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FLIPPED LEARNING AS AN INNOVATIVE TEACHING MODEL IN THE 21ST CENTURY

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Abstract
The paper examined flipped learning as an innovative teaching model in the 21st century. Despite different teaching, learning methods, and strategies used in the classroom today, it is quite difficult to draw the interest and curiosity of the students to learning activities. Teacher-centered approaches that may not effectively support students learning and progress are not encouraged by teachers in the teaching and learning process. In this regard, educators show much interest in the innovative teaching approaches that address the needs of 21st-century students, one of those approaches is the flipped learning classroom. This paper, therefore, highlighted the concept, theoretical background, benefits of flipped learning classrooms in the field of education, and challenges. therefore, highlighted the concept, theoretical background, benefits of flipped learning classrooms in the field of education, and challenges. Given the peculiar task of 21st-century learners, the paper advocates the need for the promotion of flipped learning.

Keywords: *Innovative, teaching models, flipped learning, 21st Century.*

Introduction

Any country's university education must aspire to provide new quality education for better excellence to tackle the difficulties given by globalization and expanding international complications. University (higher) education is the cornerstone of every country's growth and development. The World Bank (2000) recognized the value of university education in preventing nations from falling behind in terms of digital expertise. Following human and industrial resolution, the Digital Revolution is often regarded as one of the most significant shifts that have had a significant impact on education. Traditional teaching techniques are popular strategies used by educators in secondary schools and postsecondary institutions to teach and study science and other disciplines. 'Chalk and talk' instruction, lecturing, note copying by learners, factual information, abstract ideas, 'cookbook' practical lessons, and demonstrations are all prevalent in teaching and learning (Onwu & Stoffels, 2005). Traditional teaching and learning methods, according to Allen (2008), often fail to adequately improve learners' knowledge of topics. Traditional teaching and learning methods, according to Carr (2001), generally entail memorization of ideas and calculations, resulting in learners' inability to grasp the problem's underlying conceptual connections. Traditional teaching and learning methods emphasize weak problem-solving skills and limited understanding of concepts and ideas. Allen (2001) and Carr (2001) are two examples of this.

Several more reports and studies, such as Fonseca & Conboy's, have been published (2006). According to the Organization for Economic Cooperation and Development (OECD), most learners find scientific instruction and learning challenging due to a lack of motivation. Teaching innovation refers to teachers' creativity, their ability to reflect on, design, and implement a variety of teaching methods or activities, their understanding of individual student differences, learning motivation and interest, and their enhancement of students' learning effectiveness in the teaching and assessment process (Chen, 2010). Teachers using vivid and vibrant teaching tactics to pique students' interest in learning is referred to as teaching innovation. Smartboards, collaboration, virtual reality, and flipped classroom learning are some of the innovative teaching approaches that Fedena (2019) believes will benefit every teacher in the classroom.

Smartboards are replacing overhead projectors in many classrooms, and they not only improve the way professors teach, but they also improve the way students learn. By projecting visual components, it may give pupils an enhanced

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learning experience. One of the most appealing features of smart boards is their ability to integrate technology and be interactive. Students learn best when they are completely involved, and one of the greatest ways to achieve so is via hands-on learning. To help education, teachers may link their laptops, video cameras, digital cameras, microscopes, and other devices. Instructors that use smart boards believe that the number one advantage is increased student engagement and that these boards provide teachers an incredible chance to establish a classroom atmosphere where kids with diverse learning styles can learn from one another. Smartboards, according to Batat (2017) and Wall Higgin and Smith (2005) established a rich visual and aural learning environment and make learning materials more tangible, while also making teaching and learning interesting. According to Paragina et al. (2010), employing smart boards in teaching and learning improves students' capacity to utilize technology while also improving their performance and attitude toward the course. This simple-to-learn technology guarantees that both instructors and students obtain the 21st-century abilities required to thrive in today's environment (Janelle, 2019).

Teachers have reported enhanced effectiveness (Shachar &Shmuelevitz, 1997), more positive attitudes about teaching, and high levels of trust as beneficial consequences of collaborative creative teaching and learning (Tschannen-Moran, 2001). Teachers must be at the center of any effective reform in schools, according to Hausman and Goldring (2001). The more instructors cooperate with students, the more they will be able to discourse intelligently about teaching and learning theories, techniques, and processes, and therefore enhance their instruction. The beneficial adjustments that instructors have gone through are thought to benefit kids. Teachers who know how to cooperate successfully provide a good example for their students.

Virtual reality (VR) in education is a cutting-edge method of teaching and learning that combines three-dimensional computer visuals with user interface devices to create an interactive, immersive environment (Pan, et al, 2006). Virtual reality (VR) and technology, in general, are thought to aid learning by facilitating engagement, immersion, and interaction (Merchant & Goetz, 2014). Research on the benefits of technology, particularly Virtual Reality (VR), has shown practical advantages including shorter learning time and improved learning outcomes (Wong &Fung, 2010). Virtual reality on a computer screen offers the benefit of being more accessible and cost-effective for wider applications. Pantelidis (1993) reported that 40 out of 53 research focused on the application of Virtual Reality (VR) in science, technology, and mathematics issues in a recent examination of the use of VR in education. Additionally, there are places where learners benefit from hands-on experiences. Virtual Reality (VR) not only stimulates this environment by simulating real-world surroundings, but it also has the potential to drive exploration via its technical aspects. Lee and Wong (2010) discovered that students who learned about frog anatomy in a VR environment obtained superior learning results than students in a typical classroom setting in research to assess the efficacy of desktop Virtual Reality (VR) on learning outcomes in biology education.

Flipped learning is a teaching style that assists instructors in prioritizing active learning during class time by giving lecture materials and presentations to students to watch at home or outside of class. Flipped learning is one of the most interesting innovations in the contemporary classroom. It is based on the concept that utilising class time for small group activities and personalized attention helps pupils learn more successfully. Flipped learning, according to Arfstrom (2020), co-founder of the flipped learning Network, is all about enabling chances for active interaction.
It is a pedagogical approach in which direct instruction moves from the group learning space to the individual learning space, transforming the resulting group space into a dynamic, interactive learning environment in which the educator guides students as they apply concepts and engage creatively in the subject matter. Every year, more people are becoming interested in the flipped learning technique. According to a 2014 flipped learning Network poll, 78 percent of instructors have flipped a lesson, and 96 percent of those who tried it stated they would suggest it to other educators. This suggests that flipped learning motivates instructors to modernize conventional approaches and incorporate new technology into their classrooms via the use of video screencasts and other tools.

Concept of flipped learning

Flipped learning dates back to the 1990s, when Earie Mazar, a Physics Professor at Harvard University, first employed it in his studies. Bergmann (2012) then used the paradigm from Kindergarten to senior high school education practice to enable learners to complete their tasks while also assisting individuals who find studies challenging to obtain instructional resources. This emphasized that the regular in-class activities performed in a typical day-to-day class are now considered a home assignment, while the ostensibly home duties are now reviewed or discussed during the in-class session. The above is why flipped classroom learning is also known as inverted classroom learning. On this

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account, flipped classroom learning has gained traction, particularly in higher education. According to Szparagowski (2014), there are considerable disagreements over what an inverted class is. Some people believed that students spent all of their valuable time on computer devices, that teaching materials replaced instructors, or that an inverted classroom was an online course. The emergence of flipped classrooms has challenged the previous technique of teaching pedagogy to the point that instructors' roles in conventional and flipped classrooms have shifted from "sage on the stage" to "guide on the side." In a flipped classroom, students take on more responsibilities as professors drive the class debate. Proponents of flipped learning, such as Michel, Hurst, and Revelle (2009), believe it consists of two key components: interactive group (i.e. in-class activity) and computer-based group (i.e. out-class activity). According to Elazab and Alazab (2015); Bishop and Verlege (2013), the flipped learning classroom structure is made up of human connection and student-centered learning that give birth to interactive classroom activities at one end, as well as computer-based learning and teacher-centered learning.

According to Arnold (2014), a flipped learning classroom is a teaching paradigm that inverts the conventional lecture – plus-homework formula by shifting the transmission of core ideas to digital media such as video lectures or tutorials. Class time is freed up for engaging activities that enable students to apply these fundamentals to real-world circumstances while their teacher is there. Flipped learning is a kind of blended learning in which students study the information online by viewing video lectures, often at home, and homework is completed in class with lecturers and students discussing and answering issues. Instead of lecturing, teachers engage with students to provide more individualized assistance (Christopher, rt al., 2016). "Flipping the classroom" implies that students are exposed to new content outside of class, generally via reading or lecturer videos, and then utilize class time to undertake the harder work of integrating that knowledge, such as problem-solving, discussion, or debates. The flipped learning classroom is a teaching style that employs electronic methods to distribute lecture material to students at home and uses class time for practical application tasks. It may be effective for information literacy education (Sara, 2014). Flipping speaks today's students' language, it assists busy students, it assists difficult students, it assists students of all abilities to flourish, it enables students to stop and rewind their instructor, and it enhances student-teaching engagement. Bloom's taxonomy is relevant to flipped learning in that the transmission of information, which is the foundation for learning, occurs independently and outside of class, whereas assimilation of information, which requires greater critical reasoning, occurs during class under the supervision of an instructor or mentor. The flipped learning concept is based on Blooms' updated digital taxonomy, with lower-order thinking skills (LOTS) trained outside of class and higher-order thinking skills (HOTS) accomplished in class (Anderson & Krathwhol, 2001). Through online learning, low-order thinking abilities such as comprehending, remembering, and certain applications are trained before face-to-face learning. Higher-order thinking abilities, such as analyzing, evaluating, and producing, are, nonetheless, practiced in class. As a pedagogical technique, flipped learning lends itself to mastery learning, as defined by Bloom (1978). He said that while employing Mastery learning, kids study at their speed, that learning is differentiated, and that all students are obliged to acquire common, well-structured goals. He also said that if a pupil does not grasp the material, objective remediation is necessary. According to Bergman and Sams (2012), mastery learning promotes flipped learning because it offers individualized, synchronous, and student-centered education, as well as an environment for remediation and efficient feedback. This is consistent with flipped learning, in which students may study on their schedule with some autonomy in terms of time management.

The theoretical framework of the flipped learning model

Jonathan Begmann and Aaron Sams, Chemistry instructors at Wood Land High School in Colorado, are the true pioneers of flipped classroom instruction. They introduced the flipped classroom in 2007 as a random experiment, and it afterward underwent fast growth. The impact of flipped classroom learning was pushed to the world by Salmon Khar, founder of Khan Academy, who gave his famous speech at the TED Conference (ie) Technology, Entertainment, and Design conference) using video to recreate education (2011), which caused the flipped classroom to gain the attention of global educators. By (2012), approximately a thousand primary and middle schools in North America had used the flipped classroom teaching paradigm in practice (Dai, 2016). Alumni of the Massachusetts Institute of Technology (MIT) took full use of the ease of network transmission and the cheap cost of video reuse (Salmon Khan, 2011). Because knowledge points may be taught via pre-recorded video, precious classroom time is spent in invaluable teacher-student engagement, project-based classroom activities, and problem-solving. This is also at the heart of the flipped classroom teaching concept (Li, 2016). The flipped classroom, which is outfitted with a variety of technologies, Li video, and an online automatic response system, has resulted in significant changes in the following areas: the way

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classroom time is used, the approach to utilizing extra-curricular time, the use of class, and the type of interaction (Bishop &Verleger, 2013).

Constructivist learning theory, a flipped classroom

Felder, (2012), Gordon, (2018), hold the belief that constructivism has emerged as a strong theory for describing how people learn about the world around them and how new knowledge is generated. According to constructivism philosophy, knowledge is not waiting to be found, but rather is built by people via interaction with the environment and with one another.

Students are the major body of cognition in a flipped classroom, the focus of the whole class, and active architects of meaning formation, breaking past the restrictions of the conventional classroom. Students preview the necessary information using some internet media before class to have their autonomous meaning creation. The constructivist learning theory underpins such flipped classroom instruction, which maintains that students are active builders of meaning, the leader and controller of the learning process, while instructors just aid students in developing their autonomous learning (Felder, 2012). According to, flipped classroom teaching and learning is the best expression of constructivist learning theory (Felder 2012). In other words, constructivist learning theory may be successfully applied to Flipped Classroom instruction, in which the roles of instructors and students are reversed. Teachers take on the role of facilitators and assistants to students' learning, while students take on the role of primary controller throughout the learning process. Teachers give greater attention in class to collaborative learning, discussion, and communication, benefiting the whole class in the process of developing the meaning of information. Teachers in a flipped learning classroom give students with the teaching environment, teaching media, teaching topic, and aid students in actively investigating and completing cognition and information processing.

Flipped classroom and Vygotsky theory

Active learning strategies are applied in the flipped classroom setting (Betihavas et al., 2010). (2016). Its conceptual roots are founded on the simple act of not giving the lesson in a classroom setting, as well as on student-centered learning theories. (1978, Vygotsky). In a flipped classroom, the material conventionally presented face-to-face is actively and willingly taken out of the classroom (Strayer, 2012). Students prepare for the class by utilizing the same materials that would be utilized in a typical lesson. When students return to the classroom, they share the knowledge they have gained with their peers. In a flipped classroom, students participate in the lesson rather than structuring information (Munir, 2018). This job is carried out in the classroom by implementing activities appropriate for upper-level cognitive field accomplishment (Bergman & Sams, 2012). Bishop and Verleger (2013) are the first scholars to make the connection between flipped classrooms and Vygotsky's theory. Following research has attempted to strengthen this relationship. According to researchers such as MacieJewski (2016), in a flipped classroom setting, there is more available time to be employed inside the classroom. This time may be planned so that students can talk and engage in the classroom. During this period, students may also work in groups and engage with one another for problem-solving tasks. Hao, (2016) has also tackled flipped classrooms from the perspective of Vygotsky, (1978), and in this theory, individual interaction is very significant. As a result, throughout his study, he gave the students the option to work in groups so that they could assist one another. Vygotsky's (1978) theory on flipped learning highlights two important factors in the flipped learning process: 'culture' and 'language.'

Vygotsky's conception of the flipped classroom as a mode of cultural transmission on culture, utilizing Vygotsky theory to approach flipped classroom learning revealed that it creates an appropriate context for cultural transmission. This is accomplished in two ways by using a flipped classroom**:**

(i) Videos prepared as lesson content (ii) Class time in which active learning methods are used.

Vygotsky, language and flipped classroom

According to Vygotsky (1987), language is developed via social interactions conducted for communicative goals and has two key functions for cognitive development. The first job of language is to improve the transfer of information from adults to children, and the second is that language is a very strong way of providing intellectual harmony to children on its own. Vygotsky's theory stresses the role of language in cultural transmission; everything about social structure is formed in spoken language and communicated to the child via language. As a result, in a flipped classroom, the teacher maintains their job as a more informed person inside the classroom and outside of school time, which is a typical teaching and learning process, but the instructor cannot intervene in extra-curricular activities. They give

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textbooks, workbooks, and online resources to students as much as possible, and students absorb the material on their own via homework exercises and project projects.

Benefits of a flipped learning classroom

As 21st-century learning needs more creative, hands-on, and flexible modes of teaching, the old education paradigm of information transmission from a teacher at the front of the classroom to pupils in tidy rows of desks is outmoded and unproductive. Shalina's (2017). Figlioli,(2017). By transferring passive lecture topics to the at-home situation, students are allowed to examine those materials at a time and location that is convenient for them and to go over crucial or confusing aspects as many times as necessary until they are completely understood. This, in turn, assists students in ensuring they have all of the core knowledge required to engage in interactive learning conversations and activities that encourage them to apply what they have learned. It entails a new way of looking at and solving issues. Flipping a classroom improves the learning experience by combining student-led active learning with peer-to-peer cooperation and personalised support. Flipping a classroom allows educators to tailor each lesson to the unique needs of their students like never before (Bergmann 2012).

A handful of benefits of flipped learning classroom according to Jonathan and Aaron (2012) includes:

(i) Flipping enables students to study at their speed, while conventional lecture models bind students to the pace established by the teacher for each class session and the course as a whole. Instructors are under pressure to complete their curriculum in the time allotted in the classroom, depending on the pace at which the "average" student can absorb the content. If a student struggles with a topic, they must either interrupt and request the session for the remainder of the class, or try their best to keep up and request another explanation at the conclusion or outside of regular class time. Students in flipped learning classes, on the other hand, may go back over any section of a recorded lecture that they are having difficulties with as many times as required, and if they still have problems, they can come to class prepared with specific questions for their teacher.

(ii)

(ii) **Flipped learning is customized, active, and engaging;**
Instructors design learning activities that engage students via active learning based on the basic content presented before class. Before class even starts, the teacher has fresh information at their disposal to assess the class's level of understanding of the lesson topic. With data from video analytics and online quizzes, teachers can not only guarantee that students are engaged with the pre-class material but also direct the classroom experience based on what students have learned and what needs to be taught. In a flipped classroom, instructors may dedicate more time to kinds of learning that place students in an active position, testing and applying the information taught in the lecture. The emphasis of learning is shifted to the students themselves via group problem-solving student presentations and whole-group discussion.

(iii) **Flipped learning videos help the student review for exams**;
Universities have been recording conventional classroom-based lectures for more than a decade, and students use recorded lectures as a study tool throughout mid-term and final exam periods. Flipped classroom videos may provide the same advantages as recorded in-class lectures. Students may examine pre-class materials to help prepare for tests and examinations once they are made accessible.

(iv) Through time and ongoing development, flipped content may become richer: While professors have traditionally gathered a variety of materials to supplement their lectures, flipped learning makes that process considerably richer, more effective, and more accessible. Some students consume lesson information at home; it does not have to take the shape of a lecture. Teachers may assign films, games, and readings, tying everything together with short videos they record.

(v) Students in flipped classes outperform their peers: Every teacher wants a more fulfilling teaching experience, one that is engaging and immediately helps their students. As with any change, the conservative nature of administrators and other stakeholders means that for the flipped classroom to thrive, it must also demonstrate outcomes where they matter at test time. According to one poll conducted by the flipped learning network, 67 percent of primary and secondary school instructors claimed that their pupils' test results had improved. According to another poll, 71 percent of instructors noticed an improvement in students' grades in the flipped classroom. Other advantages of flipped learning include: it offers a mechanism for differentiating teaching

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and learning. Differentiated teaching and learning is the practice of creating various instructional resources to fit the requirements of students of different levels and abilities. 2017; Keefe). Flipped learning is also advantageous since it adheres to Bloom's taxonomy, which states that students are actively aided and encouraged during certain tasks that demand higher-order thinking. Students may rewind, study, and skip through parts of short instructional video lectures that they already understand. This skill may be extremely useful for students with accessibility problems, especially if subtitles are offered for individuals with learning disabilities. Lectures may be seen several times, which may be beneficial to persons whose first language is not English.

Benefits of flipped learning classroom to teachers

Flipped learning instruction also benefits teachers who can make better use of their own time and resources to do progressively more each year. By flipping, teachers can; (i) Save time by creating basic lecture content once and sharing it with multiple class segments for subsequent years.

(ii) Continually improve specific parts of lecture content by reviewing analytics, video comments, and discussions in class.

(iii) Allow themselves to invest time in learning and sharing new and more detailed content, either as the future classroom or in classroom discussion.

(iv) Ensure their own missed classes don't mean missed learning, by providing reliable and consistent learning materials for substitutes to use.

(v) Finally flipped learning classroom gives the instructor more time to teach each student individually rather than the class as a whole and devoting class time to the application of concepts might give instructors a better opportunity to detect errors in thinking particularly those that are widespread in a class.

Challenges of flipped learning as an innovative teaching model

The flipped classroom, like any other educational approach, is not without criticism. The use of the model as a justification to continue substandard teaching or implementation without reflection is one concern addressed by researchers and instructors. The time shift utilized to transfer work also poses issues for certain lecturers who appreciate spontaneity in their presentations. It might also be argued that a bigger time commitment, at least initially, is necessary for adopting the flipped classroom. If not examined and applied with care and customizing, this deceptively simple methodology may merely be a continuation of a flawed teaching paradigm. As Ash pointed out (2012). "A high-tech variant of an old educational style," video lectures are. This argument is based on the widely held assumption that lecturers are not an engaging learning vehicle and that finding a new manner to offer them does not improve the dynamic (Nelson, 2012; Bull, et al., 2012). As a result, some teachers have shifted their approach to what is known as the mastery model. Bergmann (2012) observes that studying lecture topics at home does not provide students with instant solutions to their queries. For industrial engineering students, a flipped learning classroom involves cost estimation (Kellogg, 2009). However, the more complicated or sophisticated the lecture aids and learning objects are, the more time teachers are expected to devote. Many people who have attempted to utilize the flipped learning classroom have addressed this topic (Michel et al., 2009). Instructors may need to master new technical skills to generate video lectures in addition to preparing lectures and in-class activities or resources (Educause, 2012). However, following the first installation, teachers should anticipate the time spent generating resources for the flipped learning classroom to be decreased since reuse and adaption will minimize time investment in future sessions. However, it is not just the development of electronic courses that might be time-consuming. Even if the lecture is made up of reading, thorough preparation and time will be necessary, according to Lamman (2012), to fulfill learning goals and make them evident to students, to design suitable assignments that assured readings were finished, and to devise means of engaging a whole class. The flipped learning model's self-paced nature has been lauded as a plus for those who use it, but it has also been viewed as a drawback for certain students. Although many students will appreciate the ability to go through topics more rapidly or review the content at a slower pace, other students may be unable to manage their work and time effectively (Ash, 2012). Instructors that are comfortable with this concept will be constrained to their classroom setting until the whole school system overhauls its promotion mechanisms to be based only on student learning progress and accomplishment, which is an improbable situation. This viewpoint is supported by Evans (2011), who feels that the amount of confidence that administrators must offer teachers for them to accept this much innovation throughout the curriculum would need a significant cultural transformation. Homelife may also be a hindrance to the flipped learning approach in children. The technology required to engage with lecture materials

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may not be accessible in every student's household (Nelson, 2012). Bergmann (2012), on the other hand, claimed that technology for watching or participating has not been an issue in the classroom when students may not have dependable internet connection since CD-Roms may be handed to them to use as a kind of improvisation. This barrier is even less of an issue in higher education settings, as computers are accessible for use on campus throughout the day and sometimes late at night. Many of the tasks need higher-order reasoning. Students may rewind, study, and skip through parts of short instructional video lectures that they already understand. This skill may be extremely useful for students with accessibility problems, especially if subtitles are offered for individuals with learning disabilities. Lectures may be seen several times, which may be beneficial to persons whose first language is not English.

Recommendations

This paper recommends that:

(i) To reorganize science teacher education courses, a transformational paradigm and an online system should be developed.

(ii) Science education instructors should be able to integrate, develop curricula, and use technology for creative instruction.

(iii) In the future, research should be performed to integrate differential learning (DL) with flipped learning, since differentiated learning entails providing unique meaning material across several modalities of teaching and allowing students to study at their speed (Keefe, 2007). Flipped learning is a method that may help with differentiated education.

(iv) The flipped classroom learning technique was shown to be instilled in teacher–education curricula and promoted by curriculum creators.

(v) All schools and households should have the necessary facilities to support the successful use of flipped learning.

(vi) Flipped classroom learning as a method of instructional delivery should be introduced to both in-service and pre-service instructors.

(vii) Appropriate channels should be established for instructors from various educational sectors, as well as educational technologists, to debate and collaborate on a usable learning platform. To reorganize science teacher education courses, a transformational paradigm and an online system should be developed.

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