body system" (M 4.556, S.D. 12.27).

***Discussion of the findings***

Physics is one of the science foundation subjects at the Secondary schools which exceptionally requirements the applications of a technological-enriched environment and state-of-the-art learning techniques that have the possible to enhance students' interest in Physics and learning experiences whenever they were exposed to the flip learning classroom. The availability and frequency of use of innovative and enriched teaching methods greatly influence the student's interest and learning experiences in all academic institutions of learning particularly in secondary schools (Pahalson, et al., 2014). This study therefore examined the effects of flipped learning on the students' interest in Physics and students' learning experiences between a flipped classroom and a conventional classrooms. Therefore, discussion of the findings based on the Research Questions goes thus:

The result of the effects of flipped learning on the interest of students in Physics is presented in Table 3. The result shows that the flipped learning classroom positively influences students' interest in learning Physics and facilitates the acquisition of Physics calculations and practical skills among others during the usage of the method for this study. This result is supported by the findings of Brakhage et al. (2023) stated that students' leisure time interests in physics classes can be enhanced whenever their behavioural disengagement in physics is reduced through enriched environments and technology-driven learning styles. Talan and Gulsecen (2019) and California State Polytechnic University (2017) discovered that the students were largely satisfied with their learning activities whenever they were exposed to the flipped classroom. Djudin (2018) further noted that teachers' instructional patterns, parental factors, peer group influence, lack of teaching-based technology, and absence of appropriate learning environments discourage students from developing an interest in Physics at most schools. Trumper (2006) study discovered that male students have a higher interest in Physics than female students.

The result of the student's learning experiences between a flipped classroom and a conventional classroom is presented in Table 4. The result shows that flipped learning classrooms improved students' learning experiences, transformed their learning styles, and energized their self-confidence to understand Physics among other benefits than conventional classrooms. This result supported Amanah, Wibowo and Astra, (2021), who discovered that students exposed to flip learning had exceptional interest in Physics and learning experience whenever they were taught with flip classroom and other technology-driven instructional techniques when compared with students taught in traditional classrooms. Also, Putri and Purwaningsih (2021) and Sirakaya and Özdemir (2018) confirmed that the flipped classroom motivates students to learn physics, influences students to learn flexibly and independently, and improves students' metacognition in outward show.

## CONCLUSION AND RECOMMENDATIONS

This study has educationally and emphatically proved that individual learners curiosity to offer any subjects or courses of their choice are basically stimulated by their interest and learning experiences they acquired based on some notable instructional factors like technology-driven facilities and strategies. The flip classroom learning method as it was reflected in this study motivating, encouraging, and positively influencing students interest in Physics and learning experiences more than traditional teaching methods. This study at this moment worthwhile concluded that groundbreaking technology-driven instructional facilities and methods lucratively catalyzed students' interest in Physics subjects courageously and renovate students' experiences about learning Physics and other science subjects within and outside the academic and training institutions efficiently. Therefore, based on the findings of this study, it is highly recommended that secondary school teachers should always be ready to be utilized innovative teaching techniques that will boost students' interest in learning Physics and other subjects exceptionally, and creatively stimulate students' learning experiences in all ramifications always among others.

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