

# Understanding the Zone of Proximal Development through Online Group Work of University Students

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## ABSTRACT

Group work is a common practice in educational settings, where university students collaborate to achieve shared goals. Today, group work is not limited to face-to-face interactions but can also take place in virtual environments. Online group work has become a vital aspect of modern education, offering students opportunities for collaboration and peer learning in a virtual space. When examined through the lens of the Zone of Proximal Development (ZPD), online group work enables students to learn from their peers and instructors, facilitating higher levels of understanding and skill development through collaboration, guidance, support, and feedback. Therefore, this study aims to explore learners' perception (1) towards interaction between knowledgeable and skilled persons, (2) towards interaction in group work online, and (3) on the use of tools and technology in group work online. This quantitative study employs a survey with seven sections: demographic profile, social interaction, more knowledgeable others, zone of proximal development, learner-to-learner interaction, learner-to-instructor interaction, and learner-to-content interaction. Participants of this study are 103 Mechanical Engineering undergraduates from Universiti Teknologi MARA (UiTM), Malaysia. Overall, the findings suggest that collaboration, interaction, preparation, and feedback are critical for enhancing both teaching and learning. These findings can help to improve students' experiences in online and group learning.

**Keywords:** group work, online, ZPD, collaboration

## INTRODUCTION

### Background of Study

Group work refers to a collaborative effort by students to achieve the goal of learning and accomplish tasks or assignments given [12]. Traditionally, group work has been confined to face-to-face interactions within physical classroom settings. However, the rapid growth of digital technology and the shift toward online learning platforms, particularly in higher education, has led to the widespread adoption of virtual group work. Online group work offers students the opportunity to engage in collaborative learning in a flexible, accessible, and often more diverse environment. When working in a group, members not only share knowledge and skills to support one another, but emotional bonding with fellow group members also plays a crucial role in their perception of social presence and collaboration. This emotional connection helps students feel more engaged and connected [13].

Online learning includes both synchronous and asynchronous methods, each impacting students' learning in both positive and negative ways. Synchronous learning occurs in real-time, where educators often use webinars and video conferencing to conduct lessons. This is similar to traditional classroom learning, as students can unmute their microphones and ask questions directly. Online boards or whiteboards may also be used for posting comments, whether shared or private. Feedback from educators and classmates is immediate, promoting active participation in class [1]. However, some students feel it is annoying as they have to always answer questions to show that they are present.

On the other hand, asynchronous learning is not conducted in real-time. Educators may record a lecture and upload it to a platform like YouTube, providing students with a link to watch at their convenience. Social networks also allow educators and students to share videos, assignments, links, and class materials [1]. Asynchronous communication is especially beneficial for students who are shy in traditional classroom settings, as they may feel more comfortable interacting with instructors in this environment compared to vocal students in a face-to-face setting [13]. As for activities, the benefit is that students have more time to think, prepare, and gather necessary materials to complete their tasks [1]. Hence, both synchronous and asynchronous should be used to complement each other and enhance students' learning experiences.

### **Statement of Problem**

Students see online collaborative work as a desirable component of their future learning [14]. They favour online collaboration over face-to-face interactions because it provides flexibility, allowing them to work and discuss at times that suit them, including late at night. It also allows them to connect with others across borders, express their opinions freely, access information, and update one another more easily [5].

However, many students face significant challenges in engaging effectively in online group activities. The absence of face-to-face interaction creates communication barriers [14, 2], making it difficult for students to build trust, establish rapport, and collaborate productively. Additionally, unequal participation is a common issue, where some students may take on more responsibilities, while others contribute less [7]. Time management because of balancing study, work, and house chores can also interrupt online learning [13, 5]. These challenges can lead to feelings of disengagement, anxiety, and frustration, affecting both students' motivation and learning quality.

Given these obstacles, there is a clear need to explore students' perception towards online group work for enhancing online group work and ensuring that students can fully benefit from collaborative learning in virtual environments.

### **Objective of the Study and Research Questions**

This study is conducted to understand ZPD in online group work among university students. Specifically, this investigation is done to answer the following questions;

- How do learners perceive interactions between knowledgeable and skilled persons?
- How do learners perceive interactions in group work online?
- How do learners perceive the use of tools and technology in group work online?

## **LITERATURE REVIEW**

### **Advantages of Online Group Work**

Doing group work online has many advantages. One of them is group work online provides flexibility where students can work at their own pace. It is also flexible in terms of connecting with others across borders, expressing their opinions freely, retrieving information, and updating one another more easily [5]. They can share knowledge and skills when working in groups [7]. In other words, an individual will be exposed to other people's thoughts and views on the subject matter. The knowledge of each individual is limited; hence with discussion in group, they can collaborate and think together to come up with new and creative ideas [2, 8]. Besides, when students face difficulty in understanding materials, they have company to assist them or reexplain the materials in group work to better understand it [12]. Since they are working together to complete a task, they will divide the work equally and share workload between group members. Not only do they do the work equally, but the work is also divided according to each member's strength. The strength is also included in terms of technology such as making slides or editing videos. Therefore, it will help to save time and effort. Additionally, when working together, they can help each other by giving feedback on many aspects of the task assigned, including the content, pronunciation, speaking pace, and coherence. Peers are important in affective aspect. Working in groups can help each other in terms of support and motivation to complete the task rather

than working alone when there is no one to turn to. It also boosts their confidence [8].

### Challenges of Online Group Work

Apart from advantages, there are also challenges when working in a group work online. According to [2] the major challenge of working online is it can pose a communication problem. It is because of delay in communication online as opposed to face-to-face interaction where people can get reply instantly. As such, the time to do and complete assignments will be dragged. It is also true for [5] especially when there are internet connectivity issues. [7] said that her study was conducted due to higher education students expressed their frustrations with their inability to contact group members to complete group work especially in the asynchronous setting. [14] further claim that students see in-person group work contexts as having a more positive impact on social skills than online contexts. Online communication medium has limited capacity for creating a level of intimacy and immediacy because online forums are mechanical, and it was difficult to have social interaction with others. Another effect of the communication medium was on writing styles as it influenced the level of formality. So, students tended to make sure that their messages were polite when they were discussing sensitive topics [13]. Moreover, some people will take advantage and there will be unequal participation of group members. Thus, it is suggested that collaborative group assignments should be marked according to individual student's contributions to the group assignment [7]. Students also found that it is difficult to find a common time to set up a meeting or discussion online since they were also tied up with domestic responsibilities at home. Some students have problems committing themselves to working online due to bad time management [5]. Furthermore, instructors often assigned class members to groups which is a challenge because students preferred to self-select their group members [14]. In terms of emotion, it seems that online group work causes anxiety and a feeling of injustice because of marks that they will get [3]. Overall, there are many challenges that students face when they are doing group work online.

### Past Studies

[7] conducted a study to explore the pros and cons of collaborative group work in an online learning environment. The research design used was a descriptive online survey, and a convenience non-probability sampling method was employed to gather the sample. A total of 40 recent higher education graduates from different regions in Guyana participated in the study. The findings highlighted several benefits of collaborative group work, including shared knowledge and skills, reduced workload compared to working alone, the promotion of teamwork, and equal exchange of information. However, there were also drawbacks, such as time wasted waiting for others in the online setting, an increased individual workload compared to working solo, conflicts over roles and responsibilities within the group, and unequal participation where some members carrying the bulk of the group assignment. This study shows that the drawbacks of collaborative group work were more prominent than the benefits. It suggests that providing more structure in online collaborative work could lead to better outcomes.

On the contrary, [14] emphasizes the importance of incorporating group work into the curriculum. Their study, which examined student preferences and experiences across different years of study, involved 300 undergraduate participants from the 1st, 2nd, 3rd, and 4th years at a Canadian university. All participants completed a single online survey that collected demographic information, group work preferences, collaborative learning experiences, academic competitiveness, and familiarity with technology in both synchronous and asynchronous online collaboration platforms. The results revealed that in terms of assignment preferences, the majority of students from all academic levels favoured a mix of group work and independent work. Students also preferred to choose their own group members. Overall, students have a positive view of both in-person and online group work.

When collaborating online, online engagement is also an issue that needs to be investigated. [4] conducted a study to examine the effect of group work on students' online engagement. The study involved 354 participants from various academic fields, who were purposefully selected from a public university in Malaysia. These participants completed a questionnaire divided into seven sections: demographic profile, social interaction, more knowledgeable others, zone of proximal development, learner-to-learner interaction, learner-to-instructor interaction, and learner-to-content interaction. The findings highlight how group work influences online engagement, analyzing attributes such as forming, storming, norming, and performing. Based

on these impacts, instructors can take steps to improve and design online group work activities that foster greater learner engagement and stimulate interest in learning.

## Conceptual Framework

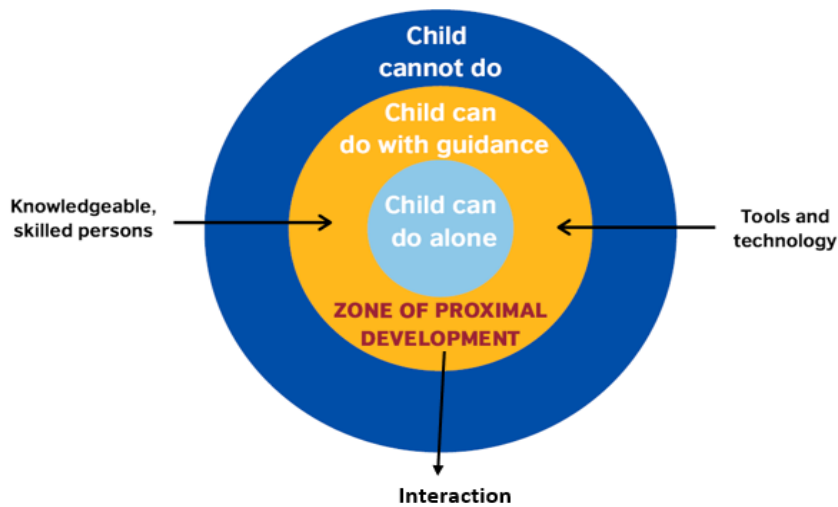


Fig. 1 Conceptual Framework of the Study

Figure 1 represents the conceptual framework of the study. This study is rooted from Vygotsky [15]. It was then combined with group work factors from Rahmat, Mok, Lau, and Ling [10] and online engagement factors from Martin and Bolliger [6].

1) *Knowledgeable, skilled persons*: In the context of this study, knowledgeable, skilled persons refer to more knowledgeable other and learner-to-instructor. More knowledgeable other refers to other people who have more knowledge. According to [8] and [2], a person's knowledge is limited. Therefore, they need to collaborate with others to construct new knowledge. Besides, instructor presence is very important to online learners. Online learners want instructors who support, listen to, and communicate with them [6].

2) *Interaction*: In the context of this study, interaction refers to social interaction, learner-to-learner, and zone of proximal development. Social interaction is essential in group work. It involves verbal and non-verbal exchanges to get messages across. However, it is difficult to do so in online settings where the interaction can be mechanical [13]. Learner-to-learner interaction is extremely valuable for online learning and leads to student engagement. To prevent online students from experiencing potential boredom and isolation in the learning environment, it is essential to build activities that enhance engagement [6]. The Zone of Proximal Development, proposed by Vygotsky [15], describes how cognitive development occurs in children with the help of guidance and support. A person can complete a task or solve a problem better with mediated assistance in the ZPD as opposed to unassisted [8]. In relation to group work, this concept highlights that when students collaborate on tasks, they benefit from the guidance and support of their peers and instructors, which enhances their learning experience.

3) *Tools and technology*: In the context of this study, tools and technology refers to learner-to-content. Learners engage with content to learn effectively, so the content must be interactive and interesting [10].

## METHODOLOGY

This study used a descriptive survey research design to explore ZPD through online group work among university students. A total of 103 Mechanical Engineering undergraduate students from Universiti Teknologi MARA (UiTM), Malaysia, were purposively selected as participants. The survey instrument (Table 1) was adapted from Rahmat, Mok, Lau, and Ling [10], as well as Martin and Bolliger [6]. The survey consists of Section A, which gathers demographic information, and six other sections with a total of 42 items.

Specifically, Section B includes 8 items on social interaction; Section C, 7 items on More Knowledgeable Others; Section D, 7 items on the Zone of Proximal Development; Section E, 6 items on learner-to-learner interaction; Section F, 7 items on learner-to-instructor interaction; and Section G, 7 items on learner-to-content interaction. Participants indicate their level of agreement with each statement using a Likert Scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree).

Table 1 Distribution Of Items In The Survey

| SECTION           | FACTORS                           | NO OF ITEMS |
|-------------------|-----------------------------------|-------------|
| B                 | Social Interaction                | 8           |
| C                 | More Knowledgeable Other          | 7           |
| D                 | Zone of Proximal Development      | 7           |
| E                 | Learner-to-Learner Interaction    | 6           |
| F                 | Learner-to-Instructor Interaction | 7           |
| G                 | Learner-to-Content Interaction    | 7           |
| TOTAL NO OF ITEMS |                                   | 42          |

Data was gathered using a Google Form and analyzed using SPSS version 26. As shown in Table 2, the SPSS analysis produced Cronbach's alpha of 0.978, indicating a high level of internal reliability for the instrument. The demographic profile data is presented in tables showing frequencies and percentages. Furthermore, data related to the research questions is displayed in tables with mean scores and standard deviations.

Table 2 Reliability Statistics

| Cronbach's Alpha | No. of Items |
|------------------|--------------|
| .978             | 42           |

## FINDINGS

### Findings for Demographic Profile

Table 3 shows the percentage and frequency of the participants' demographic profile. A total of 103 students participated in the study. From these, 88.3% were male (91 participants) and 11.7% were female (12 participants). In terms of semester, 89 participants were from Semester 2, 4 participants were from Semester 4, and 10 participants were from Semester 6 and above. The data indicates that the majority of participants were male and in Semester 2.

Table 3 Demographic Profiles

| NO. | VARIABLES | ITEM        | FREQUENCY (F) | PERCENTAGE (%) |
|-----|-----------|-------------|---------------|----------------|
| 1   | Gender    | Male        | 91            | 88.3           |
|     |           | Female      | 12            | 11.7           |
| 2   | Semester  | 1           | 0             | 0              |
|     |           | 2           | 89            | 86.4           |
|     |           | 3           | 0             | 0              |
|     |           | 4           | 4             | 3.9            |
|     |           | 5           | 0             | 0              |
|     |           | 6 and above | 10            | 9.7            |

### Findings for RQ1

This section presents data to answer research question 1 - How do learners perceive interactions between knowledgeable and skilled persons? In the context of this study, knowledgeable and skilled persons are measured by items in (a) more knowledgeable other, and (b) learner-to-instructor.

Table 4 demonstrates respondents' views on the concept of the knowledgeable other in group work. The statement with the highest rating is that group work enables respondents to learn how others justify their opinions, with a mean score of 4.31 (SD=0.67). The second-highest rating is for the statement that group work shows how others present their ideas, with a mean score of 4.30 (SD=0.67). Following this, group work demonstrates how others solve communication problems (M=4.16, SD=0.75), allows respondents to learn communication skills from others (M=4.14, SD=0.78), and increases their desire to learn more from others (M=4.11, SD=0.74). The second lowest rating is for the statement that group work allows meaningful interactions, with a mean score of 4.04 (SD=0.82), and the lowest rating is for practicing listening skills during group work, with a mean score of 4.03 (SD=0.77). Since all statements in this category received ratings of mean score above 4, it indicates that respondents generally have positive experiences working with others in online group settings.

Table 4 More Knowledgeable Other

| NO | STATEMENT                                                          | MEAN | SD   |
|----|--------------------------------------------------------------------|------|------|
| 1  | Group work allows me to learn communication skills from others.    | 4.14 | 0.78 |
| 2  | Group work allows me to practice listening skills.                 | 4.03 | 0.77 |
| 3  | Group work allows me to learn how others justify their opinions.   | 4.31 | 0.67 |
| 4  | Group work allows me to have meaningful interactions.              | 4.04 | 0.82 |
| 5  | Group work shows me how other people solve communication problems. | 4.16 | 0.75 |
| 6  | Group work shows me how others present their ideas.                | 4.30 | 0.67 |
| 7  | Group work makes me want to learn more from others.                | 4.11 | 0.74 |

Table 5 highlights respondents' views on their interactions with instructors. Respondents believe that the instructor's teaching style encourages active student participation, with a mean score of 4.14 (SD = 0.69). Three statements receive the same mean score of 4.06 (SD=0.73, 0.75, 0.75), indicating that respondents feel instructors provide feedback from previous assessments, offer clear and positive feedback on performance, and use multiple communication tools to stay connected with students. Respondents also rate the effectiveness and convenience of online platforms used by their instructors slightly lower (M=4.03, SD=0.77). The lowest-rated statements in this category are whether the instructor encourages students to stay engaged in the online classroom (M=3.98, SD=0.78) and whether the instructor maintains ongoing interaction with students after the online class (M=3.96, SD=0.78). Overall, the findings suggest that respondents generally have positive interactions with their instructors, but instructors could improve by enhancing engagement and maintaining interaction even after the online class ends.

Table 5 Learner-To-Instructor Interaction

| NO | STATEMENT                                                                                      | MEAN | SD   |
|----|------------------------------------------------------------------------------------------------|------|------|
| 1  | The instructor's teaching style involves students' active participation.                       | 4.14 | 0.69 |
| 2  | The instructor encourages students to stay engaged in the online classroom.                    | 3.98 | 0.78 |
| 3  | The instructor provides feedback from previous assessments.                                    | 4.06 | 0.73 |
| 4  | The feedback from the instructor on students' performances is clear and positive.              | 4.06 | 0.75 |
| 5  | The instructor uses more than two communication tools to stay connected with students.         | 4.06 | 0.75 |
| 6  | The online platforms used by the instructor for the online class are effective and convenient. | 4.03 | 0.77 |
| 7  | The instructor maintains ongoing interaction with students after the online class.             | 3.96 | 0.78 |

## Findings for RQ2

This section presents data to answer research question 2 - How do learners perceive interactions in group work online? In the context of this study, interactions are measured by items in (a) social interaction, (b) learner-to-learner interaction, and (c) zone of proximal development.

Table 6 outlines the results related to social interaction. The data reveals that respondents feel they can view different perspectives when interacting with others in a group (M=4.37, SD=0.69). They also report making

new friends ( $M=4.33$ ,  $SD=0.75$ ), solving problems together ( $M=4.26$ ,  $SD=0.71$ ), and engaging with peers ( $M=4.23$ ,  $SD=0.72$ ). Furthermore, group work helps improve their interpersonal skills ( $M=4.07$ ,  $SD=0.72$ ) and adds an element of fun to class ( $M=4.06$ ,  $SD=0.86$ ). However, the respondents feel that group work do not contribute significantly to enhancing non-verbal cues ( $M=3.98$ ,  $SD=0.71$ ) or language skills ( $M=3.96$ ,  $SD=0.78$ ). Conclusively, while social interaction in online group work is generally positive, it has limited impact on non-verbal communication and language development.

Table 6 Social Interaction

| NO | STATEMENT                                                 | MEAN | SD   |
|----|-----------------------------------------------------------|------|------|
| 1  | Group work helps me to interact with others.              | 4.23 | 0.72 |
| 2  | Group work helps me to improve interpersonal skills.      | 4.07 | 0.72 |
| 3  | Group work helps me to improve my language skills.        | 3.96 | 0.78 |
| 4  | Group work allows me to understand non-verbal cues.       | 3.98 | 0.71 |
| 5  | Group work allows me to meet new friends.                 | 4.33 | 0.75 |
| 6  | Group work teaches me to solve problems.                  | 4.26 | 0.71 |
| 7  | Group work allows me to see other people's point of view. | 4.37 | 0.69 |
| 8  | Group work is a fun activity in class.                    | 4.06 | 0.86 |

Table 7 displays the results regarding learner-to-learner interaction. Two statements receive mean score above 4: students prefer to work in the same group as their selected peers for online activities ( $M=4.10$ ,  $SD=0.75$ ) and find that support from peers motivates them to complete tasks ( $M=4.02$ ,  $SD=0.67$ ). Students also indicate that collaborative learning fosters peer understanding ( $M=3.93$ ,  $SD=0.69$ ), that peer support is essential to prevent course dropout ( $M=3.89$ ,  $SD=0.84$ ), and that a sense of community enhances engagement in online classes ( $M=3.88$ ,  $SD=0.63$ ). The lowest-rated statement is that students would not seek help from their peers ( $M=3.83$ ,  $SD=0.75$ ). Overall, the results suggest that students experience moderate interaction with their peers in online group work.

Table 7 Learner-To-Learner Interaction

| NO | STATEMENT                                                                   | MEAN | SD   |
|----|-----------------------------------------------------------------------------|------|------|
| 1  | Collaborative learning promotes peer-to-peer understanding.                 | 3.93 | 0.69 |
| 2  | I am more likely to ask for help from my peers.                             | 3.83 | 0.75 |
| 3  | I prefer to be in the same group with my chosen peer for online activities. | 4.10 | 0.75 |
| 4  | The sense of community helps me engage in online classes.                   | 3.88 | 0.63 |
| 5  | Support from peers motivates me to finish tasks.                            | 4.02 | 0.67 |
| 6  | Support from peers prevents me from dropping out of the course.             | 3.89 | 0.84 |

Table 8 illustrates the findings regarding the zone of proximal development. Respondents indicate that working in a group helped them generate more ideas ( $M=4.12$ ,  $SD=0.81$ ). This is followed by improvements in negotiation skills ( $M=4.07$ ,  $SD=0.73$ ) and listening skills ( $M=4.03$ ,  $SD=0.73$ ). Additionally, respondents feel that their decision-making ( $M=3.97$ ,  $SD=0.80$ ), communication ( $M=3.94$ ,  $SD=0.79$ ), and problem-solving skills ( $M=3.88$ ,  $SD=0.81$ ) are enhanced. The lowest-rated skill is self-confidence ( $M=3.85$ ,  $SD=0.84$ ). It can be concluded that group work not only fosters the generation of ideas but also supports the development of a range of other skills.

Table 8 Zone Of Proximal Development

| NO | STATEMENT                                                     | MEAN | SD   |
|----|---------------------------------------------------------------|------|------|
| 1  | My communication skills improve when I interact in a group.   | 3.94 | 0.79 |
| 2  | My self-confidence improves when I interact in a group.       | 3.85 | 0.84 |
| 3  | My decision-making skills improve when I interact in a group. | 3.97 | 0.80 |
| 4  | My problem-solving skills improve when I interact in a group. | 3.88 | 0.81 |

|   |                                                       |      |      |
|---|-------------------------------------------------------|------|------|
| 5 | I get more ideas when I work in a group.              | 4.12 | 0.81 |
| 6 | I improve my listening skills when I work in a group. | 4.03 | 0.73 |
| 7 | I learn negotiation skills when I work in a group.    | 4.07 | 0.73 |

### Findings for RQ3

This section presents data to answer research question 3 - How do learners perceive the use of tools and technology in group work online? In the context of this study, the use of tools and technology is measured by items in learner-to-content interaction.

Table 9 reveals the findings related to learner-to-content interaction. Of all the statements, only one receives a mean score above 4, which is that respondents believe it is important to have an overview of the content before the class starts ( $M=4.07$ ,  $SD=0.65$ ). Two statements share a mean score of 3.93, indicating that respondents feel the activities could enhance their understanding of the subject matter ( $SD=0.69$ ) and that the ease of accessing online content is important ( $SD=0.82$ ). Following this, respondents feel that online activities could improve their critical thinking skills ( $M=3.90$ ,  $SD=0.80$ ) and help them apply relevant knowledge effectively in the learning process ( $M=3.87$ ,  $SD=0.78$ ). Additionally, respondents do not believe that synchronous ( $M=3.84$ ,  $SD=0.74$ ) and asynchronous ( $M=3.70$ ,  $SD=0.78$ ) activities offer immediate assistance. Overall, respondents have moderate perceptions of the effectiveness of tools and technology used in the learning process.

Table 9 Learner-To-Content Interaction

| NO | STATEMENT                                                                    | MEAN | SD   |
|----|------------------------------------------------------------------------------|------|------|
| 1  | Synchronous activities (i.e., online discussion) offer immediate assistance. | 3.84 | 0.74 |
| 2  | Asynchronous activities (i.e., assignments) offer immediate assistance.      | 3.70 | 0.78 |
| 3  | The activities improve the understanding of the subject matter.              | 3.93 | 0.69 |
| 4  | The activities in online learning improve critical thinking skills.          | 3.90 | 0.80 |
| 5  | Relevant knowledge is used wisely in the learning process.                   | 3.87 | 0.78 |
| 6  | The ease of online content is important.                                     | 3.93 | 0.82 |
| 7  | It is important to get an overview of the content before the class begins.   | 4.07 | 0.65 |

## CONCLUSION

### Summary of Findings and Discussions

The highest and lowest findings from each research question are highlighted. The aspects of knowledgeable and skilled individuals are assessed through the more knowledgeable other and learner-to-instructor items. The highest-rated response in this category is that group work helps respondents learn how others justify their opinions. This aligns with [11], who found that participants gain insight into justifying others' opinions, leading to meaningful interactions. Online learning community should be an environment where students can exchange multiple perspectives and receive peer support [13]. Conversely, participants in this study feel that their instructors do not maintain ongoing interaction after online classes, which contrasts with the findings of [4], where participants believe that their instructors continue interactions after class. The instructor's presence is crucial as their supportive role guides the groups toward more productive work patterns [9].

Interaction in online group work is assessed through social interaction, learner-to-learner interaction, and the zone of proximal development. The data shows that respondents feel they can gain different perspectives when interacting with others in a group, which aligns with [2], who noted that individuals are exposed to others' thoughts and views on a topic. Everyone has different prior knowledge. When interacting together, new knowledge can be obtained [8]. However, students do not tend to seek help from their peers, which supports [4], who found that fewer participants are likely to ask for assistance from their peers. This may be due to the person having some unpleasant collaborative learning experiences in the past [13].

Students believe it is important to receive an overview of the content before class, as this statement receives the highest rating when they are asked about their perceptions of using tools and technology in online group

work. This finding is consistent with [4], where the finding indicates that most participants agree on the importance of getting an overview of the content before class. On the other hand, students do not feel that asynchronous activities, such as assignments, provide immediate assistance. This finding also aligns with [4], which shows that participants generally disagree that asynchronous activities offer immediate support. However, the benefits of asynchronous activities are that students will have more time to think and prepare. They can also find essential materials to complete the task given [1].

### Implications and Suggestions for Future Research

1) *Conceptual Implications*: The findings of this study have strong conceptual implications within the framework of Vygotsky [15], ZPD. Students can positively work with their peers to complete the task given. Additionally, the right guidance and support from their instructors enabling students to achieve more in their learning.

2) *Pedagogical Implications*: The results of this study indicate that collaboration, interaction, preparation, and feedback are crucial factors for enhancing teaching and learning. Implementing strategies that focus on these aspects could improve both online and group learning experiences for students. The benefits of collaborative learning, as highlighted in the findings, are evident in various areas. Therefore, educators should consider increasing the use of group activities that allow students to develop skills such as expressing and justifying opinions, critical thinking, and engaging in discussions.

In terms of interaction, although the students in this study have positive interaction with their group members, they may still feel reluctant to ask peers for help, possibly due to a lack of trust, confidence, or a preference for working independently. To overcome this, educators could encourage the development of peer support networks, create a more collaborative learning environment, or introduce structured peer feedback sessions to help students feel more at ease seeking assistance from one another. Educators can also highlight the importance of peer contributions to the learning process.

Pre-class preparation is essential for student engagement and success. Since students in this study also recognize its importance for their learning, educators could start each class with a synchronous preview of the day's lesson. Educators can provide brief summaries or overviews of the content to be covered. They can also show videos to activate students' prior knowledge on the topic. For asynchronous preparation, educators can provide pre-class materials like readings or videos, helping students to get ready for the upcoming lesson and enhancing both participation and understanding.

Students feel that instructors are difficult to reach after online classes. However, continuous engagement beyond class time is essential for student retention and understanding. To address this, instructors can set aside time outside of class for consultations. Students should have the opportunity to contact their instructors during office hours for subject-related queries. Additionally, instructors could provide follow-up activities to reinforce the lesson content, helping students maintain interaction and clarify any questions that arise after the online session.

3) *Suggestions for Future Research*: Future research should consider including participants from a variety of disciplines, as this study focused solely on Mechanical Engineering students. Exploring different disciplines could yield unique and interesting findings. Furthermore, incorporating interviews with students about their perceptions of online group work could provide more in-depth insights, as they would be able to offer more detailed responses.

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