Innovative Approach to Enhance Active Online Learning: Engagement, Feedback and Classroom Environment

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Abstract: In the community of inquiry (CoI) frameworks, a meaningful learning with technology in higher education requires interaction of social presence, cognitive presence, and teaching presence. However, it is challenging to create a CoI within an online teaching and learning (OTL) environment especially during the COVID-19 pandemic when educators are forced to conduct it. This paper proposes three innovative approaches for such a community to enhance active learning during synchronous OTL, specifically You Talk for engaging students, Resource Pool for facilitating feedback, and Classroom Meet for recreating the classroom environment. The three approaches were implemented by independent instructors for their respective undergraduates in synchronous online class. The treatment groups show significantly better academic performance than the control groups for all the three innovative approaches. The students from the treatment groups strongly agree that these innovative approaches promote active interaction, enhance attainment of the learning contents, deliver the course contents effectively, assure satisfaction and engage students actively during OTL. It suggests that either approach to engaging students, or facilitating feedback, or recreating the classroom environment serves as teaching presence to support the social presence of the students and therefore creates cognitive presence among them.

Keywords: Distance learning, Emergency remote teaching, Tertiary education, Community of inquiry, Mathematics

1. Introduction

Since the commencement of the worldwide lockdown in 2020 due to the COVID-19 outbreak, online teaching and learning has become the central activity for tertiary education institutions across the globe. The educators in the institutions are caught off guard when they are forced to conduct what the education community referred to as the emergency remote teaching or emergency eLearning (Carrillo & Flores, 2020) and forced online and distance learning (Othman et al., 2022). This online teaching and learning mode is then generally referred to as online distance learning. Many terms are used interchangeably with online teaching and learning in recent studies, including video conferencing, eLearning, (long) distance learning, online remote teaching, online learning, and mobile learning. The main central concept, albeit the different names used, is that the online teaching and learning is characterized by teaching and learning that occur with a distance in space or time, or both (Bozkurt & Sharma, 2020). This study adopts the meaning of online teaching

and learning (OTL) that refers to the online environments with a variety of learning possibilities that the educators teach and interact with the students in a remote scenario (Carrillo & Flores, 2020).

The aspects that topped the concern of OTL studies are the interactions and discussions among the participants of OTL or the engagement of the students (Abid et al., 2021; Aguilera-Hermida et al., 2021; Andrew et al., 2021; Carrillo & Flores, 2020), activities related to feedback, assessment and supervision throughout the OTL (Adedoyin & Soykan, 2020; Carrillo & Flores, 2020; Pereira et al., 2021), and issues related to technology as the tools to maximize learning processes during OTL (Adedoyin & Soykan, 2020; Carrillo & Flores, 2020; Kabilan & Annamalai, 2022; Kaur Sidhu et al., 2022) and facilitate the objective of learning with technology instead of from technology (Bozkurt & Sharma, 2020). Many of these researchers based their studies on the Community of Inquiry (CoI) framework by Garrison et al. (2001). The researchers have stipulated that meaningful learning with technology or computer-mediated learning experience is the result of three interacting presences detailed in CoI: social presence, cognitive presence, and teaching presence (Carrillo & Flores, 2020; Kabilan & Annamalai, 2022; Pereira et al., 2021). Social presence refers to the ability of the students to see themselves as socially and emotionally attached and being perceived as "real people" in an online learning community, cognitive presence is the ability of the learners to construct meaning through persistent reflection or feedback and discourse in an online learning community, and teaching presence serves as the support to enhance the social and cognitive presence with the strategies taken to design, facilitate and provide instruction with regards to the education content of an online learning community (Garrison & Arbaugh, 2007). This framework appears to become very relevant to the OTL education scenario experienced these two years. The OTL conducted during the lockdown that last more than two years has seen many evidence-based innovative and practical practices reported by the researchers from the higher learning institutions in response to the challenges faced.

With respect to the first concern mentioned above, the typical delivery mode of OTL which is either asynchronous or synchronous, or both bring challenges to engaging students. Although both asynchronous and synchronous OTL are commented as equally effective ways of delivery, the latter is recognized as relatively more preferred by the tertiary education community due to its instantaneous nature (Andrew et al., 2021; Brady & Pradhan, 2020). Nevertheless, these researchers commented that getting students engaged in an online teaching and learning environment is challenging when compared to the conventional physical classroom environment. Student engagement includes the student's behavioural, emotional, and cognitive connection to learning and is enhanced through four student's psychosocial constructs of engagement conceptual framework: self-efficacy, emotional response, belonging and wellbeing (Kahu & Nelson, 2018). Self-efficacy refers to the students' belief in their abilities to succeed academically; emotional response refers to the students' emotional receptiveness towards online learning and can be inculcated through explicit efforts or encouragement of the instructor; belonging is an emotional sense of students that they fit in and connected to the social network of the university as a whole and the course enrolled specifically; and wellbeing of the students points to the state of students' finance, social, health and other factors that provide the feeling of security for the students to stay focus and engaged in learning (Elmer et al., 2020). Although recommendations of actions to get students engaged based on the above four constructs are given by the researchers, actual examples of methods or good practices are scarce.

On the other hand, the transition from traditional physical lecture to OTL brings about unpredicted challenges particularly in monitoring students' learning progress through feedback and formative assignments. This explains the second concern discussed above. The activities related to feedback, assessment, and supervision during the OTL is an important learning process to ensure an inclusive OTL so that no students are left behind. When students procrastinate in this aspect, they tend to delay, not completing the assignments or refusing to turn in their work. This situation causes obstruction towards the feedback activities and eventually affects the students' performance in the course (Simpson & Pychyl, 2009). Effective feedback during the OTL learning processes should foster learning support, interactive collaborations and reflection among the students, which are among the key drivers to knowledge development (Carrillo & Flores, 2020). Constant and timely participation, communication, group discussion, contributions and commitment to the learning tasks of OTL are among the effective approaches for meaningful OTL sessions (Vinagre, 2017). Studies

show that an impactful OTL environment should encourage self-paced learning, consider the needs, strengths and interests of individual students, emphasising formative assessment, encourage small group setting in tackling learning tasks, and employing integrated approach to suit different knowledge domain and components of OTL (Carrillo & Flores, 2020). The studies that delve into the OTL practices show that the collective existence of interaction, collaboration, and relationship building among the students and the instructors are the source of students' satisfaction, influencing the cohesion of a class, promoting collaborative knowledge construction among the students and empowering the impact of the OTL practices (Carrillo & Flores, 2020). Many researchers studied feedback as one of the issues while some reported on feedback as an intervention within an higher education setting (Pereira et al., 2021). However, there are very few that report on incorporating technology-mediated feedback within the routine or scheduled formal classes.

As a computer-mediated delivery, conducting OTL requires effective usage of pedagogical tools which are predominantly technological. Thus, OTL has seen technology becoming an integrated component in the complex interactions among the existing components of conventional teaching and learning process: instructors, students, and tasks (Borba et al., 2018; Mumford & Dikilitaş, 2020). When considering the use of a technological tool, the pedagogical possibilities (Cullen et al., 2013) and the ease of use (Hollingsworth & Lim, 2015) of an online tool are the crucial aspects the instructors should examine. Besides that, collaboration is stipulated as the key feature in determining the social affordances aspect of the pedagogical possibilities of an OTL tool (Theelen et al., 2020). The tools reported in studies are categorised as narratives, blogs, chat, forum, web or video conferences, and social network. They include gamification, animated clips, videos, wiki tools, podcasts, voice boards, virtual worlds, e-book readers, e-folio, and massive open online course (MOOC) (Carrillo & Flores, 2020). Biasutti and El-Deghaidy (2015) and Cullen et al. (2013) point out that it is vital to use only technologies that are appropriate for a task during the teaching and learning sessions as there is no one-size-fit-all tool. Studies show that OTL with learning support during the lockdown improves student academic results as compared to those without learning support (Clark et al., 2021). Although there is opinion that OTL provides better learning effectiveness than physical classroom learning (Chang et al., 2021; Mohammad et al., 2023), it is undeniably different from in-person learning, where students can get immediate feedback and personal guidance from the instructor. Students have missed the in-class collaboration, an opportunity that is essential to meaningful learning processes (Carrillo & Flores, 2020). Cassibba et al. (2021) reported that more than half of the university mathematics instructors use new teaching modalities to try to maintain the same standard as when teaching in person. Nevertheless, studies on technological pedagogical tools focusing on creating the in-class collaboration environment within an OTL are lacking.

Consequently, the main challenges faced when conducting an active OTL during the lockdown revolve around these three issues. Firstly, the challenges in getting the students engaged in an OTL environment when compared to the standard physical classroom environment. Secondly, difficulties in monitoring students' learning progress through feedback and formative assignments during the OTL. Thirdly, struggles in designing the physical classroom environment where students get in-class collaboration from the instructor and their peers. This study aims to propose three innovative approaches in engaging the students, facilitating feedback, and recreating the classroom environment in an OTL session. These proposed approaches that are aimed to overcome the challenges discussed above are termed as You Talk, Resource Pool, and Classroom Meet, respectively. The perceptions of the students on the active learning experience using these approaches and the effectiveness of these innovative approaches by comparing the students' academic performance are studied. It is hypothesized that the innovative approaches could serve as the teaching presence that supports the social presence and thus enhances the cognitive presence of an OTL. Specifically, this study hypothesizes that the academic performance of the students in the groups employing the innovative approaches (the treatment group) is significantly better than the academic performance of the students in the groups that do not employ the innovative approaches (the control group). It is to be tested using independent t-test for the experimental and control groups, with consideration of normality diagnosis if necessary.

The organisation of this paper is as below: Section 2 gives the methods and materials of this study, including the proposed innovative approaches; Section 3 presents the results obtained and its

corresponding discussions; and the last section provides the conclusions of the study, with recommendation for future studies.

2. Methods and Materials

This section discusses the innovative approaches proposed in this study, the participants, measure, and data analysis for this study.

2.1 Innovative Approaches

Three innovative approaches are proposed in this paper to enhance active online learning during the COVID-19 pandemic, which is believed to be useful for any future disruptive situation. Specifically, You Talk for engaging students, Resource Pool for facilitating feedback, and Classroom Meet for recreating the classroom environment in an OTL session.

You Talk is a tool kit for the instructor to engage students during a synchronous online class by incorporating their behavioural, emotional, and cognitive connection to learning. It adopts the student engagement framework of Kahu and Nelson (2018), which comprises four psychosocial constructs of self-efficacy, emotional engagement, belonging and wellbeing. Within each construct, the tool kit of You Talk adapts the recommended guide for student engagement by Andrew et al. (2021) to design non-technical questions that motivate students to respond. Although the questions are posted at different slots of the synchronous online class, they are deemed to support student engagement throughout the class as students are always getting ready to respond. The mapping of engagement constructs and the framework of You Talk is shown in Table 1.

Table 1. Mapping of engagement constructs and the framework of You Talk

Engagement Construct	Framework of You Talk		
	When	**Conduct**	**Example of question**
Belonging	Beginning of a topic or subtopic	The instructor introduces a current real-life scenario related to the topic or sub-topic. Invite students randomly by name to respond verbally.	"Share what you know or do not know about the scenario."
Self-efficacy	Any time deemed suitable during a lesson	The instructor posts distinct questions related to the learning content to each randomly invited student by name to respond verbally.	"Explain the meaning/ name/ of the phrase/ notation/ step."
Emotional engagement	End of a lesson	The instructor invites students randomly by name to respond verbally. May incorporate activities such as polls.	"Tell how much you are satisfied with today's lesson using the Scale of 1 to 10, where 1 is very dissatisfied, and 10 is very satisfied."
Wellbeing	End of a topic or subtopic	Using a platform such as a learning management system (LMS), the instructor invites students to provide responses.	"Which of the following best expresses how you feel about learning this topic or sub-topic as of now: Happy/ Confident/ Worried/ Confusing."

The Resource Pool adapts the architecture of the e-portfolio which stores, retrieves, and uses feedback information (Fung, 2016), as the e-portfolio allows for easy tracking of diverse feedback information over time and encourages learners to revisit information (Carless, 2019). The main merit of the Resource Pool is that it is designed based on two attributes: contribution value and collaboration value. In other words, the contribution of digital formative assignment feedback is a pool of collaborative efforts. When it comes to the implementation of the Resource Pool, it requires

high commitment from the students. In the first class of the learning semester, the intent of the Resource Pool is communicated clearly to students to create a sense of belonging among them. The procedure, role, and actions to be taken by the students are clearly explained too. The students are required to submit the weekly assignments online for the instructor to provide feedback. The digital assignment feedback is then organised and stored in cloud storage by the instructor before sharing it with the students. The cloud-based digital assignment feedback is herein referred to as Resource Pool and serves as a reflection of knowledge or self-learning, and references to all the students for consecutive assignments. Acknowledgements of students' contributions and efforts in the Resource Pool are given on the site to boost the morale of the contributors and to motivate all students to collaborate. To encourage active participation, students are also allowed to submit their weekly assignments online after the digital assignment feedback is shared.

cClassroom Meet recreates the classroom environment at a distance during a synchronous online class. It generates a virtual learning environment to support in-class activities, allowing interactions between instructor and students, and among students. It is interesting to note that the interaction in a virtual classroom could be better than in a traditional classroom with the use of various technological platforms (Willermark & Islind, 2022). In Classroom Meet, the Classkick platform is used on top of a virtual meeting platform when doing class activities that involve practice questions during a synchronous online class. The Classkick has the features to serve as a pedagogical agent for promoting interactions and allowing real-time feedback from the instructor and peers. Thus, it is adopted as the key factor for instructors to decide on what technologies to be incorporated into lessons including the interactive features of the technology and whether it provides feedback (McCulloch et al., 2018). In numeracy courses, feedback that addresses students' procedurcl skills, conceptual understanding, and mathematical practices is critical in elaborating the qualities of student works and identifying areas for improvement (Stovner & Klette, 2022). In this paper, the Classroom Meet is designed for numeracy courses with the aim of providing the aforementioned feedback. In the implementation, after the instructor introduces the theory of the topic planned for a lesson, students are invited to enter the Classroom Meet with pre-set practice questions. The Classroom Meet mimics the environment of the physical classroom. For example, when a student clicks "raise hand" on a question that he/she needs feedback on, the instructor or the peers in Classroom Meet will be notified. They have the option to click and check the solution of the student, then interact with the student through writing or audio to provide feedback or necessary scaffold to facilitate the student to proceed. An interactive real-time feedback session in a classroom at distance is created in Classroom Meet.

2.2 Participants

The undergraduate students of three independent instructors from an institute participated in this study. Each instructor implemented one of the above innovative approaches. In each approach, the control and treatment groups are students from different semesters but same intake in September of two different years. From the historical records of the institute, students from the March intake showed slightly different performance from the September intake, but students from the same intake month showed a similar trend of performance. Thus, to minimise the factors due to entry qualification of students and teaching style of instructors, students from the two September intakes of the same instructor were included for an innovative approach.

Both control and treatment groups were attending the synchronous online class for numeracy courses during the COVID 19 pandemic. The innovative approaches were not implemented on the students in the control groups but implemented on the students in treatment groups for the whole semester. The number of students in the control and treatment groups is respectively 26 and 25 for You Talk, 23 and 23 for Resource Pool, and 40 and 50 for Classroom Meet.

2.3 Measure

This paper investigates the effectiveness of the proposed innovative approaches by comparing the academic performances of the control and treatment groups. Academic performance is measured

by the grading score of the students for the numeracy courses, as it takes into account the formative and summative assessments conducted throughout the semesters.

A questionnaire is developed to capture the perceptions of the students on five features of the innovative approaches, which are engagement, interaction, delivery, attainment, and satisfaction. It adapts the institution's instrument that collects students' feedback on a course at the end of the semester. The five features characterise active learning. In this study, engagement refers to the online sessions that actively involve the students in the learning process, interaction refers to the online environment that encourages the students to interact with the instructor and peers, delivery refers to the learning content which is delivered interestingly in the online learning sessions, attainment refers to the innovative approach that helps the students to master the learning content, and satisfaction refers to the overall fact that the students enjoy the online learning sessions. The items are in a 4-point forced Likert Scale to form either favourable or unfavourable opinions, in which "1" indicates strongly disagreed, "2" indicates disagreed, "3" indicates agreed, and "4" indicates strongly agreed. An overall perception was obtained by averaging the perceptions of all the features. All responses are voluntary. The Cronbach's alpha value for the overall scale is 0.972, indicating a high level of internal reliability.

2.4 Data Analysis

The effectiveness of the innovative approaches is analysed by using independent samples test. As the data are normally distributed, an independent *t*-test is employed. The perceptions of the students on the five features of the innovative approaches are summarised using descriptive statistics.

3. Results and Discussion

This section presents the results and its discussion on the effectiveness of the proposed innovative approaches and the students' perceptions of the innovative approaches. Subsequently, the hypothesis of this study will be concluded, and its implication to the CoI will be suggested.

3.1 Effectiveness of the Innovative Approaches

The effectiveness of the innovative approaches is evaluated by comparing the students' academic performance of the control and treatment groups. Fig. 1 depicts the distribution of marks for the treatment and control groups of the respective innovative approaches. Box plots in Fig. 1(a), (c) and (e) show that the median marks of the treatment groups were higher than the control groups. Visually, the distributions of marks are clearly normal for Resource Pool, approximately normal for Classroom Meet, and slightly skewed for You Talk. The Kolmogorov-Smirnov Test suggests all the distributions of marks are normal. All the low outliers are included in the analysis even though it may provide a more pessimistic estimate for the treatment groups.

Meanwhile, the error bars in Fig. 1(b), (d) and (f) indicate that the mean marks of the treatment groups were comparatively higher than the control groups. The mean marks of the treatment groups and control groups are 71.40% and 62.88% respectively for You Talk, 73.37% and 65.65% respectively for Resource Pool, and 78.28% and 71.56% respectively for Classroom Meet.

To determine whether the mean marks of the treatment groups are significantly higher than the control groups, the independent *t*-test was carried out, and the results are summarised in Table 2. Based on 5% significant level, the treatment groups of the three innovative approaches reported significantly higher mean marks than the control groups (You Talk, $t_{37.186} = 2.450$, $p < 0.05$; Resource Pool, $t_{44} = 2.668$, $p < 0.05$; and Classroom Meet, $t_{67.667} = 2.094$, $p < 0.05$;). Moreover, the Pearson correlation analysis reveals a significant strong positive relationship ($r = 0.790$, $p < 0.001$) between students' turn in rate of assignments in the Resource Pool and their marks. These are vital evidence that students who are involved in innovative approaches show better academic performance.

Table 2. Mean marks of the treatment and control groups for the three innovative approaches.

Innovative approach	Group	N	Mean ± SD	*p*-value
You Talk	Treatment	25	71.40 ± 15.26	0.019
	Control	26	62.88 ± 8.47	
Resource Pool	Treatment	23	73.37 ± 10.42	0.011
	Control	23	65.65 ± 9.168	
Classroom Meet	Treatment	50	78.28 ± 12.11	0.040
	Control	40	71.56 ± 17.17	

Note: SD = standard deviation

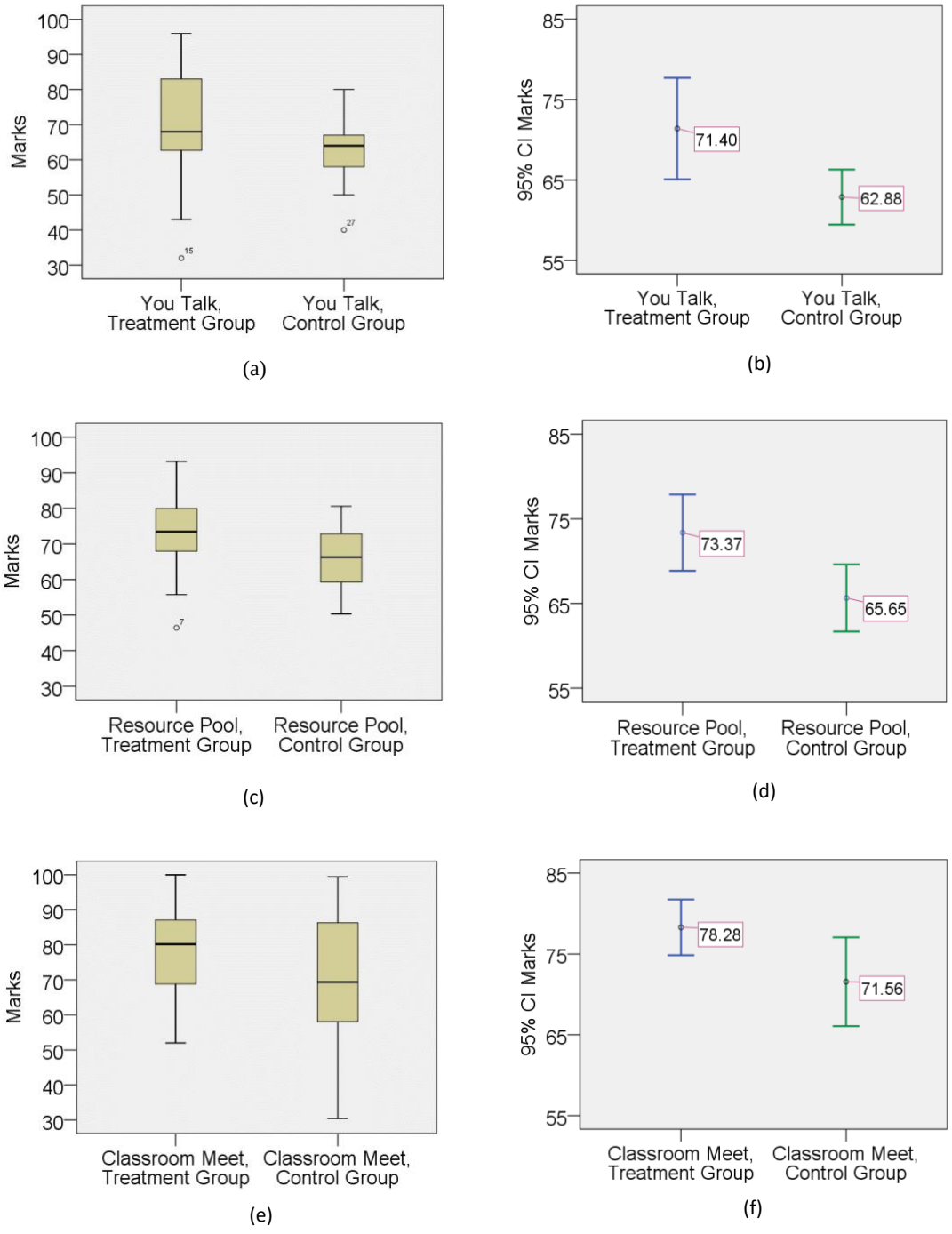

Fig. 1 Comparison of marks distributions for the treatment and control groups of the respective innovative approaches

The findings in this study support the hypothesis of this study where the academic performance of the students in the groups employing the innovative approaches (the treatment group) is significantly better than the academic performance of the students in the groups that do not employ the innovative approaches (the control group). It reveals the importance of the intertwining effects of the three presences in the OTL community of inquiry. You Talk, Resource Pool and Classroom Meet approaches serve as the teaching presence that support the social presence, which is exhibited by the interaction and engagement features, making the students socially and emotionally attached to the OTL class. The teaching presence is manifested within these approaches through the strategies designed in conducting the OTL for an active learning environment. The approaches actively involve the students, promote interactions among the instructors and students, encourage the students to talk and express themselves, foster the commitment of the students to be involved in the learning tasks, provide feedback to the students, and recreate classroom environment by incorporating appropriate technological tools. The significant improvement in the academic results of these three innovative approaches support the cognitive presence of the approaches, helping the students in mastering the learning content through meaningful discourse during the synchronous and asynchronous OTL sessions.

3.2 Students' Perceptions of the Innovative Approaches

Table 3 indicates the scores on the various features of the innovative approaches perceived by the students. The features are the engagement, interaction, delivery, attainment, and satisfaction. In overall, students' perspectives were largely positive about these features with an average score of 3.59 out of 4, or an average agreement level of 89.73%. Specifically, the implementation of the innovative approaches in an OTL environment had promoted active interaction between instructor and students and among students at 90.64% agreement level, enhanced attainment of contents knowledge at 90.25% agreement level, delivered course contents effectively at 89.73% agreement level, earned satisfaction toward OTL at 89.36% agreement level, and actively engaged students at 88.69% agreement level.

The students perceived that You Talk was best for promoting interaction (85.94%) by creating an environment for question and answer during synchronous online class. In the environment of active interaction with the instructor, the students were at 85.42% agreement level that You Talk connected them to learning, thus helping them with the attainment of contents delivered during synchronous online class. They were at 84.90% agreement level that You Talk engaged them actively in the learning process through interaction. About the feature of You Talk that helps to enhance the delivery of content more interestingly, the students' agreement level was 84.38%. The students enjoyed and were satisfied with the synchronous online lesson with You Talk at the level of 84.38% agreement. Overall agreement on the features domains of You Talk was at 85.00%.

Table 3. Feature domains rated by the participants

		Engagement	Interaction	Delivery	Attainment	Satisfaction	Overall
You Talk	average score out of 4	3.40	3.44	3.38	3.42	3.38	3.40
	%	84.90	85.94	84.38	85.42	84.38	85.00
Resource Pool	average score out of 4	3.61	3.74	3.70	3.70	3.65	3.73
	%	90.22	93.48	92.39	92.39	91.30	93.31
Classroom Meet	average score out of 4	3.64	3.70	3.70	3.72	3.70	3.69
	%	90.95	92.49	92.41	92.96	92.41	92.24
Overall	average score out of 4	3.55	3.63	3.59	3.61	3.57	3.59
	%	88.69	90.64	89.73	90.25	89.36	89.73

The highest agreement level of the interaction feature in You Talk, followed by attainment, engagement, delivery, and satisfaction imply that the strength of You Talk is in encouraging

interaction among the students and instructors and their peers. This has supported the students in mastering the learning content in an OTL, allowed active involvement of students in the learning process, fostered interesting delivery of the learning content, and thus contributed to making the students enjoy the OTL learning sessions. These findings suggest the role of You Talk in promoting the four psychosocial constructs where this innovation is based: self-efficacy, emotional response, belonging and wellbeing (Elmer et al., 2020; Kahu & Nelson, 2018). The above shows the role of You Talk as an innovative approach in tackling one of the top OTL concerns to engage the students and foster interactions among the participants during an OTL session (Abid et al., 2021; Aguilera-Hermida et al., 2021; Andrew et al., 2021; Carrillo & Flores, 2020).

The students who participated in Resource Pool most agreed that it promoted interaction (93.48%) opportunities in which an environment was created for the students to ask questions and offer opinions during the feedback session of the synchronous online class. It is followed by their agreement for both the delivery and attainment features of the Resource Pool at 92.39%. The students were inclined to strongly agree that Resource Pool enhanced the feedback session and feedback information on the digital assignment, thus helping them to master the learning contents. Their level of satisfaction with the Resource Pool was 91.30%. About the engagement feature of Resource Pool, the students agreed at a 90.22% level, which was slightly lower than the interaction domain of Resource Pool. This might be due to the student's perception that the feedback session created active interaction for question and answer, however, the instructor invited responses from the students more on a voluntary basis. Overall, the students agreed with the feature domains of Resource Pool at 93.31%.

The results of Resource Pool suggest that the innovative approach is effective in supporting learning, interactive collaborations and reflection among the students, which contribute to knowledge development (Carrillo & Flores, 2020). This implies the importance of contribution value and collaboration value which are the basis of the innovation of Resource Pool. The significant strong positive relationship between students' turn-in rate of assignments in Resource Pool and their academic performance is in agreement with the claim by Vinagre (2017) that timely participation, contribution and commitment to the learning tasks of OTL are substantial strengthening factors to meaningful OTL sessions. The feature that the students agreed most for the Resource Pool is interaction, followed by delivery and attainment, and satisfaction and engagement. This is in accord with the findings by Carrillo and Flores (2020) which stipulate that the collective existence of interaction, collaboration, and relationship building among the students and the instructors contribute to the student's satisfaction, the cohesion of a class, and collaborative knowledge construction among the students. These are reported as being able to empower the impact of OTL practices. The findings of Resource Pool show this innovative approach is timely in facing another top concern of OTL, which is activities related to feedback and assessment (Adedoyin & Soykan, 2020; Carrillo & Flores, 2020; Pereira et al., 2021). The Resource Pool is a pool of collaborative efforts, requires high commitment from the students, allows self-paced learning, and functions as the source of reflection and references for consecutive assignments of the whole class. The results obtained indicate this innovative approach is able to provide an impactful OTL environment (Carrillo & Flores, 2020).

The students who participated in the Classroom Meet during synchronous online class most agreed that the classroom environment at distance with real-time feedback either from the instructor or their peers helped them with the attainment of learning contents (92.96%). It is followed by their agreement on the interaction opportunities provided by Classroom Meet (92.49%) as they could interact through text, image, audio, and visual of the platform with a group of people for their solution to the practice questions. The students agreed at a 92.41% level that Classroom Meet enhanced the delivery session of practice questions for the numeracy course. Their satisfaction level on Classroom Meet was 92.41%. Similar to Resource Pool, the students' agreement on the engagement feature of Classroom Meet was slightly lower than the interaction domain, which was at 90.95%. This might be also due to the student's perception that Classroom Meet created active interactions on the platform for practice questions, however, the instructor's role was more on providing feedback or necessary scaffold to facilitate those students who asked for a consultation. The overall agreement on the feature domains of Classroom Meet was 92.24%.

The results of Classroom Meet reveal that the treatment groups reported significantly higher mean marks than the control groups and the feature the students agreed most is attainment, that is this innovative approach had helped them to master the learning content. These imply that meaningful learning does happen during the synchronous OTL sessions using the technologies in recreating the classroom environment. The results which show that interaction is the second most agreed feature of Classroom Meet, followed by the features of delivery and satisfaction, indicate that the technologies incorporated in this innovative approach fulfil the key factors of supporting interactivity, feedback, and collaboration (McCulloch et al., 2018; Theelen et al., 2020). The pedagogical possibilities of a technological tool have been considered in Classroom Meet (Cullen et al., 2013). High agreement level among the students on their satisfaction towards this innovative approach implies the technological tools are easy to use, an important factor to consider in conducting OTL (Hollingsworth & Lim, 2015).

The results of the present study concerning engaging students in an OTL environment may provide diverse experiences to students. There is some degree of challenge in engaging students through ongoing dialogue in You Talk. Unlike in a physical classroom where the instructor has the advantage of 'reading' body language, this is not possible in an OTL environment. Nevertheless, synchronous communication through You Talk led to improved communication between students, and between the instructor and students. This resonates with the study of Calder et al. (2021) where formal and informal discussions of course content led to emotional well-being. Regarding facilitating feedback, students' collaborative works in Resource Pool allowed students to engage by leaving digital footprints (the assignment submitted) and sharing them with peers and instructor for live feedback during tutorial lessons. This is consistent with Hast (2021), where online feedback allows for self-paced engagement. This approach works well for students who are committed to working on their formative assignments and storing it online for feedback at any time convenient to them. Interestingly, those who tend to procrastinate were eventually influenced by their peers to contribute despite late submission. This shows that engaged students saw the values and adjusted their learning setting to be actively involved in the OTL environment. Recreating the classroom environment in an OTL took a step further whereby hands-on practices in real classrooms were virtually filled with real-time practice and feedback with the use of appropriate technology in Classroom Meet. All students were new to the application but with the correct choice of the technological tools used and topped with proper guidance and training, students eventually engaged in the recreated classroom. As highlighted by Hast (2021), training support is crucial even though students may be technology literate. With immediate feedback provided by instructor or peers, students perceived efficacy to engage in Classroom Meet.

4. Conclusion

This study proposes three innovative approaches to enhance active online learning. The approaches aim to engage the students, facilitate the feedback activities, and recreate the classroom environment in an OTL session. The results show that the academic performance of the students employing these approaches are significantly better than those that do not employ the approaches. The students strongly agree that these innovative approaches promote active interaction, enhance attainment of the learning contents, deliver the course contents effectively, assure satisfaction and engage students actively in the OTL. It suggests that the proposed innovative approaches portray the meaningful learning resulting from the three interacting presences of a CoI where the approaches serve as the teaching presence that support the social presence and thus creates the cognitive presence. As the COVID-19 pandemic evolves into an endemic, many educators express positive intention for the continuance of online teaching and learning while the education community enter the post-pandemic era with the resumption of face-to-face lectures (Bajaj et al., 2021). The online teaching and learning experienced during the lockdown accentuate the demand for the online and distance learning particularly in the field of long-distance learning or eLearning. This is because the education stakeholders see its potential in enabling anytime anywhere learning (Du et al., 2022) amidst the world's emergence from the COVID-19 pandemic. The approaches reported add value to the existing evidence-based innovative practices in overcoming the challenges faced in online learning. It is useful

to the educators should there be any disruptive situation happen in the future. Potential future studies include combining the three proposed approaches for a "triple-dose" active learning approach. Besides that, it is interesting to survey the implementation of these approaches in a hybrid setting of teaching and learning sessions in higher learning institutes, where online and physical students are participating simultaneously.

5. Co-Author Contribution

The authors affirmed that there is no conflict of interest in this article. All the authors took part in carrying out the field work, preparing the literature review, writing the research methodology, doing the data collection and analyses, interpreting the results, and reviewing the writeup of the whole article.

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7. References

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