NAU Journal of Technology and Vocational Education
Volume 11, No. 2, April 2026

FLIPPED CLASSROOM METHOD ON TEACHING AND LEARNING OF BIOLOGY IN SECONDARY SCHOOL

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Abstract
Effective teaching and learning cannot be accomplished without proper management of the learning process. The need to change classroom orientation from teacher – centred to student – centred for more active involvement as a way of improving students' learning is well recognised. From this research, flipped classroom make teaching and learning enjoyable, productive, engaging, effective, and satisfying. In addition, flipped classroom is a powerful tool used to achieve academic, behavioural and affective goals. Efficient use of flipped classroom will increase students' attitude that reflects the engagement of students and improves their performance. Teachers should adopt the flipped classroom approach because it is a student-centred learning strategy that involves the students rather than spoon-feeds them. It was recommended that; teachers should seek for more knowledge on the utilisation of flipped classroom for instruction, stakeholders in the education industry should appreciate, support and sustain the use of flipped classroom, government should, supply adequate technological facilities that will sustain flipped classroom integration in all secondary schools in Ekiti State, and school management should allocate both finance and resources to promote professional development of teachers.

Keywords: *Flipped classroom, Teaching, Learning, Biology, and Secondary School*

Introduction

Education curriculum has been designed to make the learners relevant in the society. The curriculum is designed to make our learners to be very unique in their own way, to endow them with the strength that they need to forge ahead in their aspiration. Therefore, efforts are to be made for learners to encounter instructions unhindered under the guidance and supervision of the teacher. Curriculum implementation takes place as the learner acquires the intended experiences, knowledge, skills, ideas and attitudes that are aimed at enabling the same learner to function effectively in a society (Bediako, 2019). The learner and how it will acquire the knowledge is the main focus of the curriculum. In a bid to make the learners function effectively in the society, he needs to acquire factual knowledge in all the subject across the curriculum. This is a way of making the learners to have a comprehensive knowledge of the instruction that they are being exposed to and other information that are relevant to the learners' development in the society. All these requires commitment to learning.In view of the demand for 21st century, there is high projection for 21st century learning.

Educationists all over the world emphasised certain traits that learners should exhibit, these traits hang on the ability of the learners to solve problems, to be creative, ability to think critically, having skills in literacy, numeracy, digital skills, collaborative learning, social responsibility and acquisition of media literacy. Therefore, for a healthier learning to take place, students should be actively engaged in and out of classrooms. The students need to learn how to process and analyse large amount of information (Buckles, 2021). It has become so imperative for teachers to improve their instructional skills. However, as much as the traditional model of instruction was put in place from the inception of education, the traditional method sees the teacher as the only person that has it all in terms of giving instruction in the classroom, therefore, making the process of teaching to be teacher-centred. It is a way teacher become the primary controller in the classroom and students are just merely the listener and remain passive in the whole duration of discussion (Maresos, 2017). Some teachers and professionals have concluded that, this traditional model of giving instruction is no lon[ger responding to the needs of the reality of 21st century learning. In the view of Lawless (2019), A learner-centred

approach views learners as active agents, they bring their own knowledge, past experiences, education ideas, impacts how they take on board new information and learn. One of the ways of making learning learner-centred is to integrate the regular classroom interaction with technology and engage the learners actively in the learning process. This can as well be called digital technology. Digital technology in education have increased exponentially, particularly in the last ten years and may even be said to be revolutionising the way learners learn. The evolution of technology and social software is significantly changing, not only the way learners have access to the information and knowledge, but also the type of relationship the students have with the instructor and with each other (Siemens, 2018). This form of learning engages students and prepare them for readiness to learn, encourages full participation of learners. Learners can as well assess instruction over and over. It encourages permanent learning, accommodates as many participants as possible, no class limit. It makes learning to be fun and encouraging.

According to Swinney (2016) digital technology can make a significant contribution to learning where our educators are supported through professional development, resources, leadership, digital technology can enrich learning and teaching, help to raise levels of attainment and close attainment gap.Equally stressed that, the appropriate and effective use of digital technology within education will give all of our learners the opportunity to improve their educational outcomes and to develop digital skills that will be vital for life, learning and work in todays' increasingly digitalised world. This innovation in learning can arouse the interest of the learners. It can as well incorporate the traditional model of learning while the teacher serves as a guide and the learners focused on their own learning.These include; Google Classroom, Flipped Classroom etc.

Flipped Classroom

Stone (2012) defined flipped classroom as a new pedagogical method which consist of video lectures, the videos can be those that are available from the internet or pre-recorded by teachers themselves that students watch at their own time and pace to attending classes. It is a strategy where learners work and participate on an assigned content either individually or as a group. It is an approach which flips the conventional classroom method into an interactive teaching method using technology into web-based classroom construct instructional foundations from teacher-centred to learner-centred.

Pallathadka and Pallathadka (2020) stated that, it involves the teacher making use of a pre-recorded or pre-class activities to engage the learners in an out of class preparatory to take part of the class work on their own and later come to the class for further interaction. Also, Skonnard (2015) see the flipped classroom as an instructional strategy and a form of blended learning where students watch video lectures outside of class to learn content (usually online) and then do their homework in class with the presence and guidance of teachers, students can now learn at their own pace and save class time for interaction. This approach requires students to engage themselves outside of the classroom as well as in it. The teacher is obliged to provide the learning materials and conducive learning environment even while flipping the classroom.

The core idea of the flipped classroom is to invert the common teaching approach instead of using class time to lecture. Learners learn in advance of the class instruction via video or other means for interactive lesson or other mode of content exposure. The class now becomes the place to apply the material through problems solving, advance concepts and engage in collaborative learning.In this way, all aspects of instruction are re-thought to maximise the scarcest learning resource time (Tucker, 2012). Although, apart from using technology, students can still be engaged in physical lesson in form of pre-instruction assignment such as pre-reading class, getting certain mathematics problem-solving, reading the literature text, having a project to execute and at the end, the class will be for robust discussion and clarification of ideas not clear to the learners.

Theory of Flipped Classroom

The flipped classroom instructional strategy happens to be an arm of blended learning. This learning strategy is anchored on the constructivist learning theory. The constructivist learning theory was propounded by Jean Piaget 1896-1980 (Baken Lefa, 2014). This constructivist theory is based on the social aspect of learning, the theory stating that the learner constructs knowledge rather than just

passively takes information (Cattblog, 2022). It further explains that students learn best when engaged in learning experiences rather than passively receiving information. That learning is inherently a social process because it is embedded within a social context as students and teachers work together to build knowledge, Because knowledge cannot be directly imparted to students, the goal of teaching is to provide experiences that facilitate the construction of knowledge (Cattblog, 2022).

In all these, it is certain that students need to construct their own knowledge in order to make learning remain permanent. Learners need to make their own discovery and generate ideas. All these are what the 21st century learning entails. The whole attention of learning is on the learner, the learner is at the centre stage of learning and so, there is a need for teachers to make use of the learners centred approach of learning of which the flipped classroom strategy is one of them.

Another indication of the usage of flipped classrooms is connected to certain important findings on the science of teaching and learning raised by Bransford, Brown and Cocking (2000). He stressed that, in order for students to develop competency in a given area of study, they have an obligation to have a deep foundation of factual knowledge, understand facts and ideas in the context of a conceptual frame that facilitate retrieval and application.

The idea is that the flipped classroom provides an opportunity for students to learn and interact with other students with the guidance of the teachers. Students can work together to solve the problem and apply new concepts this create a strong learning community. While they have access to immediate feedback from peers and the teachers helping students learn to correct misconceptions and organise their new knowledge. The immediate feedback that occurs in the flipped classroom is crucial because it helps students to recognise and think about their own learning. Although students' thinking is not an inherent part of the flipped classroom, the higher cognitive functions put into practice through class activities along with the ongoing learners-teachers interaction can lead to the metacognition associated with deep learning (Brame, 2013).

In the flipped classroom, teachers use face to face time to focus on higher level learning and lower level outcomes outside of class. This means flip video before class could be as simple as watching a video before class for the lower level cognitive stages (which is knowledge and comprehension, and then attending class for more in-depth discussions that involve the higher-level skills of judging, analysing and creating). If students work with the fundamental material before class, they are better prepared to apply the information and engage in higher discussions with their peers and instructor (Honeycutt and Garrett, 2014).



Figure1. Flipped Classroom Approach (Alimi S.F, 2025)

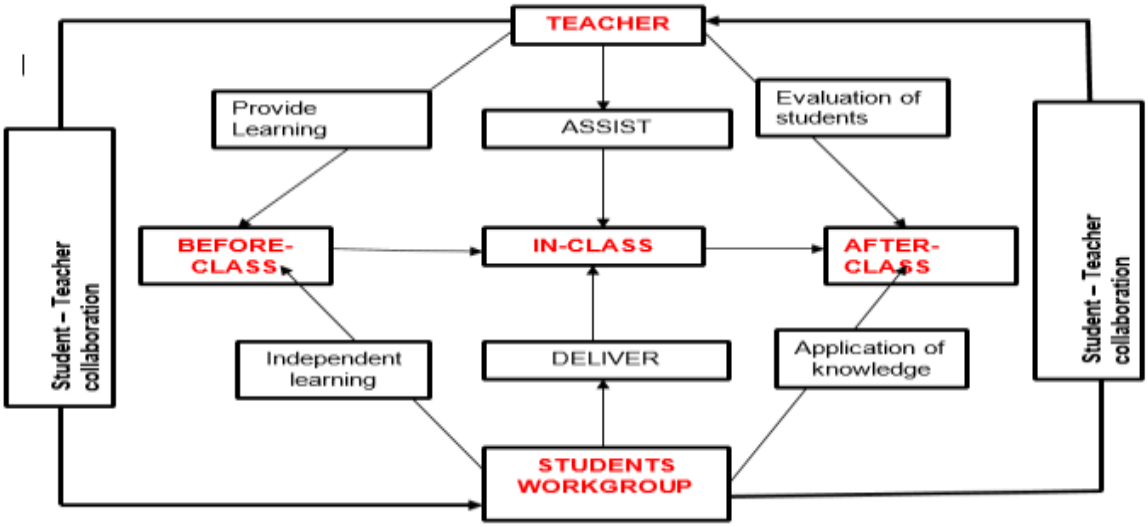

Figure2: Flipped Classroom Model (FCIM) **(**Alimi S.F, 2025)

Flipped Classroom Model

The instructional model is a flipped classroom model in which the learning activities are organised into three stages: before-class, in-class and after-class. During the learning and teaching process, student–student and student–teacher collaboration are emphasised in the teaching and learning process. Students form work groups and group members are encouraged based on what they have prepared individually, to collaboratively discuss the material in depth, develop their conceptual understanding and achieve a shared goal. Student–teacher collaboration is essential to the instructional model, in which students are invited to participate in curriculum implementation and decision-making. The three learning stages involve intensive student–teacher interaction, which greatly aids the realisation of teaching and learning objectives.

Challenges and Problems in Implementing Flipped Classrooms in Nigerian

Despite flipped classroom effectiveness, there are group presentations where some students have problems with the fact that individual members in any given group were not held accountable for their degree of involvement because the final mark was a collective group mark. Some students may suggest incorporating an evaluation measure for their individual team members in order to allow for increased accountability. In other cases, students comment that they do not particularly enjoy the group presentations because presenting was considered to be an uncomfortable and, in some instances, a "frightening" experience. Their findings are not surprising as previous studies have also highlighted the limitations of technology as an important factor in determining the student experience in the flipped classroom (Strayer, 2012)

The main challenges that arose from using the flipped classroom approach in a graduate level setting were twofold and included issues due to student comfort level and of technology. While managing technology was a big issue in our administration of the flipped classroom another equally important aspect of this teaching model in the need to ensure that students are actually stimulated in class and find the learning environment to be safe (without discomfort and fear) supportive and beneficial to their learning.Yunna Liu and Yang Nan (2024). On the technology front, students found the audio quality of certain videos to be poor. On these occasions it made it difficult for students to clearly hear the instructor irrespective of how high they adjusted their audio settings. They also commented on how some of the video lectures had background noise.

Moreover, when they did view the video lectures at home, some students expressed dis - satisfactory with the fact that they could not ask questions of the instructor in real time. The instructor had recommended to students to record their questions during viewing of the video and bring them to the needed tutorial session and or class as an item for discussion but some students felt that the lag in time did not appropriately facilitate their learning. Also, a few students stated that by the time they

arrived at the tutorial session and or the class, they had forgotten which areas they had difficulties understanding in the videos.

The final concern expressed by some students was the fact that the lecture videos were often over an hour long in length, which made it difficult for them to view them in a single seating. They were unable to recommence viewing the video from the point where they had previously paused it since the video location had returned to its original starting point.

Further, it requires a motivational teacher who has the will to follow up students 'progress.This requires providing additional working hours and effort from teachers'. Furthermore, teachers' should be professional in integrating modern technology in education. Therefore, implementing this strategy could be difficult for educators who have not qualified in using technology or communication skills. Some obstacle may face the educational and learning process while applying technology tools in the classroom, (Alimi, 2025).These obstacles include: the lack of devices and software used in recording and preparing lessons, the lack of teachers' skills in using the technology tools skillfully to develop teaching method, motivating and communicating with students', the insistence of teachers' to follow the traditional method in their teaching process. However, those teachers' can be convinced through presenting successful practices of applying technology in the classroom compared with the traditional method (Alimi, 2026).

Future Directions

Creating an effective and sustainable learning environment requires constant monitoring and timely adjustments. On the basis of the feedback provided to the team by our students we have identified several areas that require further improvement. First the video lectures need to be significantly modified and a different more user- friendly recording platform needs to be seriously considered. Second the videos should be broken down into multiple shorter video file segments (i.e.videos of 20 to 30 minutes length each so that students are able to give their undivided attention and fully concentrate on the content presented in one sitting. Additionally, the shorter videos will permit students to more easily pause and return to their video as well as allow them to watch each section at different times of the work depending on their schedule. Third, the audio quality of the videos needs to be dramatically improved by making every effort to remove or eliminate the background noise. Fourth, an online forum needs to be created so as to permit the instructor to directly communicate with the students and address any pertinent questions in a timely manner prior to mending the actual class. Finally, Administrative barriers need to be removed and more autonomy afforded to the instructor in order to ensure the timely release of the videos to the students' (Alimi, 2026).

Implications of Flipped Classroom Instruction Model to Teaching and Learning

The flipped classroom model implies a role change for both teachers and students. In essence, the active role of the teacher as the "sage of the stage", now assumes the role of a guide/facilitator on the side for a more collaborative and cooperative contribution to the teaching process. (Carnevale, 2022).

1. The flipped classroom model implies a role change for both teachers and students. In essence, the active role of the teacher as the "sage of the stage", now assumes the role of a guide/facilitator on the side for a more collaborative and cooperative contribution to the teaching process.(Johnathan et al, 2012)
2. The teacher in a flipped classroom takes on a different role than what we normally envision. The teacher does not give direct instruction. Their role became one of a facilitator who set up the content, maps out homework and provides a welcoming learning space that students can explore in (Carnevale, 2022).
3. The teacher in a flipped classroom is responsible for many tasks, creating or finding essential information to present to the students (Brown, 2016).
4. The teacher intentionally designs a flexible experience to engage students in asynchronous online learning followed by synchronous active learning during a scheduled class time.(Flipped Learning Network FLN, 2014).

5. The teacher's role shifts from the major information provider but guides the learner to source for and discover information useful for knowledge acquisition and learning (Carnevale, 2022).

The Roles of Teachers in a Flipped Classroom

The teacher in the flipped classroom has a very different role than that of the traditional classroom. Since learning is now student-driven, the teacher is no longer the sole source of knowledge. He/she assumes the role of a guide or facilitator by assisting the students to find the sources of knowledge themselves. (Goss, 2014)

The main objective is to provide an understanding of effective practices and basic procedures and tools used to analyze, design, develop, implement, and evaluate experience. (Estes, Ingram & Liu 2014). When the responsibility in the classroom shifts to the student, that might mean relinquishing a degree of control. (Honeycutt & Garrett, 2014).

A progressive 'flipped teacher' also assumes the role of designer of the curriculum. Managing the digital content of the subject material in a syllabus involves knowledge of instructional design as well. The nature of flipping a classroom is similar to that of classroom-oriented instructional design models where the teacher serves in many roles that may include subject matter expert, instructional designer, and media developer. (Estes, et al, 2014)

One of the importance of flipping is actually based on instructional design strategies. For instance, inverting the content and homework will further enable a more effective use of class time, where active learning strategies can be applied, which are proven to help increase student learning outcomes (Estes,et al, 2014).

Teachers who choose to flip has an obligation to make important decisions regarding content sequencing and flexible formatting for access and delivery both in and outside of actual class time (Estes, et al, 2014)

Students Engagement in Flipped Classroom

Engagement acts as a student-initiated way to quality educational results like academic improvement and performance (Jang, Kim, & Reeve, 2012). Engagement is a general-purpose paradigm comprising three different, yet inter-correlated and mutually supportive ways to academic achievement-namely, its behavioural, emotional, and cognitive aspects (Christenson, Reschly, & Wylie, 2012).

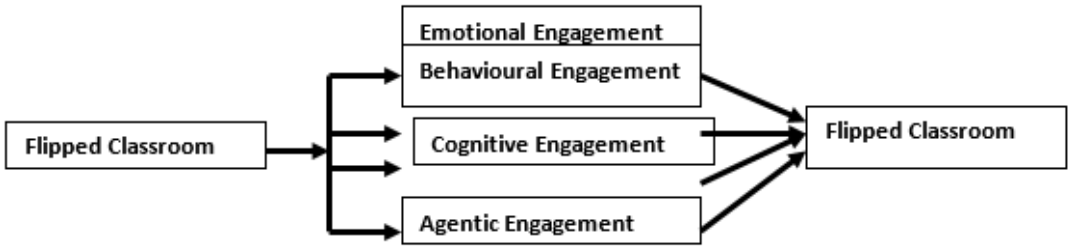

Figure 3: Students Engagements in Flipped Classroom (Alimi S.F, 2025)

Reeve (2018) described behavioural engagement as the involvement of students in the learning activity in terms of attention, effort, and persistence while emotional involvement illustrates the existence of positive emotions during a task such as interest and to the absence of negative emotions like anxiety. Cognitive engagement is also described as how deliberately the students attempt to learn in terms of employing advanced rather than superficial learning strategies, such as using amplification rather than memorization. Agentic engagement needs teachers and learners to have the ability to handle new and demanding circumstances and is equally stand-in for peer collaboration that is commonly helpful (Richards, Sweet & Billet, 2013).

However, students do become behaviourally, emotionally, and cognitively included in the learning activities which their teachers offer, and their level of the effort, enjoyment and strategic thinking does foresee important outcomes, like performance. Bouvier and Sehaba (2019) used activity theory and trace theory to describe behavioural engagement and identify races of relations in the performed

activities, with the help of the learning atmosphere, high behavioural engagement will encourage active teaching and learning.

Procedures on the use of Flipped Classroom

1) The major focus of this method is for the learners to interact with the learning contents prior classroom interaction. The class interaction is just a follow up of learning which is meant to perfect instruction (Alimi,2025)
2) The learners apply what is in class on the next day through a variety of activities or assignments that could once have been homework with the teacher working as a coach or guide (Bethany Petty, 2018).
3) The teacher has to earmark the content that he wants the learners to learn. Particularly the contents in the curriculum which is meant for the actual week and not haphazard learning.
4) The teacher breaks the contents into learnable units for easy learning.
5) The teacher also gets the lesson plan done based on this strategy.
6) The teacher has to develop the learning materials sequentially to avoid confusion.
7) The learning materials are then developed into video or other appropriate means of learning.
8) The video earlier developed is later shared to all the learners for them to view and get comprehended.
9) The learners interact with the learning materials first to get the information relevant for learning.
10) The learners themselves will get additional information using the video as a guide.

Conclusion

Effectual teaching and learning cannot be accomplished without proper management of the learning process. The need to change classroom orientation from teacher – centred to student – centred for more active involvement as a way of improving students' learning is well recognised. From the literature review in this paper, flipped classroom make teaching and learning enjoyable, effective, and satisfying. In addition, flipped classroom is a powerful tool used to achieve academic, behavioural and affective goals. Efficient use of flipped classroom will increase students' attitude that reflects the engagement of students and improves their performance.The Flipped Classroom less students frustration and disruption in the classroom. The concept inverts or flips traditional thinking about the process of instruction, and utilises innovative strategies involving digital technology to deliver materials and resources. However, there has been considerable amount of attention in the different quarters regarding the Flipped Classroom. Complete websites dedicated to promoting the flipped classroom ideology have been popping up. The online Conversation is not only limited to promotional websites and informational articles, but organizations are also beginning to market materials to help teachers who want to implement the flipped model in their classroom, providing resources for making screen casts and instructional clips.

Recommendations

The following recommendations were made:

1. Teachers should adopt the flipped classroom approach because it is a student-centered learning strategy that involves the students rather than spoon-feeds them.
2. Teachers should seek for more knowledge on the utilization of flipped classroom for instruction because it is technology-driven; hence, attending workshops, seminars and conferences within and outside their education districts and state is a must if they must use this approach with expertise;
3. All stakeholders in the education industry should appreciate, support and sustain the use

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