INVESTIGATION OF ONLINE STRATEGIES THAT PROMOTE INCLUSIVE TEACHING AND ACTIVE LEARNING

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1. BACKGROUND

Online teaching and learning during Covid-19 pandemic dominated in many countries, including South Africa, as it allowed students to continue with their education while in lockdown (Mpungose, 2020). This crisis also provided the Chemistry department at the Tshwane University of Technology with the opportunity to explore prons and cons of online learning, paving the way for the adoption of ICT and blended learning beyond Covid19 era. It has also served as a catalyst for educational change. This emergency and remote teaching and learning has introduced new and previously undervalued ways of engaging with students and responding to their needs which should be acknowledged. But it has also exposed that online learning comes with a lot of challenges, which include a decrease in student attendance and a lack of student engagement with course material (Weijers *et al*., 2022). For online teaching and learning to be effective, instructors need to employ innovative teaching and assessment methods that increase student engagement, attention and support students' individual needs.

The aim of this study was to explore various strategies that could enhance the effectiveness of online teaching-learning by promoting inclusive teaching, specifically through active learning. Incorporating pedagogical practices that work to maximize active and inclusive teaching concepts has proven to be beneficial for all students, especially those from disadvantage backgrounds (Salazar, 2010). Making online classes both active and inclusive help students learn easily, increase their participation and also help them feel more connected to their learning and their peers (Barkley *et al*, 2005). This approach also promotes learning among learners with diverse needs and who have diverse learning styles (Lawrie *et al*., 2017). Active learning is a process whereby learners are actively engaged in building understanding of facts, ideas, and skills through the completion of teacher directed tasks and activities (Braxton, 2000). Learners get involved in the learning process than merely passively listening to a lecture's lesson. Active learning techniques can be used to engage learners in thinking critically or creatively, speaking with a partner, in a small group, or with the entire class, expressing ideas through writing, exploring personal attitudes and values, giving and receiving feedback and reflecting upon the learning process Mazibuko, 2014). When a lecturer employs active learning techniques, he or she will typically spend greater proportion of time helping learners develop their understanding and skills, promoting deep learning and a lesser proportion of time transmitting information that is, supporting surface learning. In addition, the lecturer provides opportunities for learners to apply and demonstrate what they are learning and to receive immediate feedback from peers or the lecturer (Bonwell & Eison 1991). Multiple studies have indicated that active learning improves learners' achievements, it has been proven to be an effective pedagogy throughout the chemistry curriculum (Demissie, 2011).

2. SCOPE

The project was focused on Environmental Chemistry I and II, second year students registered for the diploma in Analytical Chemistry at the Tshwane University of

Technology. At the beginning of the semester, It was explained to students that the module would be delivered using a blended approach which was a decision taken by the department of Chemistry to be implemented for all the modules offered by the department. It was further explained that the instructional approach for the module would be active learning. The lecturer explained how the active learning works and that the main aim of this approach is to engage students with materials that they are learning through problem-solving activities, writing assignments, group discussion, reflection activities, and any other task that promotes critical thinking about the subject. I addition students were made aware that active learning requires that students do something that develop their skills, as opposed to passive learning where information is merely transmitted to them.

3. APPROACH /METHODS

In order to engage students and increase their participation in online classes, this study first focussed on three different approaches that are recommended to promote active learning which include:

a. Polling and the use of chat box

This approach was used to engage students and increase their participation in online class. Various activities were prepared in small section of each the learning unit and students had to participate sharing their opinion using polling or chat box. This method provided the following advantages: It provided real time opportunities for students to test their understanding of materials they were learning and put it into practice, it allowed students to participate in large lecture while staying anonymous, creating two-way communication in a lecture between students and lecturers, students were able to obtain immediate feedback from both students and lecturer on the clarity of material, enable the instructor to better adapt to classroom needs.

b. Peer-Led Team Learning

This is a well-defined active learning model involving small group interactions between students, and it can be used along with or in place of the traditional lecture format. In this method the instructor introduces a group activity and provide instructions and then divide students into smaller groups, which will then be sent to their breakout rooms for a specified period. The instructor moves from one breakout room to another to check on the progress during the activity. When the time lapses, each group come back to the main class to report back. This method provides the following advantages: promote collaboration amongst students and provide students with the opportunity to learn from their peers and it gives students the opportunity to evaluate their peers. It assists the lecturer to pinpoint key areas that need further discussion and refinement and implement just in time teaching with targeted discussions as needed.

c. Flipped Classroom

The general idea of this method is to move more of the passive preparatory work (like reading and practice exercises) that students can do more easily on their own to OUTSIDE of the classroom and move more active and difficult activities such as discussing applications of more challenging material and in depth problem solving to INSIDE the classroom. I this study, videos of the learning materials were posted to provide explanations for topics and problems prior to lectures. The goal of the videos is to reinforce lecture topics or potentially introduce a given topic. The students were expected to prepare before the lecture and also play the videos to prepare them for

the subsequent discussion and problem-solving activities in class. This method provides the following advantages: lectures spend less time introducing new topics, students develop independent learning skills, teachers can create more engaging lessons, students who are absent do not fall behind, students are able to build a deeper understanding.

4. ACHIEVEMENTS AND CHALLENGES

After the module was offered for a semester using active learning and blended approach, a questionnaire created using google forms was sent to students in order to evaluate their experience of the module. The responses were anonymous and out of the class of 90 students, 49 responses were obtained which was more than half of the class. Since some of the sections of the module were offered online it was important to find out the type of devices students were using for their online classes. About 51 % of the students indicated that they were using laptops and 49% were using smartphones. Approximately 51% of the students indicated that they prefer blended approach for the delivery of the module Environmental Chemistry, 33% prefer only online and only 16 % would prefer face to face. This proved that the decision taken by the Chemistry department to use a blended approach was a good one since that is the method preferred by most students. Students prefer a blended approach because some on the sections that are taught online are recorded and they can access the recordings anytime which gives them the opportunity to learn at their own pace. In addition, blended approach provides the opportunity for students to also meet face to face with the lecturers. This approach actually provides students with the best of both opportunities. However, some students expressed their frustration with slow and unstable network connections which affected their attendance. With regards to active learning, most students indicated that they prefer an equal blend of lecturing and activities because activities and class discussions help them clarify points that are being taught immediately during class. Students further indicated that working in groups during class activities encourages collaboration and peer learning but they prefer to work in small groups not exceeding five members per group. Working in groups provide students learning benefits such as individual reflection and interactivity amongst students. Implementation of active learning methods in the Environmental chemistry class has shown to influence learners' social and academic integration and shown to foster a learning environment that enables thoughtful discussions with a variety of opinions and perspectives where the voices and ideas and opinions of all the students in class are valued and respected by the instructor and their peers which underpins the important issue of social justice. In addition, inclusive teaching through active learning has been successfully implemented by the Chemistry department at Stanford University in USA and Brown University in Rhodes Island in the USA using similar strategies in both online and hybrid environment. The main challenge was to get everyone to participate in active learning activities especially those students who resist change and still prefer the old teacher centred learning method.

CONCLUSION AND RECOMMENDATION

The study has shown that students prefer active leaning than passively listening to the lecturer. In addition, it has become clear that Environmental Chemistry students prefer a blended approach. It has become apparent that active learning and a blended

approach cater for all type of students, students from different backgrounds and with different learning styles which addresses the issue of social justice. This research has shown that inclusive teaching can be achieved by employing active learning strategies both in an online and blended learning setup. There are many more other active learning strategies that needs to be explored.

It is recommended that, with regard to group work, It is important to distribute evaluation form that allow each student to assess contributions made by each member of the team in terms of intellectual involvement in planning/research, effort toward achieving group goals, cooperation and support of others.

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