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THE DISCUSSION OF TEACHING AND LEARNING STYLES IN MATHEMATICS SUBJECT: A TRADITIONAL VERSUS INTERACTIVE-ENGAGEMENT APPROACH

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ABSTRACT

Technological advances in education have changed the delivery method in teaching and learning. Students have been exposed to more engaging and interactive delivery methods. These changes can further enhance the students' understanding in a more effective way. There are two types of teaching styles in delivering knowledge; it is by using traditional method or applying active learning approach. This paper analyses the learning and teaching styles of the traditional and interactive engagement approach, and also discusses the advantages and limitations of both methods. Learning mathematics is different from learning reading comprehension subject. Techniques and presentations need to be more effective so that students are able understand and solve problems quickly and effectively. Thus, a discussion on both methods is needed in order to identify which method is suitable to be applied in delivering knowledge to the students.

Keywords: Active Learning; Interactive Engagement; Mathematics; Traditional Teaching

1. INTRODUCTION

Mathematics is a construct that enables us to try and solve problems in the simplest way possible and arrive at concrete answers. However, most of students, either the school children or adult learners, they might be struggling with the concept of Mathematics. They are not interested with this subject because the subject is perceived as boring, not fun, difficult and hard to understand. Therefore, it is significant to highlight that Mathematics has always been a subject that students prone to fail in their academic performance. For that reason, the appropriate steps

need to be taken in order to solve the common issues like failure rates and mathematics anxiety among students. According to [1], proper guidance on methods of learning Mathematics and metacognitive and self-regulatory strategies are suggested to reduce the difficulty in mathematical tasks. Teaching and Learning (T & L) strategies are much significant in correcting the major sources of difficulty arising from nature of mathematics. Thus, the objective of this study is to review the categories and strategies of teaching and learning styles applied in Mathematics subject. Figure 1 below shows the research design of T & L style in Mathematics subject for this study.

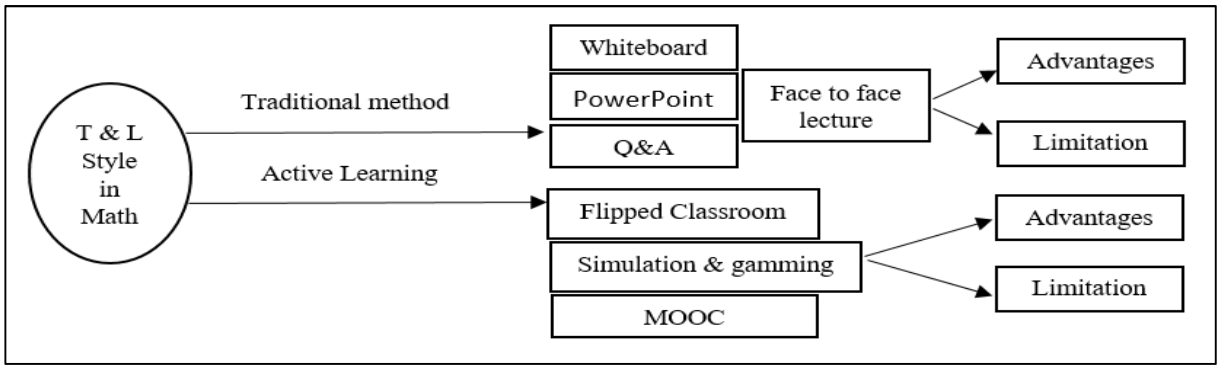

Fig.1. Research design methodology followed

From this paper, all the discussions should be able to give extra knowledge for instructors on the varieties of techniques which have supreme impact and effective outcomes for educators or instructors and students. The second section of this paper discussed on both active and traditional learning styles. Discussions on theoretical concept, advantages and limitations of flipped classroom models, simulation, and gaming and MOOC style for this study are also revealed in this section. Finally, conclusion and suggestion for future studies are presented in the last section.

2. TRADIONAL TEACHING APPROACH

Traditional teaching method is a face-to-face teaching and also known as teacher-centered instruction, where the usual old-fashioned mathematics instruction is used in the lecture. In a traditional classroom, the lecturer stand in front, near the whiteboard and the students are positioned to sit in straight rows with a textbook open. On their desk, there are paper and pencil ready to take notes. Normally, in 50-minutes class period, lecturer starts by recalling previous lessons by using question and answer (Q & A) technique and highlighting helpful materials for the first 10 minutes, followed by a comprehensive presentation of the new topic for 25 minutes. The students are then asked to begin practicing the new contents by answering and completing

multiple problems for the last 15 minutes until the end of class period.

2.1 Advantages of Traditional Method

The use of traditional methods in mathematics teaching has its own advantages. In the traditional classroom, lecturer controls and inspires students effectively when the students encounter problems or conflicts. They inculcate flexible teaching method by adjusting the content according to actual requirement under the general teaching arrangement, which is not only conductive to cultivate the basic technique but also for the good habit in forming students' self-study ability [2]. According to [3], this method is also efficiently applicable for the topics that need more detailed explanation on the board. Besides that, upon conducting a debate with the students, it gives the lecturer chance to expose students to other educational materials and allows the lecturer to precisely determine the direction of the presentation and facilitates large-class communication.

2.2 Disadvantages of Traditional Method

However, the traditional methods of math instruction do have many disadvantages. Since the teaching mode is singular and the lecturer becomes the center in the teaching process, it gives limited thinking space for the students. In particular, they are not allowed for much questioning, investigating or individual development of understanding. In short term, this kind of method might work but students who could not remember what the lecturer taught on a certain steps or do not understand why the particular procedure is used will naturally be oblivious to the information attained [3]. From the experience and observation, students in the traditional teaching classes also have difficulties to understand the subjects of mathematics and they have anxiety when it comes to examinations and class activities and discussions [4]. This situation can then be one of the factors of high failure rates in mathematical subjects.

3. ACTIVE LEARNING APPROACH

A genuine pedagogical method that focuses on students' movements, action and involvement in the learning activities is one of the active learning styles in teaching mathematics. Active teaching method needs students to be involved in the lesson and reflect what they are doing during learning process. Effective learning outcomes can be elevated through creative teaching activities and it needs student's participation in classroom activities. Students might learn through individual activities, paired activity, informal small groups, and co-operative student

project in active mathematics learning classes. This method incorporates various activities, such as conceptual mapping, brainstorming, collaborative writing, case-based instruction, cooperative learning, play-around, simulation, project-based learning and peer teaching. Students are required to use higher thinking skills such as analysis, synthesis, and evaluation in active learning methods [5]. Students should be exposed to varying conceptual and theme styles of learning according to various environments and changes as there are more universal approaches to active teaching.

3.1 Flipped Classroom

Flipped classroom is an education technique introduced to change the traditional lecture learning style to instructional strategy. It consists of blended learning that reverses the traditional learning environment by delivering instructional contents such as oral, visual, listening, hands on, problem solving etc. Flipped classroom's approach involves requirements such as watching videos before attending lecture and having students' discussion. According to [6] , students use time in class to work through problems, concepts first, and engage in joint learning.

3.1.1 Advantages of Flipped Classroom

There are several advantages of flip classroom, namely it is cost effective, students are able to learn at their own pace, it minimizes operational disruptions and also it improves hand-on collaboration between staffs. Internet facilities in most university campuses enable the students to learn and view web-based instructions at their own pace and time. Online learning provides opportunities to use the classroom for information applications. Contact hours during lectures can be focused on problem solving, skills development, and gain a deeper understanding of the matter because students have view the lesson before classes [7]. Teachers can provide students with a variety of student-centered opportunities in the classroom for better collaboration from teacher to student. The benefit of flipped classroom is the freedom of students to interact with the content according to their own learning style. It can also improve communication and connection with students that possessed a broad range of abilities. Teacher is able to provide more one-on-one personal engagement when the lecture portion is removed from class. During individual feedback sessions, students who may be hesitant to ask questions in the middle of a lecture may seek assistance from the teacher [8]. Lectures notes can also be viewed several times before students formulating their questions. Other advantage of flipping classroom is that both students and lecturer are able move forward although they are absentees in the classroom.

In flipped classroom pedagogy, students who miss lectures due to illness and students who are engaged in university-supported activities such as athletics will have the potential to stay on track without lengthy interaction with the instructor. Teacher who is absent may leave the course material to their students and it allows them to move forward with the help of the provided materials The course is able to be proceeded as scheduled without unnecessary delays [9].

3.1.2 Disadvantages of Flipped Classroom

However, the flipped classroom approach has its own limitation. The limitations include overly reliant on students' trust, networking opportunities restricted, and denies learners 'face time'. It is not easy for lecturers to post content online when they are adapting from traditional lectures to alternative media. Lecturers also need to make changes to the online lectures. Adjustments to course content may be dependent on the technology originally used to create the lecture in order to form flexibility. Complexity of making changes could vary between re-recording an entire video lecture or could be as simple as adding an additional slide to a power point presentation. As technology used for presenting information gets smarter, faster, better, and cheaper, educators will be forced to learn and access more of these tools. The flipped classrooms, as well as active learning, require students to assume more responsibility for their individual learning experience. Teachers must include clear expectations of self-direction and motivation within their syllabus or framework of the course. For this reason, verification, through application of information in a project-based scenario, may be one indication that students have performed the task of viewing the lecture prior to entering the classroom. When discussing the use of the flipped classroom model, it is important to recognize the financial limitations of public schools, teachers, and students who may have limited financial resources. The success of this model relies on the availability of computers and access to the internet outside of the classroom [10].

3.2 Simulation and Gaming

Simulation gaming or games are to be very effective in improving achievement understanding in mathematics. Computer games can also be highly effective in increasing children's learning and enjoyment of mathematics. Mobile educational games have been developed by combining the fun factor of mobile games, the flexibility of mobile learning and the benefits of games. This study found encouraging evidence which points to the improvement shown by students using the math apps in particular the struggling students. Example simulation games for

mathematics subject is shown in Figure 2.

Fig.2. Example simulation games for mathematics

3.2.1 Advantages of Simulation and Gaming

Games provide a great source of learning as they help to improve coordination, problem solving skills, attention and concentration. Thus, there have been a continuous development of instructional games to further motivate the students to be actively involved in learning [11]. Arguably, these games generate enthusiasm, excitement, and enjoyment in order to increase students' interest, satisfaction and continuing motivation. Computer math drill games, even though being more simplistic than commercial role-playing games in terms of visual, activity, and interaction design, still significantly enhance students' positive attitudes toward math learning. In addition, participants have learned better problem-solving techniques, better decision-making skills, acquired sharpened hand-eye coordination, heightened concentration, developed enhanced critical thinking capabilities and improved motor skills [12].

3.2.2 Disadvantages of Simulation and Gamming

In games that require role-playing, the players sometimes succeed in becoming absorbed in their roles and sometimes do not. When players cannot empathize with their assigned roles in the games, it lessens the success rate. Games often have passive role requirements which players usually find boring. Role-playing games tend to have similar design characteristics. Due to that, after playing several games, students found the structural differences of the games to be fuzzy [13] .

3.3 MOOC (Massive Open Online Course)

Massive Open Online Courses, or MOOCs, can be defined as online courses that allow participants free access and unrestricted participation to any courses of their choice. Besides the conventional modes of teaching such as lectures, videos and reading material; MOOCs also provide a platform for interactive forums.

3.3.1 Advantages of MOOC

The advantage of MOOCs is that it provides free access to main courses taught by elite professors in an asynchronous format available anywhere and on any device with internet access. This type of course delivery format helps in varying the style of learning and teaching in education. Furthermore, MOOCs generally have no prerequisites, fees, formal accreditation, or predefined required level of participation.

3.3.2 Disadvantages of MOOC

However the disadvantage of MOOC is it cannot provide personalized courseware and attention from a tutor. It is difficult to keep track of students' assignments and involvement. Learners with disabilities and students with no internet connection would not be able to use MOOC. MOOCs can't be used as a credit-earning course at universities and language can be an obstacle while offering MOOCs.

4. CONCLUSION

Based on the literature review, it can be concluded that combining both traditional learning and active learning would provide instructors and learners with a new experience like no other. The introduction of any new strategy requires a shift in the minds of both educators and learners. Instructors must try to teach with multi alternatives strategies in the classroom. It is important for instructors to periodically reflect on their teaching effectiveness when they are willing to teach with traditional and active learning. Students also need to adapt with a new pedagogy style and recognize its value. Students may develop higher order of thinking skills and creativity through active learning. The active learning strategy provides an opportunity to address problems of an increasing demand to improve learning experiences and capture the attention of millennial students faced by educational institutions. Thus, this method should be used in order to strive towards more powerful learning outcomes, knowledge retention, and higher knowledge depth to obtain an optimistic future for education.

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