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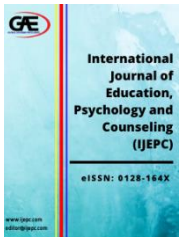

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A STRATEGY OF ADOPTING COLLABORATIVE TEACHING IN MATHEMATICS FOR HIGHER EDUCATION

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Abstract:

Research has established collaborative teaching method as a means for educators to deliver instruction to students by performing collaborative practices among themselves or in the collaboration with industry experts. By collaboratively sharing their knowledge to students and applying different teaching techniques, students gain the benefits by learning from different educators and the industry expert. The collaborative teaching is a form of twenty-first century teaching method that benefits to both students and educators. However, there is still lack of research conducted that focuses on the full strategies to implement collaborative teaching in online distance learning (ODL) and face to face modes. Hence, this study aims to provide comprehensive strategies for adopting collaborative teaching in Mathematics subject for higher education in both ODL and face to face sessions. A qualitative technique was used to document the strategies of implementing collaborative teaching approach in class and to obtain feedback from educators and students regarding the implementation of collaborative teaching. The

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findings revealed that there were three phases adopted; pre collaborative teaching phase, collaborative teaching phase and post collaborative teaching phase. The effectiveness of the sessions depends on the planning in the pre collaborative teaching phase. It was shown that most students and educators had a positive impact on the collaborative teaching approach. This study can act as a reference for other educators to implement collaborative teaching strategies in their subject matter. In addition, it helps educators to have a better understanding of educators' and students' perceptions of adopting collaborative teaching.

Keywords:

Collaborative Teaching, Face To Face, Mathematics, Online Distance Learning, Strategy.

Introduction

Education is changing massively towards 21st century education. In order to achieve that, the delivery methods applied by the educators are evolving away from teacher centered learning to student centered learning. Educators nowadays need to be more proactive and perform collaborative practices among themselves or other industries by sharing their knowledge and effective teaching techniques in order to prepare the students for the real world. One of the delivery methods that can be applied is collaborative teaching, or co-teaching. Collaborative teaching occurs when two or more educators share a lesson with a group of students in one of the same classes, and it involves three phases: co-planning, co-instructing, and co-assessing (Murawski & Lochner, 2011; Ploessl et al., 2010). Educators who take part in collaborative teaching share ideas or knowledge, as well as emotional support and encouragement when faced with personal or professional issues. Many studies have been conducted regarding collaborative teaching in education, either in school or higher education (Nayan et al., 2010). Most research focused on the impact of implementing collaborative teaching. According to Gallo-Fox and Scantlebury (2015), co-teaching helps mentor educators and teacher candidates improve their practise and skills and enhances teacher candidates' learning.

Research related to co-teaching has often examined students' and educators' perspectives towards collaborative teaching (Montgomery & Akerson, 2019); Adam et al., 2020); Gokbulut et al., 2020; Asha, et al., 2022). Although collaborative teaching is a widely implemented approach, there remains confusion and a lack of evidence regarding the strategies of co-teaching practices, particularly regarding the use of specific and varied approaches by co-teachers. Hence, this study was done to answer the following questions:

1) How to implement Collaborative teaching strategies in ODL and face to face mode?
2) What are students' perceptions of collaborative teaching implemented?
3) What are educators' perceptions of collaborative teaching strategies implemented?

Literature Review

Collaborative Teaching Model

Collaborative teaching, also known as co-teaching, requires two or more educators to work collaboratively to deliver instruction to a diverse group of students in a shared instructional space, which involves three phases: co-planning, co-instructing, and co-assessing (Murawski

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& Lochner, 2010; Ploessl et al., 2010). It becomes an important roles in guiding students in developing skills (Erdogan, 2019). According to Friend et al. (2010), co-teaching approaches are described as six models in which each instructor contributes to the delivery of content and interacts with students. Each model is described briefly. (1) One lead, one observe. One instructor is the sole provider of content, while the other observes. This is useful when a less experienced instructor wants to become acquainted with specific content or instructional approaches or if an incoming co-instructor intends to observe the environment in the classroom before participating. (2) One lead, one assist. One instructor act as a leader for the content deliverer, while the other instructor(s) facilitate the students' questions, activities and provide assistance to the lead instructor. (3) Station teaching. Students move to multiple stations to participate in different learning activities. This is especially beneficial in laboratory settings when specialised pieces of equipment are utilised at each station in order to give the learners experience in handling the specific equipment. (4) Parallel teaching. Instructors facilitate sessions on the same subject and activities by interacting with subgroups of students within the broader teaching space or in different classrooms. (5) Alternative teaching. Allows co-instructors to address the requirements of multiple student groups: one instructor may work with the bulk of students while another works with a smaller group of students who have a specific instructional need. (6) Team teaching. Each instructor delegated the task equally, and they took turns delivering their content. Figure 1 shows the illustration of all six collaborative teaching model.

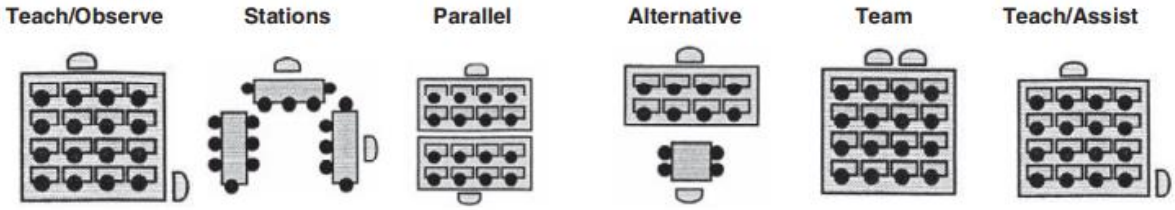

Figure 1: The Illustrated Collaborative Model From Ploessl et al. (2010)

Collaborative Teaching Strategies

In accordance with 21st Century learning, many education institutions have adopted student centered learning in their teaching delivery methods, and one of the most famous methods is collaborative teaching among the educators. Although there has been much research conducted regarding collaborative teaching strategies, but there are still lack of sources on the steps to be taken during the collaborative stages. Murawasaki et al. (2010) explained the three phases to be conducted when implementing collaborative teaching, which are co-planning, co-instructing, and co-assessing. According to Pratt et al. (2017), the strategies must begin with planning by the co-educators to ensure long-term viability and their readiness. The findings showed that collaborative-teachers must be clear on the objectives of the collaborative teaching, lesson for the day, which subtopic or part they should teach, the collaborative models that will be used, and any special considerations or changes that will be made for specific students.

An effective co-teaching collaboration is built on the notion that making time for planning and reflection is essential. Planning and collaboration involve a number of factors to consider. Teachers' planning time should be intentional and purposeful, and the students' situation in classrooms should be taken into account. (Rexroat-Frazier & Chamberlin, 2019). Collaboration

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should take into account that all team members should demonstrate strong communication skills, the ability to share knowledge, and the willingness to find the time to support teamwork where all members are responsible and accountable (Da Fonte & Barton-Arwood, 2017).

Co-instructing happens between the educators, where the effectiveness of instructions given by the educators can determine the improvement of students' outcomes. They must be able to deliver the lesson according to the most suitable collaborative model and fit into the curriculum requirements as well as the needs of their students (Brendle et al., 2017). It can only be done after extensive co-planning to build a clear understanding of the instructional aim and the best co-teaching model to be implemented. In order to evaluate student development, formative and summative assessments must be incorporated into the co-planning and co-teaching processes. The method of assessment is chosen to track student progress throughout the planning phase. Incorporating these elements into co-teaching will provide a supportive and interesting learning environment for the students (Ploessl et al., 2010).

Students' Perception of Collaborative Teaching

Collaborative teaching involves two parties, which are instructors or educators and students. (Mason, 2020) stated that cooperative learning develops when students collaborate with their teachers and peers. Having the students' feedback when implementing this delivery method is significance because the outcome of the lesson must provide a positive impact on the students. There are many studies conducted on the students' perceptions of collaborative teaching, such that according to Gokbulut et al. (2020), the students felt content, successful, and academically prepared. In addition, they also enjoyed the teachers' materials and were eager to come to class, as well as appreciated the setting of the classroom. The students claimed that more assistance was given to them, more teaching techniques were used, various teaching philosophies and teacher approaches were noticed, and as a result, their skills were enhanced in the co-teaching classes.

On top of that, the students believed that collaborative teaching resulted in the adoption of collaborative learning, which facilitated the development of the students' critical thinking, intercultural communication, and problem-solving abilities (Asha et al., 2022). Students' impressions of collaborative learning as being impacted by collaborative teaching in the current study have been supported by Warsah et al.'s (2021) study on the impact of group work on students' critical thinking abilities. (Lai, 2021) mentioned that by using technology help students learning in variety of ways. Students can collaborate with each other either using online or offline. Therefore, collaborative learning promotes students to work in group to solve the problem. In this regard, de Hei et al. (2020) investigated how collaborative learning was considered to affect students' development of intercultural communication abilities. In their investigations, Rustanuarsi and Karyati (2019) and Syahmani et al. (2020) proved that collaborative learning had a positive impact on students' problem-solving abilities. Students who experienced collaborative teaching performed well in terms of critical thinking, academic achievement, and overall involvement. Students can boost their self-confidence, learn more difficult material, and perform better (Rexroat-Frazier & Chamberlin, 2019). According to focus group interviews, students viewed the collaborative approach as more intriguing and worthwhile (Mishra & Hussain, 2023).

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In order to motivate the students, educators must play a vital role in the class. Educators can create better environment for student's learning and development (Houghton et al., 2022). Having collaborative sessions will definitely promote collaborative learning among the students. It helps the students interact with each other as well as improve their soft skills. After showing all their efforts, educators must be able to express their appreciation towards the students. This is a reciprocal interaction that occurs in learning activities that aim to create a harmonious and pleasant learning atmosphere. The students who win the prize are delighted and satisfied with their performance in accurately answering the questions posed (Ayuwanti & Siswoyo, 2021). Those who did not manage to win the prize will be eager to win in the next class.

Educators' Perception of Collaborative Teaching

Educators act as the primary role in implementing collaborative teaching as their delivery method. They must be able to collaborate with other educators in terms of time, ideas, purpose, philosophies, and understanding in order to make it success. Thus, the educators' perception of collaborative teaching is equally important as the students' perception. Based on the investigation by Ralston et al. (2017), through collaborative teaching, educators were able to identify students' thinking as it was happening and quickly clear up any misunderstandings or other ambiguities before they had a chance to negatively affect students' thinking. This finding suggested that teachers were aware of who they could work well with and delegate tasks evenly in the classroom (Krammer et al., 2018). As previously stated by Rytivaara and Kershner (2012), this outcome was in some ways anticipated because qualified teachers are aware of their preferred teaching styles based on their own experiences. Teachers obviously prefer to work with colleagues who have similar teaching styles to their own rather than those who have different teaching approaches.

Montgomery and Akerson (2019) discovered that assigning coworkers to classrooms as co-teachers and putting teaching strategies into practise allowed future educators to gain more valuable field experience. Each educational preparation programme's ultimate objective is to develop instructors who can better meet the requirements of the students they instruct, provide more encouraging comments, facilitate small-group learning, and offer individualised support. Additionally, educators should master several knowledge of competencies. These strategies will assist educators to monitor student's groups as well as provide support for task content and collaboration and determine the necessary intervention (Alabbad et al., 2022).

Implementing a collaborative teaching approach provides a chance for the educators to have more than two educators at the same time. Thus, according to Adam et al. (2020), educators were capable of controlling students' behaviour in class and during instructional activities. Additionally, they can focus more on the students and be able to help those who struggle and have difficulties in that subject matter. Even though they have limited time but since there are many educators who can assist during the collaborative session, thus, they are able to facilitate each student better than when there is only one educator in the class with limited time. Similarly, educators can also create better environment for student's learning and development.

Methodology

The study employed a qualitative method where teaching and learning strategies were documented and discussed. The study was conducted at Universiti Teknologi MARA (UiTM), Johor branch, Pasir Gudang Campus, with a total of 60 participants. The participants were the

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diploma students from the engineering course who took Calculus II in that particular semester. The subtopics discussed were First Order Differential Equations. The collaborative teaching involved five lecturers, four of whom were from Mathematics Department and one from Mechanical Engineering Department. There were two sessions conducted.

The first session was conducted in Online Distance Learning (ODL) mode as the students were not on campus due to the limited or controlled number of students allowed to be on campus because of Covid-19. There were two classes with a total of 30 students involved in the online session, and the students were added to Microsoft Teams and group telegram. These are the two platforms used for communication between educators and participants. As for the assessment, the platforms used were group telegram and Quizziz. The flowchart of implementing the collaborative teaching approach during ODL session was provided in Figure 2.

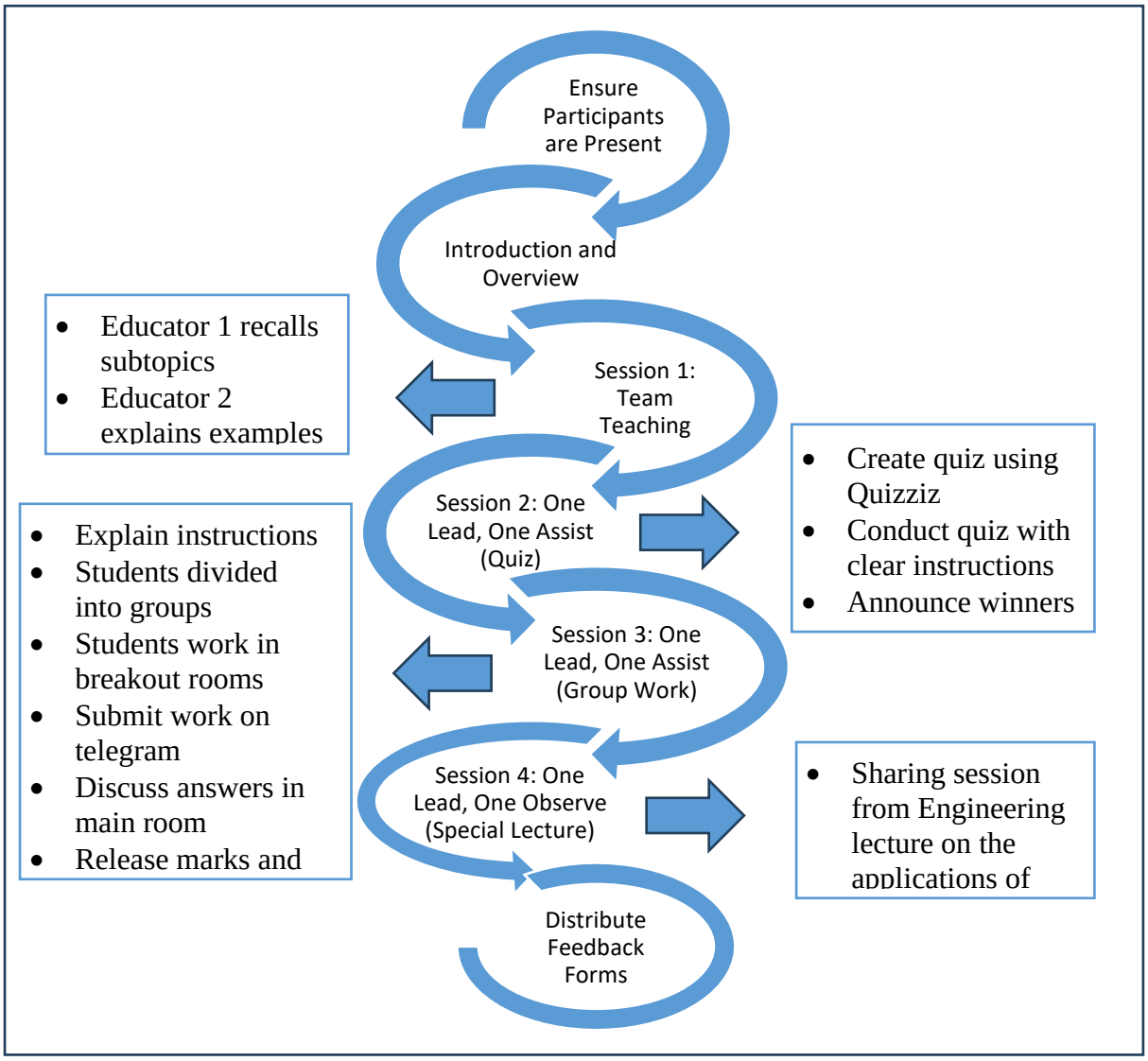

Figure 2: Flowchart Of Adopting Collaborative Teaching Model In ODL Session.

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Meanwhile, the second session was conducted face to face in a room. A seminar room was booked that can accommodate 50 persons and equip with other presentation tools. The strategies of implementing collaborative teaching in ODL and face to face mode were further elaborated in the next section. The flowchart of implementing the collaborative teaching approach during face to face session was provided in Figure 3.

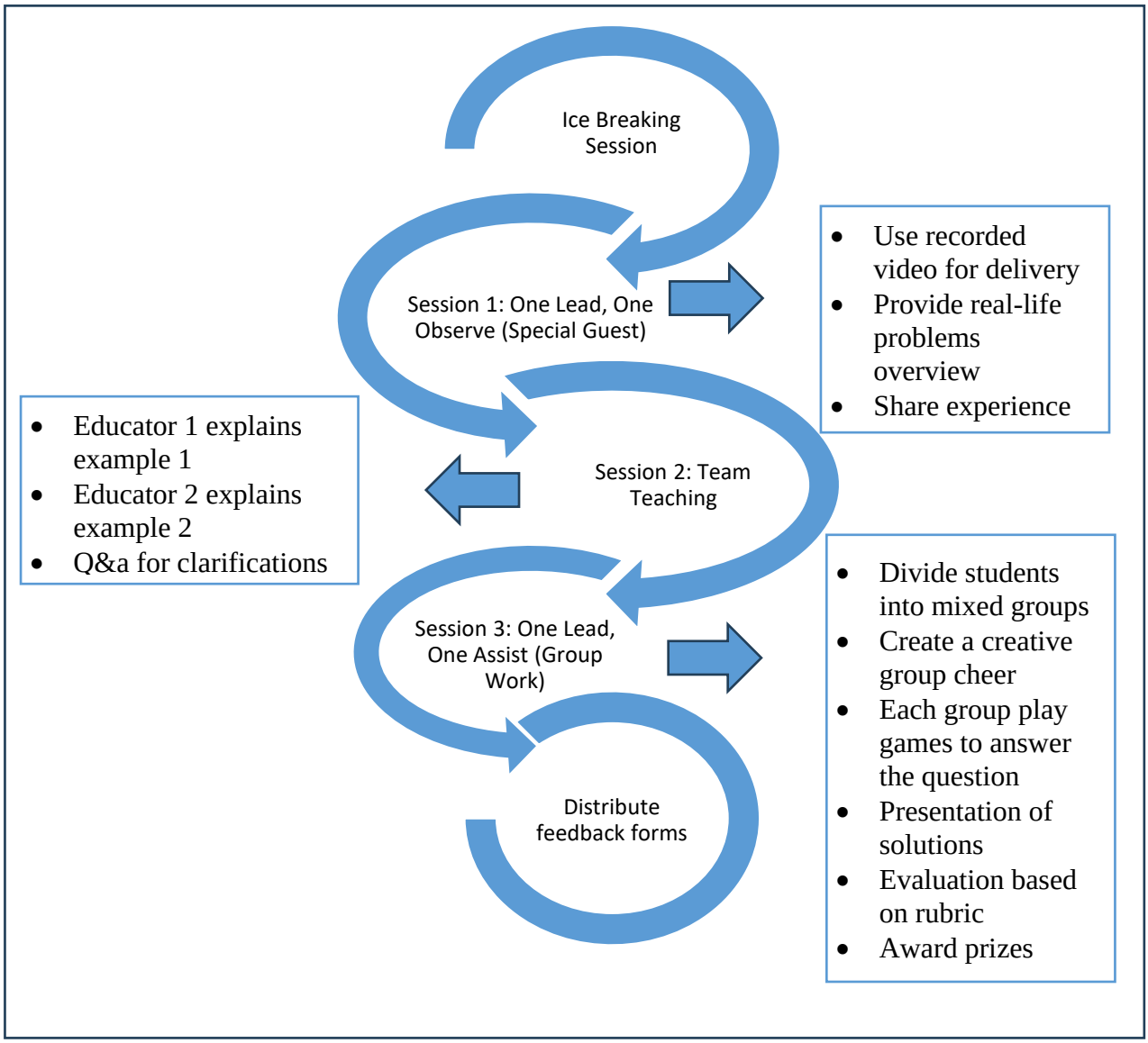

Figure 3: Flowchart Of Adopting Collaborative Teaching Model In Face-To-Face Session.

Results and Discussions

This section explains the strategies for conducting collaborative teaching in ODL mode and face to face mode. The section is divided into three phases, which are pre collaborative teaching phase, collaborative teaching phase, post collaborative teaching phase. The last subsection discusses the findings.

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Pre-Collaborative Teaching Phase

The strategies begin with finding partnerships with other educators who share the same teaching philosophy and are able to work together. We have all five lecturers involved in collaborative teaching where four lecturers from the Mathematics Department and one lecturer from the School of Mechanical Engineering. The lecturer from the School of Mechanical Engineering has vast industrial experiences. Hence, the collaborative teaching sessions involves lecturers and expert who share mathematics knowledge as well as industrial applications to students. Once the partnership was done, all five educators started to plan a comprehensive journey towards adopting collaborative teaching. All educators must be clear on the learning outcomes and objectives that need to be achieved to plan collaborative activities. They must agree on what will happen in the lesson for the day. In addition, the division of the tasks based on who will teach which components should be distributed fairly. The instructional models to be utilised should be clearly discussed, and for each model, the educators should know and act according to their role. A crystal-clear instruction must be given to the learners in order to keep everyone at the same pace and ensure that nobody feels left out. Finally, they should expect any adjustments or adaptations that will be made for specific students. The process can be accomplished through collaborative preparation, in which all educators share their experiences and reach mutual agreements on how the lesson will take place.

Collaborative Teaching Phase

The collaborative teaching was implemented through ODL mode and face to face classes. The next subsection explains the strategies used to conduct collaborative teaching in ODL mode, followed by face-to-face mode.

Strategy of Conducting Collaborative Teaching in ODL Mode

The first step that needs to be considered when having an online class is the presence of the participants. Thus, the attendance was taken before the session began, when the students started to join the meeting in Microsoft Teams. The sessions started by introducing the lecturers involved to the students, the flow of the class, and the learning outcomes from the lesson. The flow of the class consists of five sessions, with appropriate models to be adopted for each session.

The first session began with a “Team teaching” model from two educators. The first educator recalled the subtopics that were related to the current topic, such as basic integration, since they would be using it later on. It was supported by the feedback from the student for every revision done for that short period. Next, the introduction of the First Order Differential Equations was presented, and the concepts were explained briefly. The second educator was in charge of explaining step by step how to solve the questions by showing a few examples.

Moving onward, the second session implemented the “One lead, one assist” model, whereby the purpose of this session was to test the students’ understanding. In order to achieve that, a fun quiz was created using Quizziz and all students needed to participate in answering the questions. The music and interactive interface from the Quizziz lighten up the mood and spirit, which makes the students eager to answer the questions. One educator leads the session so that she provided clear instructions for the students so that they were on track, while the other educators act as facilitators whenever the students encounter any problems during the session.

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This session ended with the announcement of the winners. A short break was given to the students and educators before begin with the third session.

The next model implemented was "One lead, one assist" for the group work tutorial. One educator explained the instructions while the other assisted the students along the way. For the work tutorial, students were divided into a few groups, and they were added to a breakout room in Microsoft Teams to discuss the solution among themselves. Here, students were given a task to solve one question within a specified time, and they needed to think critically in order to get the solution. In addition, students need to communicate with their friends in the group. Once the time was up, students need to submit their works in Telegram group and the other educators who act as assistance for this session were in charge of checking and marking the students' work. After that, the marks were accumulated in order to select the winners. Simultaneously, while the other educators were busy with the marking, the main educator was discussing the answers for the tutorials in the main room. Next, the marks for each group were released through a telegram group, and the educators showed appreciation to all students for taking part in the discussions.

The final session was a special session by the Engineering lecturer regarding the applications of Ordinary Differential Equations. This session adopted "One lead, one observe" model, where only one educator delivered the content while the other educator observed. The outcomes of this session were to provide a brighter vision of the use of ODE in real life and to cultivate students' interest in the subject. Students are highly motivated to study if they know when to use the knowledge later on. The class ended with feedback forms being distributed to the students. Once they filled in the form, an e-certificate of participation was emailed to the students as appreciation of their commitment.

Strategy of Conducting Collaborative Teaching in Face to Face Mode

A total number of 30 students from Electrical and Civil Engineering were gathered in a room for the face to face collaborative teaching. The sessions began by ice breaking session where the lecturers involved introducing themselves to the students, and the flow of the class, as well as the learning outcomes from the lesson. The flow of the class consists of three sessions, with appropriate models to be adopted for each session. The students from this session already had prior knowledge of the basic concepts of First Order Differential Equations since they had learned them in class before this session.

The first session followed the "One lead, one observe" model, in which only one educator delivered the content while the other observed. The learning outcome from this session was, students should be able to connect their theoretical studies with real problems. The educator, who is an expert in the applications of the First Order Differential Equations was sharing her experience and knowledge with the students. The very first session started by providing some real-life problems overview to the students in order to spark and ignite their interest as well as attention to the respective topics. Learners tend to be motivated to learn if they know the real-life applications that require certain skills that can connect with their theoretical knowledge. Here, the methods of delivery used was providing a recorded video of sharing session. Students were free to ask any questions regarding the subject matter and the other educators who act as assistance will assist their inquiries.

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The second session implemented "Team teaching" model and the learning outcome from this session was that students should be able to recall the method used in order to solve the First Order Differential Equations. Here, the first educator explained the first example, while the second educator explained the second example. The benefit of team teaching learning was students manage to learn from two different lecturers, and they can implement the most suitable technique according to their preferences. On the other hand, the examples used were different from the examples that they did in class. Thus, students can think critically in order to solve the questions. Here, students were free to ask any questions regarding their confusion of solving the problems.

Finally, the last session adopted the "One lead, one assist" model for group work. One educator explained the instructions, while the other assisted the students along the way. The group work implemented an active learning strategy by developing a game within a group. Students were divided into small groups, and the members were mixed among both Electrical and Civil Department. Students were asked to do ice breaking among their groups and came out with a creative cheer. Starting with the first group, the members need to shout their cheer and attack the other groups by shouting the group's name. The group that was attacked will be given a question, which they need to answer in 5 minutes. If they answered for more than five minutes, they would lose the chance as well as their marks, and the other groups would have the opportunity to answer the question. After that, they need to explain their solution in front of the class for another five to seven minutes. Once they have done presenting their solutions, they will attack the other group by shouting the other group's name, and the cycle will last until all groups have presented. The marks for each group were evaluated based on a rubric. These instructions were given by one educator only, while the other educators assisted the students along the way and evaluated them. This session ended with the announcement of the top three winners and the awarding of prizes. Before the class ended, a feedback form through Google Forms was given to the students to evaluate the session.

Post Collaborative Teaching Phase

A post-mortem was held after the collaborative class. The students' feedbacks were collected from both ODL and face to face session as well as the educators' feedbacks. Table 1 presents the feedbacks from students and educators.

Table 1: Feedbacks of Collaborative Teaching from Students and Educators for ODL And Face to Face Session.

Students' feedback for ODL session
• The class is not boring because of the activites conducted. • My internet connection is slow thus it is hard for me to catch up with the session. • I feel excited to play Quiziz. • It is quite hard to discuss the tutorial during online session. • Lecturers are well prepared about the session
Students' feedback for face to face session
• I had fun joining this session. • I don't feel left out because the educators facilitate very well. • I can ask questions anytime from the other educators. • I can learn new strategies from different lecturers. • I feel more confident to explain my solution in front of the class.

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• I feel more appreciated when my group win the prize. • The time allocation is just nice.
Educators' feedback for ODL session
• The session was well-planned. • The instructions given for the sharing session and practice session were clear. • The activities were conducted within time allocated as planned. • Less communication between participants and speaker. • The online platform was user-friendly.
Educators' feedback for face to face session
• The location for the sharing session was convenient and comfortable. • The activities during the session were smooth and followed agenda as planned. • The students gave full attention and active during the Q and A session as some gifts would be given to those who answered the question correctly. • The interaction between students during group discussion was good. The students moved around and sit together in group. • Lecturers monitored the students' progress well and communicated frequently with students during the whole session. • Students were happy during the photo session as a simple closing ceremony at the end of the session. • Students were given the chance to stand in front of the whiteboard to explain their answers. This could improve their confidence and participation in the session.

Discussions

The findings showed that the process of executing collaborative teaching started with 'recruiting' the team members. They need to choose team members that they are comfortable working within order to produce an effective outcome, and to avoid any miscommunication as well as minimize the error. The relationship formed between co-teachers can impact the success or failure of the practise as well as the outcomes for the students in the setting (Rexroat-Frazier & Chamberlin, 2019). Once the partnership is done, all educators find a specific time to sit down and discuss the whole journey together. It is important to plan the strategies in order to make sure the process went smoothly and to try to minimize errors while executing it. The planning process undergoes a very detailed and comprehensive discussion since they need to be crystal clear on what will happen during the session. Based on the findings, the planning process went well since the educators were clear on the outcomes of the program and their specific tasks. Additionally, they were aware of the collaborative model that needed to be utilised during the session as well as the impromptu situations that might occur during the session. The findings are supported by Pratt et al., (2017), where in order to ensure long-term viability and readiness, co-educators must plan the strategies first. Next, the co-instructing went smoothly for both ODL and face to face sessions, even though the modes were different. The instructing process was successful in being implemented based on the original planning. Summative assessments were given to the students through quiz, tutorial and presentation. Finally, in order to reflect the success of the collaborative teaching strategies, the evaluations were given to educators and students to evaluate. Again, these findings suggest the educators aware of knowledge in co-teaching models and strategies, inhibited the ability to streamline co-planning, co-instructing and co-assessing (Murawski & Lochner, 2010; Ploessl et al., 2010)

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The statement from the students' feedback based ODL session, "The class is not boring because of the activities conducted", presents that the approach changed from teacher-centered learning to student-centered learning provides an effective approach to capturing the students' attention. As previously shown by Yunos et al. (2021), learners become unmotivated to learn Mathematics because they lack interest in the subject matter. However, some students did mention that they had difficulties catching up with the session due to their poor internet connection their internet connection. This is one of the disadvantages of conducting an online session, especially when implementing collaborative learning where the students need to engage with other students to solve the questions. These findings are coherent with previous research from Bui et al. (2021) where students have difficulty interacting and concentrating due to technological issues such as poor internet connections and computer skills.

The students' feedback from the face to face session showed that they enjoyed joining the session. This might be because they were meeting, interacting, and cooperating with new friends during the session. These results are in line with the findings by Mishra and Hussain (2023) where students thought the collaborative method was more fascinating and worthwhile. Furthermore, the findings from the statement "I don't feel left out because the educators facilitate very well" showed that this session provided full attention to every student because there were many educators acting as facilitators during the session. Thus, it was possible to assist every student during the session, unlike when the class was conducted in a non-collaborative session, where one educator could only pay attention to a few students due to the limited amount of time. The findings are in accordance with the study from (Gokbulut et al., 2020) where when the co-teaching approach was carried out, more help was provided to students. Students need continuous support from educators in order to understand and retain the new knowledge. On top of that, students mentioned that "I can learn new strategies from different lecturers". This is because different educators might have different styles, and students from different classes might feel the methods are more relatable and retainable (Gokbulut et al., 2020). Additionally, students feel more appreciated when their group wins the prize. In order to motivate the students, educators must be able to express their appreciation for their efforts. This is a reciprocal connection that occurs in learning activities aimed at creating a peaceful and pleasurable learning environment (Ayuwanti & Siswoyo, 2021).

Based on the educators' perspective towards the implementation of collaborative teaching in ODL class, it was shown that the session was well-planned and the instructions given for the sharing session and practice session were clear. This is because in the pre collaborative stage, the educators needed to be clear on the outcomes of the program and their specific tasks. Additionally, they were aware of the collaborative model that needed to be utilized during the session as well as the impromptu situations that might occur during the session. The findings are supported by Pratt et al. (2017), where in order to ensure long-term viability and readiness, co-educators must plan the strategies first. However, less communication happened between the participants and the speaker during the session. Having an online session is not easy to control, especially when the method used is synchronous learning, where the students and educators are engaging in learning at the same time. These disadvantages might be due to the poor internet connection (Bui et al., 2021).

According to educators' feedback, when the session was conducted in face to face mode, "Lecturers monitored the students' progress well and communicated frequently with students during the whole session". Instructors can effectively handle students in class and their

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behaviour in learning activities because there is more than one educator in class. Furthermore, educators are more focused and capable of guiding students with learning issues. Having more than one educator provide full coverage to the students since each educator are capable of assisting a few groups of students in a class. These findings were supported by previous studies from Adam et al. (2020), where teachers were more attentive and capable of guiding students better when collaborative teaching strategies were implemented. On top of that, the educators found that students improved their confidence when they were given the chance to stand in front of the whiteboard to explain their answers. This could increase their understanding and promote motivation in learning mathematics, as well as improve their achievement in mathematics.

Conclusions

In this study, we implemented the three phases of conducting collaborative teaching which were pre collaborative teaching phase, collaborative teaching phase and post collaborative teaching phase which are actually in line with the phases adopted by Murawasaki et al. (2010). Additionally, we added educators' and students' perceptions about the implementation of collaborative teaching in teaching Mathematics in higher education. The findings showed that the planning done was precise since the educators involved gave full cooperation in executing the collaborative teaching approach. Since all educators were aware of their roles, the sessions ran smoothly, especially for face-to-face session. It was proven by the positive feedbacks provided from both educators and students. The practice can be further utilised for the whole semester because it provided a positive impact, not limited to the students but to the educators as well.

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