

COMPLEMENTING FACE-TO-FACE PEDAGOGY WITH TECHNOLOGY-ENABLED LEARNING METHOD FOR QUALITY MATHEMATICS EDUCATION IN COLLEGES OF EDUCATION IN NIGERIA

By

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Abstract

This paper examines the issue of complementing face-to-face pedagogy with technology-enabled learning method for quality mathematics education in colleges of education in Nigeria. With the advent of the Covid 19 pandemic which crippled the education system and exposed the weakness of the conventional lecture method, there is a need to complement the face-to-face learning with the technology-enabled learning methods. Many countries have moved on/or added other methods towards a paradigm shift in learning to explore methods that makes for quality education. This paper discusses the concepts of face-to-face and technology-enabled learning methods. A case is also made for the need for quality education in the Colleges of Education being Nigeria's teacher training institution. In addition, the different forms of technology-enabled learning methods that can be used in colleges of education were discussed. Also, reference is made to how quality education can be achieved through complementing the face-to-face pedagogy with technology-enabled learning. Recommendations were made on how colleges of education can leverage on technology-enabled learning for quality mathematics education.

Keywords: Face-To-Face Pedagogy, Technology-Enabled Learning, Quality Education, Colleges of Education

Introduction

The face-to-face pedagogy (F2FP) is the most predominant method used in lesson delivery at all levels of education in Nigeria. It is an instructional method where learning content and material are taught in person to a group of learners. It involves physical contact or appearance between the facilitator and the learners, both of which can see, touch and hear each other (Solak & Cakir, 2014; Turbill, 2015; Zagouras *et al*, 2022). The most popular method of instruction delivery in the Colleges of Education (COE) in Nigeria is the F2FP. The teachers in training are taught using this method. The mathematics education student teachers are also taught using the F2FP which was somewhat adequate until the Covid 19 pandemic struck and crippled the education system. The pandemic also exposed the weakness of the F2FP (also referred to as conventional lecture method).

The advent of the pandemic birthed the quest for a new pedagogical approaches that is not limited by space and physical presence as demanded by the F2FP. One of such methods is the Technology-Enable Learning Method (TELM). TELM simply refers to pedagogical approaches that uses technology in its procedure. It is imperative to bring up the trending terminology termed Technology-Enhanced Learning (TEL) which is used to describe the application of information and communication technologies to teaching and learning (Kirkwood & Price, 2014) while TELM as used in this study shares similar meaning, it is not about ‘enhancing’ but ‘enabling’. Literature has not been able to articulate what the term ‘enhanced’ means since many authors gave various ambiguous meaning that does not converge (Kirkwood & Price, 2014). In this study, TELM is seen as a method that to makes able, gives power, means, competence, or ability to technological use in teaching and learning not necessarily to enhance.

The need for the use of TELM in the Nigerian COEs has become paramount and must be inculcated for pedagogical efficiency. The COEs are saddled with responsibility of training teachers to teach in the lower, middle and upper basic level of Nigeria’s educational system where foundation for education is laid. This study makes a case for the use of TELM in mathematics pedagogy in COEs since it is the operating system for science, technology, engineering and mathematics (STEM). Additionally, TELM captivates students, **leads to learning at individual Pace and also improves access to resources.** With the global change in pedagogical approaches, especially the paradigm shifts from teacher-centered to learner-centered methods, it is only imperative that the use of F2FP for mathematics education in the COEs is complimented with TELM to prepare teachers who in turn will teach our young people for Nigeria to thrive in the technology driven world.

Consequently, this paper discusses the concepts of face-to-face, technology-enable learning methods and the need for quality education in the Colleges of Education being Nigeria’s teacher training institution. In addition, the different forms of technology-enabled learning methods that can be used in colleges of education were highlighted. Moreover, reference is made to how quality education can be achieved through complimenting the face-to-face pedagogy with technology-enabled learning.

Face-to-Face Pedagogy (F2FP)

The Face-to-face Pedagogy (F2FP) is one of the most popular and oldest learning method known to man. It is a traditional classroom-based method of learning which involves in-person sessions that is instructor-led (Olmstead, 2023). The pace of learning in the F2FP is fast and in real time, it is set by the instructor and students in this setting are passive learners. F2FP is considered effective due to the benefits of live interaction between the instructor and the group of learners and/or students. The social connectedness and a sense of building a community & defines the F2FP (Kemp Grieve, 2014).

The definition of F2FP is simple and converges in a physical appearance of a facilitator (instructor/teacher) and a learner (s) in a defined place (classroom, auditorium, a room in a building etc) at any agreed time which may be formal or informal (Norman, 2020; Chisadza, et

al, 2021; Olmstead, 2023). Moreover, the F2FP is a teacher-centered based pedagogy. Some of the advantages informal (Norman, 2020; Chisadza, et al, 2021; Olmstead, 2023).

Moreover, the F2FP is a teacher-centered based pedagogy. Some of the advantages of the F2FP according to Olmstead (2023) and My Path Education (2023) are as follows:

1. It encourages social interactions among learners since learns learn together, at the same time, at the same place.
2. It allows instructors to develop 1-1 learning plans and relationships with learners.
3. It fosters discussion and collaboration among learners who are physically present.
4. It helps learners concentrate harder on learning by avoiding distractions.
5. Learners can connect with, problem-solve, and network with other students from a wide range of backgrounds.
6. Learners can access more information and richer understanding through teacher and other students' body language and voice.
7. **The F2FP promotes collaborative learning among peers.**
8. **Encourages critical thinking.**
9. **Teaches accountability and Responsibility**

Disadvantages of the F2FP according to the Redaction Team (2023) are as follows:

1. The F2FP is observed to lack flexibility since it requires students to structure their day around set class times.
2. The F2FP gives learners limited access to information (limited to availability of resources, what is provided in class, textbooks and materials).
3. It is dependence on Teacher's Availability. Learners are dependent on the availability of the instructor for guidance and assistance.
4. The F2FP can be expose learners to Distractions (such as noise, interruptions, or the presence of disruptive students which may hinder other learners' ability to concentrate and fully engage in the learning process.
5. F2FP is constrained by geographical proximity, requiring learners to be physically present in a specific location which may restrict access to educational opportunities for individuals who live in remote areas or are unable to commute to a physical learning institution.

To cover up the gaps in the F2FP, there is a paradigm shift to the Technology-Enabled Learning Methods (TELM) due to the advent of the internet and ICT. TELM is making learning a whole new experience for learners, teacher and institutions of learning.

The Technology-Enable Learning Method

Technology-Enabled Learning Method (TELM) describes the use of technology, platforms, systems and digital content to extend and enhance student-centered learning. It is the development and application of tools (including software, hardware, and processes) intended to promote education (Jotheeswaran, 2022). TELM has become popular worldwide especially with the advent of the Covid 19 pandemic which crippled the educational sector of many countries. Another reason for the shift of pedagogy to TELM is because the world has moved

from the traditional methods to technologically driven methods of learning. Many technologies based ways of learning have emerged and they are observed to be result oriented (Cleveland-Innes *et al*, 2019). Reyes (2023) outlined seven TELM as follows:

1. BYOD: Stands for “Bring Your Own Device”, or buy your own personal desktop, laptop, Smartphone or other device and use it at work or at school.

2. Performance Support: Performance support is a method for supporting a learner’s performance on the job and at the moment of need. Example, a mobile device could be accessed to give step-by-step instructions (in text or video format, perhaps) on how to perform a task in the field. Or, an expert could be called via video conference for consultation while performing a complex procedure.

3. Microlearning: Microlearning involves dissecting learning into “microscopic” learning bursts (typically 2-10 minutes each). Supporters say microlearning matches human brain processing capabilities, combating learner boredom, disengagement, and poor retention.

4. Gamification: In a broad sense, gamification is the integration of game elements and game design techniques in a non-game context (in this case, in the context of learning).

5. Flipped Classroom: Having students watch lectures, read text, and learn content (typically online or offline) on their won. And then students attend class and solve problems, write essays, and gain practical knowledge with the teacher in the classroom as a partner/coach/tutor/guide.

6. On-Demand Training: This is training that can be accessed by the learner at will at anytime, anywhere. Typically, that means that the full training experience can be accessed on a computer/laptop (online or via disk) or mobile device.

7. Adaptive Learning: Adaptive learning is a technique that allows for personalization of learning by “adapting” learning material to individual learning needs.

The above and other forms of the TELM such as the internet, E-books, online courses, smartphones, tablets and other devices have been seen to change the status quo of learning. The Colleges of Education in Nigeria being a teacher training institution need to be given to the TELM for quality education especially in the training of mathematics teachers.

The need for quality education in colleges of education

The term ‘Quality Education’ does not have a generally accepted meaning but can be understood from different perspectives. For instance, UNESCO (2021) on its website gave its philosophy for education and ‘quality education’ as follows:

Education is the process of facilitating learning or the acquisition of knowledge, skills, values, beliefs and habits. Quality education specifically entails issues such as appropriate skills

development, gender parity, provision of relevant school infrastructure, equipment, educational materials and resources, scholarships or teaching force.

Drawing from the above, the Colleges of Education (COEs) in Nigeria is expected to be an institution from which quality education emanates from. The institution is saddled with the responsibility of training teachers who will in turn teach younger generations. The National Policy on Education has spelt out many requirements which is in nexus with the standards set by the National Commission for Colleges of Education (NCCE) that regulates COEs. As laudable as they may be, there is a need to for the COEs to train teachers under a comparative pedagogical environment with other countries.

Many countries are either complimenting the F2FP with other approaches that are result oriented or researching into its application in their institutions of learning (Cleveland-Innes *et al*, 2019). This is in a bid to improve and enhance the ‘quality of education’ their citizens acquire. VVOB (2023) defines quality education on their website as follows:

"Quality education is one that provides all learners with capabilities they require to become economically productive, develop sustainable livelihoods, contribute to peaceful and democratic societies and enhance individual well-being. The learning outcomes that are required vary according to context but at the end of the basic education cycle must include threshold levels of literacy and numeracy, basic scientific knowledge and life skills including awareness and prevention of disease. Capacity development to improve the quality of teachers and other education stakeholders is crucial throughout this process."

A point to note in this definition is that quality education includes the development of teachers. A case is then made for mathematics teachers in training at the COEs who upon graduation are expected to teacher at the basic level (lower, middle and upper). Since quality education seeks improvement as an outcome in learning parameters, there is a need to train the COE mathematics students teachers and instructors in the use of the trending Technology-Enabled Learning Method (TELM) to bring about quality education that can be passed on to young learners. Consequently, the right TELM for mathematics pedagogy for the COEs should be used.

TELM for Mathematics Education Pedagogy in Colleges of Education

There are many TELM for mathematics pedagogy used by many countries. An old debate is whether or not Nigeria ready to utilized the TELM. The institutions of higher learning (University, COEs and Polytechnics) have witnessed to influx and use of various devices that can be categorized as TELM among students. Many studies such as Ejo (2020) and Alabdulaziz, (2021) reported on the use of technology in mathematics classroom. Interestingly, some authors believe that TELM may not bring about the desired turnaround of the malady of poor students’ performance in the subject. However, Aparna (2016) asserted that TELM may solve the problem of understanding of abstract concepts which has made many learners hate mathematics.

Software used for teaching and learning Mathematics are: Graphic Calculators, Dynamic graphing tools, Dynamic geometry tools, Microsoft Excel / spreadsheet, Microsoft Mathematics, Geo Gebra,

Auto shape, MAT LAB (Aparna, 2016). These can be introduced into the COEs curriculum alongside the seven (7) methods outlined by Reyes (2023).

Conclusion

The mathematics pedagogy in the COEs in Nigeria has predominantly utilized the Face-to-face Pedagogy (F2FP). F2FP has some disadvantages and has become inadequate in the face of the changing technological driven world. To ensure quality mathematics education at the COEs, there is a needed to move on to some of the trending Technology-Enabled Learning Method (TELM).

The COEs utilization of TELM will not only ensure quality mathematics education that is comparative to that of other countries but will also motivate the young generation of learners who will be taught by the teachers who were trained in its use. Hence a case is made for the complimenting of the F2FP with TELM for quality mathematics education at the COEs in Nigeria. This will also hopefully prepare and motivate future learners who will take up careers in Science, Technology, Engineering and Mathematics because mathematics is the operating system of science.

Recommendations

Based on the discussions above, the following suggestions are made:

1. COEs should organise seminars and workshops for lecturers and students on the use of relevant TELM in mathematics pedagogy.
2. Mathematics Lecturers of COEs should be encouraged to complement F2FP with TELM.
3. The NCCE should review the current mathematics minimum Standards to accommodate the use of TELM for mathematics pedagogy.

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