

Challenges of Online Modules for Task-Based Learning of Mathematics for Effective Online Teaching-Learning Process

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Abstract

The COVID-19 pandemic caused a sudden shut down of educational institutions, which resulted in learning challenges among the students as the education medium switched to online mode. Mathematics learning based on online modules tasks is challenging for the students due to its complexity. Therefore, this study aims to elaborate challenges of online modules for task-based mathematics learning for an effective online teaching-learning process. In particular, this study explores the challenges involved in online mathematical education, the concepts of task-based learning for online mathematics modules and determined task-based learning of mathematics for an effective online teaching-learning process. Using a literature review methodology and content analysis approach to analyze the research papers, 33 recent articles (i.e., from 2020 to 2021) were selected with a focus to COVID-19 for analysis and extract data for the analysis. The research has proposed a conceptual framework that can guide researchers to explore and explain online modules' challenges for task-based mathematics learning for effective online teaching and learning processes.

Keywords: Online Module; Task-Based Learning; Mathematical Education; COVID-19

1. Background

Due to lockdown of cities and regions which was imposed by the government during COVID-19 everyday life was hampered, as everyone was confined at home. Hence, instead of in-school classes, students were given education through online classes (Zeb *et al.*, 2020, Mohammed, *et al.*, 2022; Alareqe *et al.*, 2021; Aljaberi *et al.*, 2021). Few subjects such as Mathematics are difficult to teach and learn through online modules. Due to its inherent difficulty of complex methods and calculations, it is said to have challenges in achieving effective learning (Bringula *et al.*, 2021; Karuppanan & Mohammed, 2020; Sornasekaran *et al.*, 2020).

The paper aims to underline the challenges in online learning, specifically focusing on the online teaching-learning process and task-based mathematics learning for effective learning during the COVID-19 pandemic. The study is emphasized by establishing and developing the new science of teaching for online mathematical education, which can; bring more engagement in online classes and need less complicated web-based tools designed for simple and complex learning. In addition, it would help students to establish an interest in mathematical education and develop ways to learn through inductive inquiry-based methods in online education for mathematics (Berner *et al.*, 2021).

The research would assist academicians, scholars, practitioners, and mathematics educators in conducting online modules based on task-based/practical learning for students so that learners can apply their learning in daily life and explore their findings to give a stage to explore themselves. The proposed approach would encourage and push students to explore learning and develop a sense of

confidence and engagement. It will help them to comprehend the module of mathematics in an effective manner. The modules would be furnished further with the time and contribution of educators in re-framing ideas into online teaching modules, tasks, applications, and instructions (Izhar *et al.*, 2021; Mohammed & Yap 2010; Mohammed *et al.*, 2016; Mohammed & Sidek, 2015; 2016; Argellan *et al.*, 2019). The study highlights the opportunities to re-think the delivery of mathematics education in Covid time. The study would also provide a direction for future learning using online method which employs technology for effective mathematical education. The acceleration of the COVID-19 pandemic has increased the reliability of the technology and digital solutions in the education sector; the teachers are surrounded by a situation whereby adjustment is necessary to accept the change in the teaching and learning process (Van der Spoel *et al.*, 2020).

Online teaching modes are the alternatives to traditional teaching due to new norms applied to worldwide education sectors. Several studies have highlighted the challenges in learning paradigms of online mode by teachers and students. The studies have indicated that the main online teaching challenges are IT infrastructure at students' end and lack of digital and technical literacy, and how to use digital and web platforms to make online classes efficient and interactive (Jamil *et al.*, 2022; Islam *et al.*, 2020; Aziza, 2021). Furthermore, the challenges and issues are reported at both ends, i.e., students and teachers accessing the online class. Hafeez *et al.* (2021) highlighted the challenges faced by students and teachers in an online class which were understanding of course expectations, technical issues, time management and distraction, motivation, communication issues, the adaption of unfamiliar technology and uncertainty regarding future learning.

The problem highlighted in the study underlines the duration of pandemic during which pandemic has devastated most of the sectors, including the education sector. Education sector has suffered the closure of institutions due to the rapid spread of the corona virus and educators were forced to conduct online classes (Yusuf & Ahmad, 2020). The shift in the mode of education has brought several challenges in teaching and learning. Research by Gurung (2021) highlighted that students and teachers had faced major challenges in the transition of online modules due to COVID-19. Studies have reported that students were facing challenges in the accessibility of online modules, technical issues, lack of motivation and distraction (Barrot *et al.*, 2021). In addition, being dependent on the screen for learning, including long hours, caused loss of interest in learning process. The aim of the study is to identify and explore the challenges of online modules for task-based learning of Mathematics for effective online teaching-learning process.

Another study has reported the engagement factor, as the findings of the study have shown that students are less likely to engage with online classes. Online education requires spatial learning skills and audio-visual teaching aid to engage students with their course modules (Al Abdul Aziz, 2021). Another study has reported evidence through the survey that many students do not find online education an effective medium to pursue their studies (Ellianawati *et al.*, 2021). Research conducted in the study of mathematics education found that 27% of students found online education to be an effective medium, 53% responded as satisfied, and 20 % of students responded as ineffective. The ineffectiveness is reported due to eye strain and pressure built by screens and internet connectivity issues (Bakker *et al.*, 2021).

However, research by School Guru Edu serve and Team Lease in India has surveyed 1200 professors from 50 universities in 15 states. The professors responded that they were not satisfied with online education. They found it difficult to take online classes because of obstacles summarized as; camera shyness and comfort, lack of digital and technical literacy, lack of online teaching pedagogies, class control, and lack of physical interaction (Sharma, 2021). Underlining difficulties have become challenging for the education system to provide quality education to students. Importantly, for those enrolled in higher education, where the student has to perform complex problem-solving and apply theories for their final year project (Eika, 2021).

Furthermore, as a mathematics student, this course required attention, a clear and concise understanding of the concept, continuous supervision and systematic approach to solve structured problems. On the other hand, it is difficult for professors to teach and deliver using an online medium

compared to other modules (Chiu *et al.*, 2021). Globally, researchers are searching for new paradigms and pedagogies to improve online education through testing. They are also conducting trials of online platforms and tools to create more engagement which requires proper training for teachers and students (Calder *et al.*, 2021). However, to increase the overall quality of online mathematical education, there is a sudden need for developing pedagogies for online mathematical education, including task-based learning, effective assignments for evaluating students' performance, collective activities, tasks and assessments that can improve online mathematical education (Ilmadi *et al.*, 2020).

The study is significant for the individuals involved in online education or the field of education and helps teachers and educationists to learn the concept of online modules from a wider perspective. The study would also assist students in planning and scheduling their studies as per the challenging factor highlighted in the current study. Barriers as mentioned above can be avoided, and mathematical education can be facilitated effectively and effecting learning is always the priority of the students since it makes their learning easy. As per the professors, they can learn how to deal with the challenges and barriers to make teaching and learning effective (Haleva *et al.*, 2021).

The study will provide a direction for future researchers to explore the challenges of online modules for task-based mathematics learning using a conceptual framework provided by the author. The framework can forecast the related factors underlined as teaching methods, task-based learning, effective assessments and assignments, and proficiency level between the students and online mathematical education (Huang *et al.*, 2022). By identifying the factors highlighted by current research, future practitioners and researchers could investigate further to determine the effectiveness and efficiency level of highlighted factors (Hwang *et al.*, 2021).

2. Methods

The adopted methodology in the current research is a literature review using the content analysis method, which is a domain of qualitative research design. The content analysis is part of the conceptual framework and interlinking concepts with the model. The related review of the literature was collected through keywords such as Online Mathematical Education, COVID-19 Pandemic, Task-Based Learning, Effective, Online Teaching-Learning Process, Online classes, Online Module, and Education System in Malaysia. The selected articles for analysis are from 2020 to 2021, the years of COVID-19. Such effective insights can be presented to the research readers, facilitating them best. The articles selected for the analysis were published in books and journals (Karuppannan and Mohammed, 2020).

2.1 Conceptual Framework

The conceptual framework is developed based on the findings previous studies. It distinguishes the challenges causing ineffective learning in the online task-based modules for mathematics especially during the pandemic as in Figure 1. With regard to the current study, the model is based on the challenges of online modules of mathematics pedagogies during Covid times. The challenges are sub-categorized to students' and teachers' levels and are selected due to their relevance to one another including lack of motivation, lack of self-efficacy, online teaching-learning process, math proficiency level and psychological factors stress and anxiety. Challenges in effective task-based learning are the dependent variable whereas, lack of motivation, lack of self-efficacy, lack of digital and technical literacy, math proficiency and psychological factors are the independent variable.

Within the task-based learning context for mathematics, psychological (anxiety and stress) is a key factor which poses as a challenge in the learning process. Moreover, there is a lack of motivation in learning mathematics through task-based learning. Lack of self-efficiency and math proficiency level is also reported by the students to be a challenge in learning mathematics through this method. While another challenge highlighted in this conceptual framework is lack of digital and technical literacy. The highlighted factors are common and general challenges that students and teachers face in Mathematical online education.

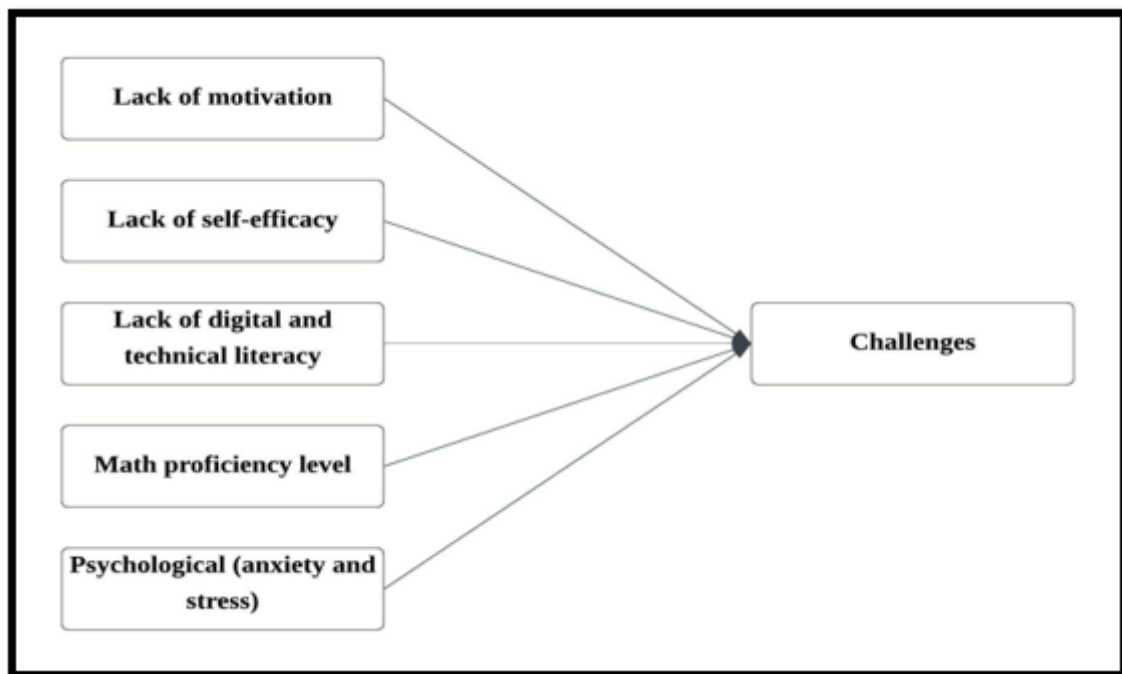


Figure 1: Conceptual framework

The literature of the study stated that during online math module students find it difficult to focus and a lack of motivation has been observed (Berner *et al.*, 2021). The students face digital and technical literacy challenges using the internet and accessibility along with modular tools and software to solve complex problems of mathematics (Phaniew *et al.*, 2021). The proficiency level of math has been a challenge for students in an online class. In addition, Al Abdulaziz (2020) stated that students have to face psychological issues such as stress, and anxiety due to a lack of understanding during the online module. The study has provided a direction for future researchers to explore further the study topic.

3 Conclusion and Recommendations

Online mathematical learning based on task-based learning practices of mathematics has provided several benefits for students and teachers to continue their education. However, the process has remained challenging and there is scope of improvement in online mathematical education. The initial challenges that occurred during the period of the COVID-19 pandemic in the context of Malaysia have been discussed and highlighted. The study's goal is to explore the challenges that teachers and students face in online mathematical education modules during Covid-19. The review of literature and analysis has identified the main challenges to the current study's psychological factors, lack of motivation, lack of self-efficacy, digital and technical literacy, teaching pedagogies and proficiency level of students. The study has provided a conceptual framework for the readers to identify the challenges faced by students and teachers. At the same time, recommendation for future researchers and academicians to explore the study and find the relevant solutions to improve online mathematical education.

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