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Peer Learning Framework in The New Normal

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Abstract

This study proposed a framework for Virtual Peer Learning by testing Peer Learning Model to engineering students at a university in Manila during the second semester of school year 2021-2022. Guided Peer Discussions method was applied using Virtual Think-Pair-Share and Virtual Gallery Walk as teaching strategies. Convergent-parallel mixed method was used to analyze both the quantitative and qualitative data. Quantitative findings revealed that the teacher's instructional strategies had significant relationships both with peer interaction and learning competencies. However, no significant relationship existed between peer interaction and learning competencies. In the qualitative findings, three major themes were defined: peer interaction, students' learning competencies, and teacher's instructional strategies and nine sub-themes emerged in describing the experiences of the participants as exposed to Guided Peer Discussions: collaboration within and between groups, challenges due to time constraints and technical issues, class engagement, skills developed, study habits, teaching methods, creating a safe environment for questioning, learning materials, and sustainability. The findings in this study provided valuable input in the development of the Virtual Peer Learning Framework.

Keywords: Virtual Peer Learning, Virtual Gallery Walk, Virtual Think Pair-Share, New Normal, Collaboration, Teaching and Learning Strategies

1. Introduction

In this new normal, an alternative way of teaching and learning has emerged to sustain the quality of the delivery of instruction. Schools and universities are now using online educational platforms to enable teachers to deliver online teaching and allow students to complete assignments, deliver presentations, take examinations and quizzes, and receive immediate feedback from their teachers online. Instruction is disseminated through technology tools, such as discussion boards, video conferencing (Khalil, et al., 2020; Fatani, 2020; Sidpra, et al., 2020) and virtual assessments where peer interactions are highlighted. By allowing peer interactions, teachers depart from traditional academic skills and rote learning; thereby focusing on skills, such as critical thinking and adaptability, which are more important for success in the future. Currently, numerous

on-line discussion forums have been developed for educational purposes where students are encouraged to interact with peers online online that can provide them with an inclusive digital space to share their ideas with one another. In this new educational paradigm shift, the challenge for the teachers is to create an environment in a virtual classroom for students with a wide range of abilities and interests to keep them engaged and develop critical thinking skills.

To address the challenges teachers face in the new normal, this study aimed to formulate a framework for virtual peer learning by testing peer learning model through Guided Peer Discussions in one online class based on the interrelatedness of the following features: (1) peer interactions (2) students' learning competencies, and (3) teacher's instructional strategies using Virtual Gallery Walk and Virtual Think-Pair-Share. The findings of this study may help the teachers understand their students better and be able to address their learning needs through thorough planning and designing of online classroom activities and assessments. This may also serve as a guide in the implementation of curriculum guidelines. Additionally, this study may encourage parents to get involved in their children's learning journey. Furthermore, when the students read this paper, they may realize their strengths and weaknesses and may motivate them to actively participate in classroom activities.

This study sought to answer the following questions:

1. How effective is Peer Learning Model in terms of (a) peer interaction measured by students' engagement and participation, (b) students' learning competencies as measured by conceptual knowledge in physics and problem-solving skills, and (c) implementation of teaching strategies using Virtual Gallery Walks and Virtual Think-Pair-Share?
2. What are the learning experiences of students as exposed to Guided Peer Discussions in an online collaborative learning environment?
3. How is Peer Learning relevant to an online collaborative learning environment?
4. Based on the gathered data and findings, what peer learning framework can be proposed for the new normal?

2. Methodology

2.1. Research Design

Convergent parallel mixed method research design was used in this study. In this method, the quantitative and qualitative data were simultaneously gathered and analyzed separately and then merged the findings of the analyses for both strands (Bryman, 2006; Creswell & Plano Clark, 2011).

2.2. Participants of the Study

Participants in this study were 2nd year Civil Engineering students enrolled in Physics in a university in Manila during the 2nd semester of school year 2021-2022. As this study was conducted during the COVID-19 pandemic, all participants had not experienced face-to-face classroom delivery process since their first year in college. Additionally, participants enrolled in the afternoon session (1:00 – 3:00pm) were selected to test whether the class schedule has an impact on the results of the data.

2.3. Research Instruments

This study used the following instruments for the quantitative part: Online Community and Engagement Survey adopted from Young and Bruce (2011), four problem-solving questions developed by the researcher, Problem-Solving Rubric adapted from Docktor, et al. (2016), and Summative Assessment developed by the researcher. On the qualitative part, Structured Interview Guide Questions developed by the researcher, and Students' Reflective Journal were used. The adopted survey instrument was used with the authors' consent. Modification of the adapted problem-solving rubric was allowed following the terms of the Creative Common Attribution 3.0 License as indicated in the published study by Docktor, et al. (2016). The researcher-made problem-solving questions have undergone reliability testing with interrater reliability of 0.939 for vectors, 0.877 for linear motion, and 0.866 for projectile motion problems. Item analysis was employed in the researcher-made summative assessment as a basis for the computation of difficulty and discrimination indices of each item. All researcher-made instruments have undergone face and content validation from three invited experts.

2.4. Ethical Considerations

After receiving approval from the CEU IERB and the PLM University Research Center, the instruments were pilot tested to 45 Chemical Engineering students that were not included in this study. Results of the pilot test were assessed by three invited experts using the rubrics adapted from Docktor, et al. (2016).

Before the actual experimentation begun, the participants were oriented about the research. The researcher provided the participants all the information about the study, the procedure of the study, the duration time of the experiment, the potential risks and benefits associated in participating in the research. The content of the informed consent was explained to the participants and was presented synchronously online in class through the MS Teams. The participants were informed that signing the informed consent means that they allow the researcher to use the results of the quiz and summative assessment, the output of the activities, the video recordings of the group discussions in the breakout rooms, the results of the structured interview questions and the output on their reflective journal as data. The participants verbally agreed to the researcher. The consent forms were then distributed online using the assignment tab in MS Teams and collected the signed informed consent on the same platform.

3. Experimental Procedures

This study was conducted for five weeks. The process of the study is shown in Figure 1.

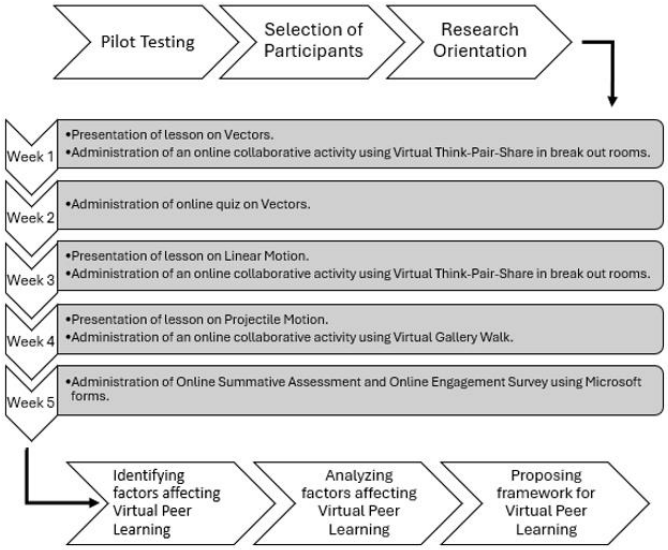

Figure 1. Flow Chart of the Study

4. Findings and Discussion

4.1. Quantitative Data

4.1.1. On Peer Interaction

Table 1. Assessment of the Students in Terms of Their Interaction and Engagement

Level of Engagement	No. of Students	%
Highly Engaged	33	82.5%
Engaged	7	17.5%
Total	40	100
Total Mean Responses	97.70	
S.D.	9.592	
Interpretation	Highly Engaged	

As reflected on Table 1, the overall students' level of participation and engagement was recorded as Highly Engaged. Results show a total mean response of 97.70 indicating that the participants appreciated their learning experiences in an online environment.

4.1.2. On Learning Competencies

Table 2. Group Academic Performance in Vector Problem

	Question1			Question 2		
	Mean	S.D.	V.I.	Mean	S.D.	V.I.
Rubric Score	4.70	0.497	Very Satisfactory	3.88	1.501	Satisfactory
Mean Percentage Rating	89.38					
S.D.	14.32					
V.I.	Very Good					

One vector problem which was composed of two sub-questions was solved by each group while they were in the breakout rooms. As shown in Table 2, rubric scores on question 1 indicate that the participants received a mean score of 4.70. However, the class got lower scores on question 2 as compared to their scores in question 1. Overall, the group performance in vectors is Very Good with a percentile rating of 89.38.

Table 3. Individual Academic Performance in Vector Problem

	Question1			Question 2		
	Mean	S.D.	V.I.	Mean	S.D.	V.I.
Rubric Score	3.99	1.28	Satisfactory	2.49	1.988	Unsatisfactory
Mean Percentage Rating	77.17					
S.D.	15.68					
V.I.	Satisfactory					

Another problem in vector, which is parallel to the one solved by group, was solved individually for 40 minutes on the next synchronous online class session. As revealed on Table 3, individual mean score for question 1 was 3.99 which was lower than the mean score for group performances in Table 2. On the second question, the mean individual score significantly dropped to 2.49 as compared to their scores in the first question.

Table 4. Group Academic Performance in Linear Motion Problem

	Mean	S.D.	V.I.
Rubric Score	4.35	0.641	Very Satisfactory
Mean Percentage Rating	91.75		
S.D.	7.78		
V.I.	Very Good		

Table 4 reveals the group performances in linear motion problems with a mean score of 4.35 which was interpreted as Very Satisfactory. Individual performances were not tested on this activity.

Table 5. Group Academic Performance in Projectile Motion Problem

	Mean	S.D.	V.I.
Rubric Score	3.32	0.843	Satisfactory
Mean Percentage Rating	79.00		
S.D.	13.70		
V.I.	Satisfactory		

Table 5 shows the group academic performance in Projectile Motion Problem with a mean score of 3.32 which was interpreted as Satisfactory. As implied by the results, the participants find some difficulty in organizing information indicated on the problem-solving question. This is associated with analyzing projectile motion concepts which they find difficult to understand, making the group performance in Projectile Motion problem as Satisfactory. This perception of finding Projection Motion to be a hard topic is revealed in the students' reflective journal. This result is consistent with several studies showing the misconceptions of students on the concepts of Projectile Motion (Hidayatulloh, et al., 2021; Defianti & Rohmi, 2021).

Table 6. Distribution of Individual Scores in Summative Assessment

Level of Performance	Number of Students	Percentage
Excellent	0	0.00
Very Good	3	7.50
Good	13	32.50
Satisfactory	8	20.00
Passed	5	12.50
Failed	11	27.50
Total	40	100.00
Mean Percentage Rating	76.13	
S.D.	10.93	
V.I.	Passed	

Summative assessment, which was composed of 25-item multiple choice questions in vectors, linear motion, and projectile motion, was administered using MS Forms. Results in Table 6 reveal that the students' level of performance in the summative assessment is Passed, with a percentage rating of 76.13. Of the three topics in summative assessment, participants get high scores on linear motion. This supports the group performance of the participants on linear motion using the Think-Pair-Share. This may be attributed to the perception of the participants that the easiest topic is linear motion. However, based on the results in Table 5, 27.50% of the participants failed on the summative assessment. A big chunk of low scores come from the projectile motion topic.

4.1.3. On Implementation of Teaching Strategies

Table 7. Assessment of the Students on Teacher's Instructional Strategies Taken from the Survey for Online Engagement

Survey Item	Description	Mean	S.D.	V. I.
14	Instructor is present and active in class discussion	4.78	0.423	Very High
17	Instructor is always available for consultation	4.73	0.554	Very High
15	Instructor is responsive when students ask questions	4.65	0.580	Very High
7	Course rules are clear	4.63	0.540	Very High
18	Instructor can handle inappropriateness in class	4.63	0.667	Very High
13	Instructor provides a well-organized course	4.63	0.774	Very High
10	Students express desire to learn the course material	4.60	0.591	Very High
8	Students ask questions during class discussions	3.70	1.043	High
	Overall Assessment	4.54		
	Mean Percentage Rating	94.00		
	S.D.	0.472		
	V.I.	Very Good		

Table 7 shows the assessment of the students on teaching strategies taken from some items on the Survey for Online Engagement. All survey items indicate that the teaching effectiveness is Very High, except for item number 8 which shows a High rating. The overall percentage rating for the teacher's instructional strategies is 94.00 which is interpreted as Very Good.

Table 8. Relationship of Learning Competencies, Peer Interaction, and Teacher's Instructional Strategies as Reflected from the Survey on Online Engagement

Variables	Pearson r	Sig Value	Interpretation	Decision to A0
Peer Interaction *Learning Competencies	0.258	0.107	There is no significant relationship	Accept A1
Peer Interaction*Teaching Strategies	0.486	0.001	There is a significant relationship	Reject A2
Teaching Strategies*Learning Competencies	0.477	0.004	There is a significant relationship	Reject A3

Results on Table 8 show that the learning competencies have a low correlation with peer interaction, displaying a Pearson Correlation of 0.258 and a p-value of 0.107. This shows that there is no significant relationship between the two variables. Hence, assumption 1 is accepted. On the relationship of peer interaction and teaching strategies, a Pearson correlation of 0.486 is obtained, with a p-value of 0.001. This result reveals that there is a significant relationship between teaching strategies and peer interaction. Hence, assumption 2 is rejected. On the relationship of teaching strategies with learning competencies, results show that there is a significant relationship between the two, showing a Pearson correlation of 0.477 and with a p-value of 0.004. Hence, assumption 3 is rejected. This result agrees with the findings of Cheng, et al. (2022) where the overall problem-solving performance in their study had a low Pearson correlation of 0.236 with peer connections.

5. Qualitative Findings

Data were analysed using content analysis and were arranged by main themes and sub-themes. Following the research questions, the main themes were defined from the related literature. The analysis of the sub-theme involved a multiple reading process with a keen attentiveness to repetition and patterns (Creswell & Creswell, 2018). Hence, sub-themes were developed based on the frequency of the content that were observed from the data. Nine sub-themes emerged in terms of how the Peer Learning Model impacts their learning.

5.1. Theme 1: Peer Interaction

5.1.1. Sub-theme1.1: Collaboration within and between Groups

One of the sub-themes identified is the manner on how students collaborated with their peers online while they were in their respective breakout rooms. Some collaborated within their respective teams, but others exchanged ideas with other teams which were assigned in another breakout rooms. In a pure online classroom setting, students interact with their peers using social media platforms in addition to the learning management systems platform. Since Messenger is a well-known social media site used by students daily, this has a greater potential for the learning process (Wang, et al., 2011).

One participant in this study stated that she shared her ideas with her group mates by messaging them and sharing her work: "I share my ideas with my group mates by messaging them and showing my work. We also do a virtual meeting where we can freely share ideas with each other." (Participant 18)

Another interesting observation is about the way the student participants did the assigned tasks. They brainstormed before doing the computations and then, they divided the task and worked independently. Participant 3 said, "…we analyzed the word problem by brainstorming and then we attempted to solve it separately before comparing the results." This was backed up by participant 18 saying that "...mostly when it comes to our group activities, we compare each other's answers. After that, we decide what to submit."

While majority of the participants in this study enjoyed collaborating with peers, one student stepped back because he was overpowered by other members of the team: "I don't think I have contributed a lot because they are all done before I can contribute. I have not shared any of my ideas because my groupmates are very smart. Sometimes I think I'm dragging them down." (Participant 34)

While the participants were in their respective breakout rooms, it was observed that in some teams, out of the five members of the team, only two or three were engaged in meaningful discussions. The other members were just observing or listening. This is similar to the study of Borup, et al. (2020), where students were generally open to the idea of collaboration on projects, but they found it to be a frustrating process because some of the peers were not good collaborators.

5.1.2. Sub-theme 1.2: Class Engagement and Participation

This sub-theme concerns about the interaction between the participants within the class or during class discussion. Participant 25 stated that participating in class discussion allowed him to gain better understanding of the lesson: "I observed that engaging in class discussions and asking more questions during discussions allowed me to gain better understanding of the lesson. Therefore, in the coming lessons I will try to participate more and ask more questions so that I can fully comprehend everything".

Student participation in classroom activities is often proven to be particularly challenging in digital settings (Plak et al., 2023) but seeing these students to actively participate and engage in classroom discussions is heart-warming. Students engage and participate when there is an atmosphere in class in which they feel supported and encouraged to express their thoughts.

5.2. Theme 2: Learning Competencies

5.2.1. Sub-theme 2.1: Skills Developed

This sub-theme concerns about the learning skills developed by the participants after their experience with GPD. Participant 31 said,

> I can say with some degree of confidence that I've fully understood the lesson by heart. Now, I'm an active contributor of solutions and graphs during group activities and I'm also doing my best to be of help to some of my classmates when they have some clarifications regarding vectors.

Self-confidence helps students develop their social skills and their resilience, allowing them to reach their full potential. Perceived confidence is likely to help students perform academically better and gain higher order thinking skills. Students who perceived to be confident speaks positively and even relate their learnings from classrooms to real life situations.

5.2.2. Sub-theme 2.2: Study Habit

Students' learning style involves their preferred ways to receive, process, and recall information during instruction which is related to learners' motivation and information-processing habits (Aragon, et al., 2002). One participant stated that he jots down notes during class discussions and watched the recorded class discussions after class sessions: "I take down notes during discussions and I watch the recorded class discussions after class." (Participant 4)

Participants learned to practice self-discipline like jotting down notes while the online class is in progress and watching the recorded class discussions after class. Note taking helps students remember key ideas which they can use when reviewing the lessons. They can also verify what they jot down by watching the recorded class discussion. They also practiced studying by group through discussions via social media platforms like what participant 11 has expressed: "We sometimes study lessons after class together and we do it through chats. I find studying with my groupmates enjoyable because they make the discussions funny and comfortable. I can easily share ideas with them". (Participant 11).

5.2.3. Subtheme 2.3: Challenges due to Time Constraints and Technical Issues

Another sub-theme identified concerns about the time allotted for the online submission of the students' output. Several challenges were encountered by the participants in submitting their outputs during the implementation of the activities. Some of these were internet connectivity, malfunctioned devices, the tedious process of taking a snapshot of the output using cell phone and uploading it to the assignment tab of MS Teams, among others. The first group activity on vectors was set for 30 minutes. However, the 30-minute period allotted for them to discuss solutions was not enough to complete the task. At the request of the students, the researcher increased the time allotted for the activity to account for the downloading of questions and uploading the answers. It was then set to 30 minutes later, making it a total of one hour for the activity. One participant expressed that they experienced technical difficulties while doing the group activity. She stated,

"We helped each other answering the problems. However, the time is almost not enough for us to solve the problems since not everyone has stable internet connection making it hard to communicate well". (Participant 10)

Another participant said, "…we were challenged on the first activity because we couldn't answer all the questions due to time pressure." (Participant 18)

On the administration of the online quiz a week later, the same issues were experienced by the students. The quiz was initially set for 30 minutes, but since the 30-minute period allotted was not enough as observed from the previous activity, a 60-minute period was set instead to give them enough time to solve the problems individually. One participant stated that he did not finish the quiz due to the tedious process of submitting output online.

"I did not finish the quiz because I have to rush everything since there's a lot of process in submitting the output. It took time for me to transfer the scanned solution from my phone to my computer and my computer has problems in uploading files to MS Teams". (Participant 3)

This scenario is similar to the study of Dietrich, et al. (2021) who pointed out that some students were stressed due to the difficulty experienced in downloading/uploading of files during examinations

5.3. Theme 3. Teacher's Instructional Strategies

5.3.1. Sub-theme 3.1: Teaching Methods

Learners need different teaching styles which can influence their academic performances. Participants in this study expressed their experiences in Guided Peer Discussions: "The first lesson in this course is very fun and exciting." (Participant 12)

Making the class sessions fun and interactive motivates students to participate and engage in classroom activities. This result supports the study of Shamsuddin, et al. (2023) where they used Google Jamboard platform in discussing online anatomy. Technology integration in lectures stimulates students desire to learn. This technique adds up to the fun and interactivity of the classroom sessions and enables students to appreciate the teaching techniques like what one participant has expressed.

"Her examples were clear and understandable, and her teaching methodologies are effective. I can also say that the Geogebra software for visualizing the resultant vector is an effective way of showing what resultants look like at real time. Thus, to add up, online learning, when done properly, can become as good as face-to-face classes if not better since the methods used includes technologies and software which aids to the students learning." (Participant 31)

5.3.2. Sub-theme 3.2: Creating a Safe Environment for Questioning

This sub-theme pertains to the kind of environment a teacher sets in a classroom. A safe learning environment is crucial for the academic and personal development of students (Sayfulloevna, 2023). To optimize interaction among students, all learners must feel that they can safely take risks that are part of exploration and constructivism (Mohajan & Mohajan, 2022). One of the comments gathered from the students' reflective journal is shown below: "Our teacher does not pressure us when asking questions which makes it more student friendly kind of teaching style. It has a great impact to us, students, especially those who have severe palpitations when pressured or nervous which takes hours to calm down". (Participant 25)

Students need to feel the presence of the teacher in an online class especially during the times when they are uncertain about their understanding of the concepts or in understanding the instruction of the task. The feeling of assurance that the teacher is always there to guide the students gives them the motivation to learn and, in turn this will lead to a strong sense of satisfaction with the online class. This result is consistent with the works of Li (2022), and Yoo and Dung (2022), which revealed that online students who have a high degree of communication with their teachers tend to have higher degree of satisfaction with online courses.

5.3.3. Sub-theme 3.3: Learning Materials

This sub-theme concerns about how the participants responded to the nature of the learning materials prepared by the teacher during this time when classes were held online. Class discussions were recorded, and the recordings were considered as learning materials where students can download or watch online. Below are the comments of student showing how he responded to this kind of learning materials.

Participant 3: "One time during the class discussion in projectile motion, I encountered some problems that are tricky. So right after the class, I re-watch the recorded class discussion particularly on the part of examples. I have paper and pen by my side then I tried to solve it and checked if my answer is right".

Recorded class discussion allows students to go back and review ideas and concepts. In this way, students are given more time to process concepts and ideas that they did not understand during the conduct of the online class. All student participants in this study were required to attend the online synchronous class sessions and class discussions were recorded so that they could go back and review what transpired during the class discussions. Previous studies (Dos Santos, 2022; Atmojo & Nugroho, 2020) had observed that uploading of teaching and learning materials gave the students positive experiences on online classroom because they could download the materials and re-read them during their leisure time after class.

5.3.4. Subtheme 3.4: Sustainability

This sub-theme concerns about the yearning of the students to sustain the kind of learning environment that they started to like. Participant 31 expressed that he enjoyed the way he learns the lessons and yearn for more interesting and fun way of learning on the next lessons: "I'm having great time working with my groupmates, and I particularly appreciated the projectile motion discussion. I hope that the next discussion will be even more fun and interesting." (Participant 31)

Keeping the classroom discussions interesting and fun creates a room for student to be motivated to learn and yearn for the next class activities to happen with the same fun and excitement.

6. Integrated Quantitative and Qualitative Findings

6.1. Peer Interaction

Results of the online engagement survey reveal that the students' level of engagement is high. Students expressed that they enjoyed interacting with their peers while they were doing the activities. The result is probably because they were more comfortable talking to their peers. Another reason for this is that they get to feel that they belong to the circle of the group. Although most of the participants enjoyed interacting with their classmates, a few of them had experienced being outcasted or overpowered by some members of their respective group. This emphasizes the need for the teachers to monitor peer interactions so that no one is left socially detached from the group.

6.2. Learning Competencies

The mean group performance in the vector problems shown in Table 2 reflects a Very Satisfactory rating on the first question and a Satisfactory rating on the second question. The decrease in group performances may be due to the perception of the participants on the insufficient time allotted for them to finish the task. The group gave more focus on answering the first question and they ran out of time finishing question 2 which is why their performance is better on the first than on the second question. This result of decrease in performance on the first and second questions was again experienced by the participants when they were tasked to solve problems in vectors individually.

Another key finding is the comparison of the group performances and individual performances in vectors. As seen from Tables 2 and 3, the group performances are higher than that of the individual performances. This shows that the peer interaction has no significant relationship with learning competencies. This result may be due to the way students perform the task by group. The students focused on beating the submission time, so they divided the task, worked individually, and then combined the individual output to create one group output.

Projectile Motion problems was the third activity, and students had already practiced time management when the activities on vectors and linear motion were done. However, the results on the projectile motion activity in Table 5 reflected a group performance rating of 79, which was interpreted as Satisfactory. This output may be associated with the perception of the participants on the difficulty of understanding the concepts of projectile motion.

Results of the summative assessment as reflected on Table 6 was interpreted as Passed with a percentage rating of 76.13. The summative assessment was an individual assessment and was administered after all the group activities had been done. Although peer interaction is high as reflected on the results of the online engagement survey, the outcome of the summative assessment shows that peer interaction has no significant relationship on the learning competencies. This suggests that rethinking about the difficulty of the assessment questions may be necessary.

Interestingly, results of the group collaboration have impact on the students' social interaction skills. The confidence of the students was boosted, especially when their ideas were accepted by the group, and some became leaders of their team. Hodgson,

et al. (2015) states that peer learning not only targets intellectual gains or formal academic achievement, but also attitudinal gains, which proves that peer learning causes a positive impact on the learning attitude of students.

6.3. Teacher's Instructional Strategies

The rating of the participants on the teaching strategies is high as reflected on Table 7. The results may be due to the positive experience of the students in doing the group activities. They enjoyed the teaching strategies and their interaction with their peers while doing their tasks. These results may be also due to the positive teacher-student relationships. The participants were comfortable in approaching the teacher whenever they had confusions in understanding the lesson and they felt that the teacher is a mother-like figure to them. Another important aspect of making the students comfortable in approaching the teacher is the availability of the teacher whenever they need assistance especially on concepts that they are confused about. This highlights the importance of the teacher's positive interactions to the students.

6. 4. Relationships of Peer Interaction, Learning Competencies, and Teacher's Instructional Strategies

Results of the relationship of the peer interaction, learning competencies and teacher's instructional strategies show that there is a low correlation between peer interaction and learning competencies as shown on Table 8. This is evident on the results of the individual performances in the vector problem on Table 3. After having a group problem-solving activity, the individual performances did not improve. This may be associated with the way the groups did the task. They divided the task and then consolidated the output of each. Peer tutoring was not given full focus because of time constraint. Another possible reason for the low correlation between peer interaction and learning competencies is that they perceive that the time allotted for them for finishing the task is not enough, so they focused on beating the submission time instead of discussing the output as a group. Another issues that might have added up to the reason why they focused on beating the submission time is the tedious process of submitting the output and the technical problems they experienced like slow or not stable internet connections and malfunctioning device.

On the relationship between peer interaction and teacher's instructional strategies, results show that there is a substantial correlation between the two. This is evident on the result of the survey on Table 6 showing that the evaluation of the participants on the teaching strategies is very high.

7. Factors Identified to be Affecting Virtual Peer Learning

Based on the quantitative and qualitative results, six factors were identified to be affecting Virtual Peer Learning.

7. 1. Technical Issues

As observed from the results of this study, several challenges were experienced by the participants that were identified to have affected their interaction with their peers which resulted to a hindrance in communications or a delay in submitting their outputs. Some of these were stability of the internet connectivity, malfunctioned learning devices like laptops and smartphones.

7. 2. Affordances of the Learning Management Systems

Affordances of LMS are characteristics of an educational platform that indicate how a particular learning behavior could possibly be enacted within the context. According to Nyland (2022), this refers to alignment between the features, uses of the LMS, and the needs of a learning problem that it is designed to solve. The LMS plays an important role in the teaching and learning process. The functionality and usability of the applications imbedded in the LMS provides the ease of use on both the students and the teacher. An LMS provides a teacher with a way to create and deliver content, monitor student participation, and assess student performance. It also provides students with interactive features such as video conferencing and breakout rooms where students interact with their peers in a small group. In this study, students experienced technical difficulties in submitting their output due to the tedious process involved in the submission.

7. 3. Peer Interactions

Another factor that was observed to have affected the peer learning is the interactions among students. Positive peer interactions resulted to gaining self-confidence and willingness of advanced students to tutor those who struggles to cope with the lessons. On the other hand, poor interactions would result to students to step back and keep their ideas within themselves.

7. 4. Student-teacher Relationships

A healthy student-teacher relationship in a classroom leans towards gaining trust and respect from each other which would promote academic achievement (Li, et al., 2022). Students are more motivated to learn when they have positive relationships with teachers. Having a healthy relationship with the students makes them feel that they are inside a safe classroom environment where they are comfortable to ask the teacher about concepts that are not clear to them or to clarify some instructions that they perceived to be confusing. This will make the peer interaction more meaningful because they feel that their teacher is there to assist them.

7.5. *Design of Suitable Learning Activities and Assessments*

In this study, students enjoyed interacting with their peers. They expressed that they gained confidence, some became leaders of the group, improved their social and communication skills. They also conveyed that they appreciated the way their teacher handled the class and had fun doing the online classroom activities designed by the teacher. However, it was observed in this study that the peer collaboration had little effect on improving the performance in vectors problems. Time constraints is a significant ingredient in a test construction. Quizzes and assessments should be designed so that students could finish it in the allocated time. Additionally, designing a problem-solving quiz where students would show complete solutions and computations and let them upload their output to the LMS is a bit challenging especially if it is done in real time. Technical

issues like internet stability and functionality of students' devices affect the output. Not all students have smart devices. Some use old laptops, while others use old smartphones. Some has internet subscriptions, while others use prepaid internet services. So, these are some of the factors to consider in designing quizzes, assessments and collaborative online activities.

7. 6. Teacher's Instructional Strategies

Motivating students to learn requires a variety of teaching strategies to capture students' interests. Designing a good strategy and techniques to catch the attention of the learners and motivate them to participate and engage in classroom activities is a must. Teachers should plan for a fun and interesting classroom session so that students would yearn to participate and engage on the next classroom sessions. Teachers should also create a safe classroom environment so that students would feel comfortable asking questions on the concepts that are not clear to them or clarify instructions on classroom activities. They would also be motivated to share their ideas and insights to the class and to the teacher without the fear of being embarrassed in front of the class.

8. Design of the Virtual Peer Learning Framework

Based on the findings of the study, the researcher proposes a Virtual Peer Learning Framework to address the various issues encountered in implementing peer learning in online classes. The proposed framework shown on Figure 2 is represented by three concentric circles. The outer circle represents the three aspects of the Virtual Peer Learning Framework :(1) technological, (2) instructional, and (3) social. The technological aspect is concerned with issues of the internet connectivity and the affordances of the learning platform. Instructional aspect addresses issues on the design of suitable learning activities and assessments, and the teacher's instructional strategies. Social aspect concerns about issues on peer interactions and the student-teacher relationships. The middle circle represents the six critical factors affecting virtual peer learning: technical issues, peer interactions, student-teacher relationships, design of suitable learning activities and assessments, and teacher's instructional strategies. The innermost circle represents the main goal of this framework: to let the students feel a meaningful virtual peer learning experience.

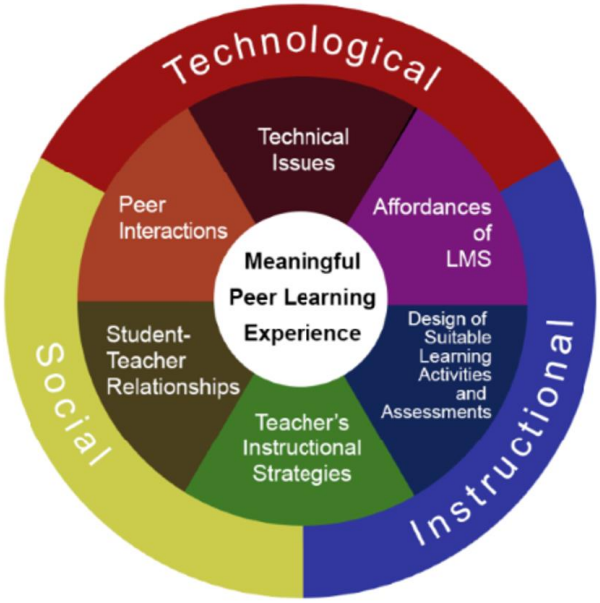

Figure 2. The Virtual Peer Learning Framework

7. 1. Technological Aspect

Technological aspect is concerned with issues of the learning platform used, its perceived usefulness, perceived ease of use and the internet connectivity. In an online classroom, the need for a computer, adequate software, constant electricity, and high-bandwidth internet is a great demand. Inadequate internet connectivity hinders students' interaction with one another while doing the online classroom activities synchronously. Online learning is challenging because of the issues on technical matters like internet connections, tedious process in uploading the activity output, distractions from interactive capabilities of the devices used by students and the kind of learning environments.

Peer interactions which appear between the Technological and Social Aspects, represents how the students do the online classroom activities like problem solving questions done in group, etc. Technical issues affect peer collaboration. The slow internet connection and the capability of the learning devices like laptops, mobile phones, etc., affect communication among peers and slows down the submission of the groups' output. These issues were experienced by the participants of this study expressing their frustration for not beating the due time for submission due to slow internet connections and the tedious process of submitting the output. These are some of the factors that the teachers should consider in designing the online activity. The kind of questions and the level of difficulty of the online activities are also factors to think about because these might be some of the reasons for the low performance result of the summative assessment in this study aside from the time pressure imposed

and the technical issues experienced by the students while doing the assessment. Designing online assessments and quizzes that are suitable for the type of students and the quality of internet connections are also important points teachers should consider.

Technological issues also affect the teachers. The affordances of the LMS which appear between the Instructional and Technological Aspects represents how the teaching strategies are delivered online and the technological issues which affect the implementation of online classroom activities. On the teacher's side, conducting class discussions, applying teaching strategies and designing online activities require a high level of technical ability and familiarity of the features of the LMS. Teachers should devote a lot of time in preparing the class materials like the power point presentation of lessons, learning activities, and quizzes.

7. 2. Instructional Aspect

Instructional aspect addresses issues on the learning goals, content of instructions, and instructional strategies. Teaching strategy matters most in boosting peer interactions. This study was conducted in the afternoon class session, where students might get sleepy while attending the class. Some studies have shown (Dikker, et al., 2020; Kaur, et al., 2021; dela Cruz, 2016; Pope, 2016) that students perform less in the afternoon session compared to the classes held in the morning session. Despite the schedule of the class, which was held from 1:00 pm-3:00pm, students in this study exhibited interest in doing the tasks and enjoyed interacting with their peers. Teaching methods in an online set-up should be interactive and should sustain the fun that the students experience so that they would be excited to look forward to being engaged in the next activities set by the teacher.

The teacher's instructional strategies which appear between the Social and Instructional aspects shown in the framework, represents the role of the teacher in monitoring peer group relationships which plays an important part in motivating students to participate in classroom activities. Teacher supervision is very crucial. It may disrupt, demotivate learners to engage in discussions or detach them from interacting with peers if not carefully planned. The quality of the student-teacher relationships affects learning. Hence, teachers should create a safe environment so that learners would be comfortable to ask questions when they feel unsure about their understanding of the instructions and be motivated to join the group activities. Teachers should also be precise in giving instructions and be strict in imposing rules, especially in an online set-up, because learners tend to get distracted by mobile devices' interactive capabilities. Establishment of healthy relationships and positive social interactions in an online classroom can be the main requirements to create a calm and motivating classroom environment. Students today are sensitive to negative behaviors which make them easily distracted and demotivated. They need guidance and support in promoting their self-confidence and self-esteem which are essential components of peer interactions and peer learning. Thus, to create a successful peer learning in an online classroom setting, the classroom atmosphere must be set to be a fun and safe environment for learning.

7. 3. Social Aspect

Social aspect is concerned with issues of peer interactions. Learning is influenced by social interactions, interpersonal relations, and communication with others (Li & Jeong, 2020; Herro, et al., 2021). In an online classroom set-up, the quality of peer interactions can lead to increased student engagement, motivation to learn and can help improve academic performance. However, as observed in this study, one student had been outcasted by his groupmates and his ideas were ignored. Another student stepped back because he was overpowered by his groupmates. These issues should be addressed by the teacher so that no one in the group will be outcasted.

Addressing the issues of the three aspects of the Virtual Peer Learning Framework and managing the concerns on the six critical factors affecting peer learning, could help teachers improve the design of the online classroom activities and their teaching methods so that students could feel a meaningful virtual peer learning experience.

8. Conclusion

Based on the summary of findings the following conclusions were drawn:

1. The Peer Learning Model is effective virtually in terms of peer interactions.

Implementation of the Peer Learning Model in an online classroom setting should be carefully supervised by the teacher to enhance learning competencies.

The Peer Learning Model is effective in terms of the implementation of teaching strategies using Virtual Think-Pair-Share and Virtual Gallery Walk.

2. Well-designed online activities stir students' collaboration.
3. The Peer Learning Model is relevant to online collaborative learning environments.
4. The proposed framework for Virtual Peer Learning that was created consists of three aspects: technological, social and instructional. The virtual peer learning experiences of the students are affected by six factors, namely: technical issues, peer interactions, student-teacher relationships, design of suitable learning activities and assessments, and teacher's instructional strategies.

Addressing the various issues surrounding the three aspects of the framework can provide a guide in planning, design, delivery, and implementation of the Virtual Peer Learning Framework for a successful teaching and learning process in an online setting.

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