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Online Collaborative Performance in Group-Based Tasks among Learners of Higher Education

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Abstract

Collaborative skills have been perceived as the most important skills by learners, instructors, and employers alike in comparison to communication and entrepreneurial skills. Despite its significant role in the workplace, many find that working together with others may complicate tasks due to limited background knowledge and problems with social dynamics. There has not been a single assessment created to assess online collaboration as an integrated performance during group-based tasks. The present study, therefore, attempts to examine learners' online collaborative performance and the dimensions contributing to effective online collaboration at the tertiary level. A mixed-method research design was adopted using surveys and interviews. A number of 508 undergraduates from local universities were given a questionnaire inquiring about their online collaborative behaviour in group work, while 30 of them were interviewed. The findings indicated that the communication tools and technological facilities category were rated the highest in online collaborative performance, whereas sharing responsibilities was rated the highest in team dynamics. There was also a significant correlation between online collaborative performance and

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team dynamics. Interview responses showed that learners agreed that good communication, clear goals, and team commitment were important elements for successful online collaboration. Despite the potential to enhance students' online collaborative performance, collaborative learning is demanding for learners and educators alike.

Keywords: Collaborative skills, group-based tasks, higher education, online learning, teamwork.

1. INTRODUCTION

The Covid-19 pandemic has significantly stressed the education system in Malaysia, and the closure of learning institutions as a measure to decelerate and curb the spread of the virus has propelled many universities to develop alternative education opportunities. Hence, online learning has at this time replaced physical classrooms to perpetuate the development of human capital with cognitive, digital, and life skills remaining essential in coursework. However, social distancing and virtual classes may also create potential threats of cognitive deficit, disconnection or isolation, lack of motivation, and a downward spiral in mental health and well-being. To mitigate these, online learning and collaboration through group-based tasks have become an indispensable teaching and learning aid to support the undergraduates' welfare and improve their education experience – anytime and anywhere – through any device (phone, computer, tablet) and approach (Web-based email, cloud-based platforms, project- management tools, file-sharing applications, instant messaging, and SMS). The infusion of technology in teaching and learning has enhanced the efficacy of remote-learning opportunities (Mayweg-Paus et al., 2021) by empowering the online undergraduate community to gain access to an extensive set of skills and abilities through collaboration and by sharing their learning challenges or successes, information and resources through technology-shared space (Gikas & Grant, 2013).

Studies elucidate that collaborative skills such as decision-making, teamwork, communication, conflict resolution, critical thinking, leadership, and problem-solving are best developed in an education setting and that the earlier this is done, the better (Mehta & Fine, 2019; Soland et al., 2013; Vallance et al., 2010). These are vital skills for 21st-century learners and can be achieved through group-based tasks (in-person or online) that foster collaboration. Group-based tasks require groups of learners to form a 'partnership' to resolve problems, realise outcomes, or create products. By integrating these salient aspects – a standard task or activity, small group learning, cooperative behaviour or positive interdependence, individual responsibility, and accountability (Johnson, 1991; Laal & Ghodsi, 2012; Le et al., 2018; OECD, 2013, 2017) – collaborative learning has proven to generate numerous proximal (increased academic achievement and employability) and distal (increased workplace efficiency) benefits for undergraduates (Evans & Waring, 2020).

Group-based activities, for instance, essentially offer learner support and underscore interactivity – features that are not central in individual or independent learning (Nokes-Malach et al., 2015; Saqr et al., 2019). Dynamic engagement in discussions as a team or with other peers apart from the instructor, who functions as a learning facilitator, increases content proficiency through greater knowledge sharing,

construction, development, and retention, especially for learners with low-level abilities. Moreover, group discussions encourage members to raise questions, generate ideas, and negotiate options collectively, thus making the collaboration process more engaging, critical, and robust. Group camaraderie also helps learners to stay motivated compared to work done in isolation (Lai & Viering, 2012). Decades of research reiterate the importance of collaborative learning in developing interpersonal and life skills because group work enhances the learners' ability to understand other people: what drives them, how they work and think productively, and work collectively (Binkley et al., 2012; Salleh et al., 2016). This understanding assists learners in co-operating and making progress with others, especially in the workforce. Nevertheless, many undergraduates find that working together with others may complicate tasks due to limited background knowledge and problems with social dynamics.

Collaboration in teamwork is indeed demanding, and it becomes more challenging when collaboration occurs online. Interaction among learners and task management are some of the common issues identified in online teamwork collaboration (King, 2007; Eubanks et al., 2016). Information and communication technology (ICT) competencies and communication and language competencies have been identified as two important domains which tertiary students need to develop in achieving effective online collaboration (Kolm et al., 2022). In addition, intra-group emotional support is found to be the main element that generates cognitive, social, and teaching presence in an effective online collaboration (Hernandez-Selles et al., 2019).

The importance of developing collaboration skills at the tertiary level cannot be undermined. According to Hart Research Associates (2015), employers emphasize the following five abilities as requisites for undergraduate employability: verbal communication (85%), teamwork (83%), written communication (82%), ethical judgment and decision making (81%) and critical/analytical thinking (81%). Effective human connection and productive work performance are best achieved through collaboration; therefore, being part of a community and having a support system is indispensable for the undergraduates' personal and career growth.

1.1 Problem Statement

With lockdowns imposed throughout Malaysia, online learning and task-based collaborations have gained prominence at the tertiary level. However, the efficacy and success of online collaboration necessitate several key elements converging to produce productive interactions, positive learning outcomes, and life skills. Online collaborations go beyond grouping undergraduates to complete work. To maximize learning performance and equip group members with essential collaborative skills for the job market, proper design and implementation of online group-based tasks are required. The inadvertent and rapid shift to online learning highlights the importance of training, digital equity, assessments, and preparation to set a conducive T&L environment for the undergraduates' sustained growth through online collaboration – individually and as a member of a larger social group (Li & Lalani, 2020). At present, there is extensive literature on online collaboration, but many underline aspects pertaining to the use of web 2.0 tools and applications to facilitate collective actions (Cheng & Yu, 2015; Garcia & Privado, 2020; Wang, 2014), learner views (Saghafian & O'Neill, 2018), learner attitude and self-efficacy (Konak et al., 2019) and the dynamics of online collaboration (Du et al., 2017). Research which has investigated

the process of online collaboration itself (Hammond, 2017) is limited to compilations of reviews from secondary sources (Razali et al., 2014). Hence, there exists a gap of knowledge on learners' behaviour when collaborating on online group-based tasks.

Moreover, current studies on online learning in tertiary institutions in Malaysia focus on learners' perceptions and their readiness, inventive methods, and ways to expand instructors' online teaching competencies to handle the unprecedented changes in teaching and learning during the Covid-19 pandemic (Mohd Omar et al., 2020; Sia & Adamu, 2021). The role of online collaborative skills is often overlooked, thus causing the assessment of such skills in most university courses to be neglected (Coiro et al., 2018). In many group-based tasks, instructors are uncertain about what (criteria) and how (tools) to assess collaborative performance. Most group-based coursework is product-oriented evaluations, and an individual's less-than-expected effort in group work goes unnoticed (Coiro et al., 2018; Leu et al., 2017). In addition, Ruys et al. (2012) have also stressed how an instructor's lack of attention in determining group norms and facilitating activities can deter optimal learning and reduce the proximal and distal efficacy of collaborative work. More often than not learners are made to work together without preparing them to accomplish collaborative activities efficiently.

A return to the past in terms of in-person collaboration in classrooms seems inconceivable at this point with the pandemic showing no signs of abating. With synchronous, Web- and cloud-based applications (i.e. conferencing applications and collaborative document development opportunities), options for developing collaborative learning activities continue to expand. Therefore, it is timely to consider what aspects of online student collaboration that have been developed over the past one and a half years at higher learning institutions are worth holding on to, abandoning, overhauling, and introducing. Past studies carried out on students at the tertiary level show various factors affecting the effectiveness of online collaborative teamwork which include group size and group formation (Tosuntas, 2020), learning environment, learning design, and learning interaction (Razali et al., 2014), teamwork principles such as skills to evaluate the performance of other team members and negotiating skills (Gapinski, 2018) and student interaction and online collaborative tools (Hernandez-Selles et al., 2019). Not much attention, however, has been given to online collaborative skills and technology use.

Thus, it is imperative to identify the skills and technologies that have been useful or are necessary to increase the efficacy of online collaboration at higher learning institutions to help undergraduates develop their cognitive, digital literacy, and life skills. The present study answers the following research questions:

- How do tertiary-level English Language learners perform collaboratively in teamwork when completing online tasks?
- How do the learners' team dynamics contribute to their collaborative teamwork performance?
- Is there a relationship between the learners' collaborative performance and team dynamics in an online learning environment?
- What are the factors contributing to successful teamwork in an online learning environment at the tertiary level?

With these questions in mind, the objectives of this research are:

- to examine English Language learners' collaborative performance in teamwork when doing online tasks at the tertiary level;

- to examine the contribution of the learner's team dynamics in their collaborative teamwork performance;
- to determine whether there is a relationship between learners' collaborative performance and team dynamics when completing online tasks at the tertiary level;
- to identify the factors contributing to successful collaborative teamwork in an online learning environment.

2. LITERATURE REVIEW

2.1 Vygotsky's Social Constructivism and Siemens' Connectivism

The two theoretical keystones that support this research paper concerning collaborative online group-based tasks among learners of higher education are social constructivism (Vygotsky, 1978) and connectivism (Siemens, 2005). Social constructivists see individuals as social creatures that develop by acquiring knowledge and skills through interactions with diverse communities (Saqr et al., 2018). In social constructivism, knowledge happens first within a social context (Vygotsky, 1978). As human cognition is fashioned through social activity (Mirzaei & Taheri, 2016), interaction is viewed as an important strategy of self-regulated learning (Annamalai, 2018). Social constructivism perceives learning not as knowledge transfer, but as knowledge constructed. According to Vygotsky (1978), higher order thinking is more likely to be constructed via social interaction and this can be done through peer-to-peer collaborations. Overall, this theory emphasizes the collaborative effort for the construction of knowledge and meaning in an interpersonal and interactive setting which focuses on the importance of the dialogic and dynamic nature of peer-to-peer communication (Mirzaei & Taheri, 2016). Learners profit from each other's interpretations of the context due to their diverse experiences, and together they build knowledge and negotiate meaning while exploring the online space (Kleinsasser & Hong, 2016). Nevertheless, the construction of knowledge in online collaborative teamwork does not solely lie in social interaction alone. The use of interactive software and synchronous meetings are considered important in online teamwork among mid-western graduates (Ku et al., 2013), while another study highlights the role of accountability in teamwork and instructor input and interaction which appear to be the major concerns among undergraduates enrolled in online programmes (Konak et al., 2019). The present study attempts to investigate the aspects that contribute to Malaysian learners' collaborative teamwork in the tertiary level settings.

Connectivism is a recent theory derived from behaviourism, cognitivism, and constructivism theories (Al-Abri et al., 2017). It is a theory expanded to focus on learning in the digital age in which it claims that knowledge and learning happen from a variety of perspectives and that learning as a process happens by connecting sources of information (Saqr et al., 2018). The connectivism theory by Siemens (2005) posits that online learning is a network phenomenon influenced by technology and socialization. The theory distinguishes the significance of ascertaining learning environments that stimulate group connectivity and collaboration experiences that help learners to participate skilfully in learning communities and social networks. In other words, the theory is about learners acquiring knowledge by connecting with each other and with technology. In connectivism, knowledge is actuated by learners connecting

to and participating in a learning community (Goldie, 2016). Learning consists of collaborative efforts made in retrieving information to create knowledge and utilizing information to present contexts (Brindley et al., 2009). Based on this theory, connections formed by actions and experience via networking require tools like social media to facilitate information creation, storing, sharing, and retrieval (Al-Abri et al., 2017).

Similarly in the present study, the learners achieve learning through the connection of information sourced from various platforms when completing their teamwork tasks collaboratively. The platforms include web browsers (such as Google Chrome and Netscape Navigator), social media (such as Instagram, YouTube, and TikTok), cloud computing, and video editing applications (such as Kinemaster and FilmoraGo) which they use to retrieve and utilize information to develop and create new knowledge.

2.2 Past Studies on Collaboration in an Online Learning Environment

Since the introduction of social constructivism as an appealing learning theory within the field of the second language (L2) education, the concept of collaboration has gained substantial interest in many studies (Mirzaei & Taheri, 2016). Recently, research on collaborative learning has grown considerably due to the influence of the constructivist social dimension of learning in L2 education (Jeong, 2019). The definition of collaboration is much more complicated than merely working with others. In a collaborative learning setting, knowledge is shared or communicated among learners as they work towards common learning goals (Brindley et al., 2009). This view is shared by Scoular et al. (2020) who defined collaboration as an act where learners share knowledge, resources, and skills from various sources in order to attain a mutual goal. They further classified collaboration into three strands:

- Building shared understanding: communicating, pooling resources and information, negotiating roles and responsibilities.
- Collectively contributing: participating in a group, recognizing contributions of others, engaging with roles and responsibilities.
- Regulating: ensuring own constructive contributions, resolving differences, maintaining shared understanding, adapting behaviour and contributions for others.

Stephens and Roberts (2017) defined peer collaboration as learners working together on the same task rather than individually on different sections of the same group-based task. They pointed out that peer-to-peer interactions can influence a learner's success. Mirzaei and Taheri (2016) defined collaboration as an environment in which a learner interacts with his or her collaborative peers to resolve a stipulated problem. Due to sharing among peers, the learning process forms a link between and among learners as their knowledge formation depends on each other's input to the collaboration (Brindley et al., 2009).

Apart from sharing input and working towards mutual goals, learners also benefit from the collaborative experience regardless of their intellectual standings or proficiency levels (Robinson et al., 2017). Students working in groups can pool their knowledge, as the shared knowledge of a group will be better than that of a person (Robinson et al., 2017).

In addition, there is an immense trend in implementing collaboration techniques in teaching-learning settings particularly with the advent of online social media tools

because they present a prospective approach for refining learners' interaction, engagement, and collaboration (Al-Abri et al., 2017). Online communications can be considered valuable and constructive behaviour to solve problems in learning activities (Annamalai, 2018). According to Annamalai (2018), when students are placed in an online environment, higher order thinking can be attained with the accessibility of materials, resources, time, and space. According to previous studies, interaction and collaboration among learners in the same group are able to entice them to learn better and can motivate each group member to involve in problem-solving together (Wan Hussin et al., 2019). Scoular et al. (2020) further added that ongoing regulation of the group dynamic and individual's contribution to the group is significant for effective collaborative work.

Recent research on online collaborative learning addressed how the aspects of traditional collaborative learning evolve in the online setting. In a qualitative case study, Annamalai (2018) investigated patterns of peer interaction among Malaysian ESL students in online writing tasks, and the findings of the study presented three main types of online interactions: language-related assistance, using partners as resources, and providing motivation. Such interactions show the transition of learners from traditional classroom learning to be more committed, purposeful, and relevant, moving towards autonomous learning via peer support.

Shah and Chowdhury (2016) in their experimental designed comparative study looked into the online and offline learning environment of 20 higher education students' performance, attitude, intention, personal interactions, and satisfaction with collaborative learning. The findings of the study indicated that the quality of the performance was higher in the case of all groups undertaken in an offline environment than in the online environment. However, personal interaction among students was higher online than offline.

On the other hand, Noguera et al. (2018) surveyed 114 students on their perceptions of online collaborative agile learning strategies and found no significant impact on students' satisfaction or performance. They suggested that various strategies are needed to help groups improve group dynamics in order to effectively learn in collaboration and increase teamwork satisfaction. This was echoed by Abrams (2019) in her study on collaborative writing by university learners in which she found that successful collaboration depends on group dynamics rather than the learners' proficiency levels as the more collaborative and equal a group was, the more opportunities it had to generate and enhance learners' engagement in the on-going task.

Despite the compelling benefits discussed in online collaboration, some researchers identified the frustrating effects such as learners' attitudes (Konak et al., 2019), staying connected, focusing on the task at hand, and managing faceless communications (Saghafian & O'Neill, 2018). Shah and Chowdhury (2016) warned that when learners do not collaborate successfully, the social and cognitive benefits of collaboration will be lost.

While research literature extensively describes the benefits and challenges of online collaboration, limited attention has been given to learners' collaborative performance in online learning. The kinds of interaction held, the decision-making process carried out and the technology used in the collaborative process should also be a concern for a positive online learning environment. Hence, the present study attempts to examine such collaborative behaviour among the undergraduates in Malaysian higher education context.

3. METHODS

A number of 508 students from two public Malaysian universities, namely Universiti Teknologi MARA and Universiti Malaysia Sabah, were involved in the study. These two universities were selected as both are public universities in the country. The students are enrolled in four faculty clusters – Arts and Humanities, Business and Management, Science and Technology and Social Science – majoring in Business Studies, Engineering, English for Professional Communication, Information Studies, Art and Design, and Applied Science. All of them were taking an English Language course in the semester when the research data were collected.

The present research adopted a mixed-methods design that used a survey questionnaire and a semi-structured interview. The questionnaire was used to examine learners' collaborative behaviour and team dynamics when doing group-based tasks, while the interview was carried out to identify the factors considered important in a successful collaboration. Table 1 shows the demographic details of the respondents.

Table 1. Demographic profile of the respondents.

		Frequency (n)	Percentage (%)
Gender	Male	160	31.5
	Female	348	68.5
	Total	508	100.0
Level of education	Pre-Diploma	85	16.7
	Diploma	68	13.4
	Bachelor's Degree	355	69.9
	Total	508	100.0
Faculty	Arts and Humanities	83	16.3
	Business and Management	182	35.8
	Science and Technology	182	35.8
	Social Science	61	12.0

A total of 348 (68.5%) female respondents and 160 (31.5%) male respondents responded to the survey. Among them, 355 (69.9%) were bachelor's degree students, 85 (16.7%) were pre-diploma students, and the rest 68 (13.4%) were diploma students. A total of 182 (35.8%) respondents were from the Business and Management, and Science and Technology faculties respectively. The other 83 (16.3%) respondents were from Arts and Humanities faculty and the rest 61 (12.0%) respondents were from the Social Science faculty. Students from the four faculty clusters were selected for easy monitoring and management of data collection.

The selected learners were first asked to complete the questionnaire. The questionnaire which is called the Online Collaboration Scale was adapted from [Tseng et al. \(2009\)](#), [Ku et al. \(2013\)](#), and [Altinay \(2017\)](#). The questionnaire consisted of two parts: Part A – Performance Skills and Part B – Team Dynamics. In the Performance Skills section, the respondents were inquired about their communication skills, communication tools, and technological facilities, collaborative skills, higher-order thinking, and time-management skills. In the Team Dynamics section, however, the respondents were asked about their experience in team interaction, sharing respondents, and managing work. A reliability test using Cronbach's alpha coefficient was used to measure the internal consistency of the questionnaire. The scale is accepted if the coefficient value is above 0.6 ([Ursachi et al., 2015](#)). The test shows that the coefficient value of Performance Skills is 0.898, while Team Dynamics is 0.953,

which concludes high consistency and reliability of both scales as a measurement used in the study (Table 2).

Table 2. Summary of the Cronbach's Alpha of each scale.

Scale	Cronbach's Alpha	No. of items
Performance skills	0.898	35
Team dynamics	0.953	21

After completing the questionnaire, 30 of the respondents were selected for the interview. A semi-structured interview consisting of eleven questions was adapted from [Shahvar \(2018\)](#). The questions are related to their experiences and preferences in teamwork in online learning, as well as their opinions on the crucial aspects contributing to effective collaboration in online assignments. Due to the Covid-19 pandemic, the students were given a choice either to be interviewed on Google Meet or Zoom sessions or to be interviewed through the telephone (voice call or WhatsApp). Each interview lasted between 20-30 minutes. Meanwhile, the survey responses were analysed using descriptive analysis, correlation analysis, and regression analysis, while the interview responses were transcribed and analysed using thematic analysis.

4. RESULTS

4.1 Respondents' Performance Skills and Team Dynamics in Online Collaboration

A descriptive analysis was carried out to identify the online collaborative performance of the respondents. The mean, standard deviation, and Pearson Correlation between the subcategories were identified. The results showed that the communication tools and technological facilities category indicates the highest mean score, $M=29.087$ compared to the other four subcategories in Performance Skills, while in Team Dynamics, sharing responsibilities indicates the highest mean, $M=30.329$, compared to the other two subcategories. Furthermore, the Chi-Square analysis found a significant relationship between each subcategory, $p=.000$. Table 3 shows the descriptive analysis for all subcategories for Performance Skills and Team Dynamics.

Table 3. Descriptive analysis for all sub-sections for the performance skills and team dynamics ($n=508$).

	Mean	SD	p-value
Performance skills	139.559	14.236	.000
Communication skills	28.874	3.442	.000
Communication tools & technological facilities	29.087	3.922	.000
Collaborative skills	27.433	3.614	.000
Higher-order thinking skills	27.795	3.895	.000
Time-management skills	26.370	3.261	.000
Team Dynamics	89.248	11.944	.000
Interaction in team	29.799	4.043	.000
Sharing responsibilities	30.329	4.476	.000
Managing work	29.120	4.355	.000

4.2 Relationship between Respondents' Performance Skills and Team Dynamics

A correlation analysis was used to determine the relationships between the variables. The significance level of correlation coefficients was set at the 0.05 level (2-tailed). Table 4 shows a significant correlation was found between Team Dynamics and Performance Skills in the respondents' online collaboration when doing group-based tasks, $r=.597$, $p<.01$.

Table 4. The relationship between performance skills, team dynamics, and the socio-demographic variables.

Variable	Performance skills
Team dynamics	.597**

**, Correlation is significant at the 0.01 level (2-tailed).

4.3 Factors Contributing to the Success of Online Collaboration

A number of 30 respondents who answered the questionnaire were all involved in group work or projects at the time of data collection. The students were interviewed on:

- their preference in teamwork collaboration (online or face to face),
- the five most crucial factors they feel are important which influence the success of the online collaboration.

Based on the interview responses, 16 (53.33%) of the respondents preferred collaborating online, ten (33.33%) preferred face-to-face collaboration, and four (13.33%) felt both depending on the situation. Many of them thought that online collaboration provides flexibility for them to work and carry out discussions at their own preferred time, sometimes till late at night. It also allows them to communicate with others across borders, voice their opinions freely, retrieve information, and update each other more easily. However, if given a choice by some of them, working face-to-face is preferable as it is difficult to communicate online, especially when there are internet connectivity issues. They 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 had problems committing to working online due to bad time management. Table 5 summarises the respondents' preferences.

Table 5. Respondents' preference for collaboration mode.

No. of respondents	Collaboration mode preferred	Reasons
16 (53.33%)	Online collaboration	Flexibility Ease of communication Updating work progress Ease in information retrieval
10 (33.33%)	Face-to-face collaboration	Internet connectivity issues Easier to set up a meeting time Not tied up to house chores
4 (13.33%)	Depending on situation	Requires proper time management

The interview responses also reveal the factors deemed crucial by the respondents in contributing to the success of the online collaboration. Out of 13 factors given, seven factors were ranked as the top five aspects which affect the online

collaborative performance of the respondents. The highest rated factor is clear communication which was chosen by 23 respondents (76.66%). This is followed by team commitment and time-management skills which are both rated by 21 respondents (70%) respectively. The third factor is the ability to retrieve information from the right sources which was rated by 13 respondents (43.33%), while the fourth factor is work-management skills which were rated by 12 respondents (40%). Two factors are positioned as the last of the top five factors namely having clear goals and team support which were rated by 11 respondents (36.66%) respectively. Table 6 lists the rankings of all the factors made by the respondents.

Table 6. List of factors ranked by the respondents.

No.	Factors	No. of respondents (n=30)
1.	Clear communication	23 (76.66%)
2a.	Team commitment	21 (70%)
2b.	Time-management skills	
3.	Ability to retrieve information from the right sources	13 (43.33%)
4.	Work-management skills	12 (40%)
5a.	Clear goals	11 (36.66%)
5b.	Team support	
6.	Frequent commitment	10 (33.33%)
7.	Well-defined instructions	8 (26.66%)
8a.	Instructor support	7 (23.33%)
8b.	Use of interactive software	
9.	Higher-order thinking skills	4 (13.33%)
10.	Synchronous meetings	1 (3.33%)

5. DISCUSSION

The high rating given to the communication tools and technological facilities category in respondents' collaborative performance confirms the importance of identifying learning environments that stimulate group connectivity and collaborative experiences as asserted by [Siemens \(2005\)](#) in his connectivism theory. Such tools and facilities help learners to participate skilfully in their group assignments and social networks. The respondents' sharing of responsibilities in team dynamics indicates evidence of the construction of knowledge and negotiation of meaning among the team members ([Kleinsasser & Hong, 2016](#)). The findings display a similar notion by [Scoular et al. \(2020\)](#) who identify collaboration as the sharing of knowledge, resources, and skills by learners in order to achieve a mutual goal.

Nevertheless, an intriguing finding worth to be highlighted is that interaction in teams was rated the lowest in Team Dynamics. This contradicts [Shah and Chowdhury's \(2016\)](#) study which indicates higher personal interaction among students online than offline, and [Annamalai's \(2018\)](#) research which identifies peer interaction as a motivation toward autonomous learning. Being open in communication and the ability to give to and accept criticism from others are still lacking in students due to Malaysian cultural appropriateness. It was found that some students were still unable to open up and hesitate to express their ideas due to shyness. They were scared that their opinions would not be considered by the rest of the team members, though some knew that what they wanted to say was true. They were also scared that they would be criticized if their opinions were not accepted by the rest. Respect, politeness, language

use, and care for others' feelings are part of Malaysians' man of culture (*budi bahasa*) that has become the norms and taboos instilled by the society (Ramli, 2013).

Although it is not a written rule, it has defined the lines between what is permissible and unacceptable in society. Apparently, such appropriateness may need to be compromised in academic settings and students ought to be taught the nuances of politeness in communication. In fact, Ryu and Sandoval (2015) suggest that more emphasis should be given to social influences on student argumentation and collaboration.

In addition, the students' communication also reflects lack of intra-group emotional support. There was a weak rapport among the students considering the remote learning sessions carried out. Most of them had not met each other physically for the whole year as all lectures were conducted online. Time constraints, uncertainties and deaths among family members amid lockdowns due to COVID-19 pandemic had also prevented initiatives to foster closer relationship among the students. This has become a hindrance to build strong socio-emotional bonds among the team members which is the basis for developing trust as well as a sense of group belonging and responsibility (Hernandez et al., 2019).

The results also show a strong correlation between team dynamics and collaboration which supports Abrams' (2019) study indicating the role of group dynamics in successful collaborative writing. In the present study, the respondents' interaction with team members, ability to share responsibilities, and the way they manage work to influence the quality of online collaborative performance produced. Dinh and Salas (2017) identify team cognition, which includes sharing responsibilities, as part of the core process and an emergent factor in teamwork effectiveness. Failure to develop team cognition may result in impaired performance and negative outcomes for the collaboration.

The seven contributing factors chosen by the respondents in the present study have been identified as part of the nine categories suggested by Salas et al. (2015) as crucial to effective collaboration. According to Salas et al. (2015), these nine categories are the key dynamics that influence teamwork. Clear communication factor is similar to Salas et al.'s communication, team commitment, and time management skills are part of team coordination, while the ability to retrieve information from the right sources, work management skills, clear goals, and team support are related to team cognition. Communication is a crucial component of teamwork (Dinh & Salas, 2017; Herrera et al., 2017) as it inherently affects other aspects of teamwork such as coordination. Dinh and Salas (2017) suggest two methods in order to optimize team communication, namely increasing accessibility of information and practicing closed-loop communication procedures to ensure the receipt of messages and clarify any ambiguities in interpreting the message. Team coordination involves the behavioural mechanism necessary to perform a task and transform team resources into outcomes. Coordination, which can be explicit or implicit, is the driving force of team performance. Team cognition, however, refers to the shared understanding among team members and may involve knowledge of roles and responsibilities, team mission objectives, and norms. All these factors are interdependent with each other. Table 7 shows the relation of the factors between the present study and Salas et al.'s (2015).

Communication, however, may not be the only skills to emphasise on in an effective online collaboration. Kolm et al. (2022) identify six competence domains emerging from a review of 14 studies related to online collaboration competencies.

ICT competencies are found to be the main competence domain reported, while communication and language are the third competence domain emerged. ICT competencies include the students' ability to use Web 2.0 tools for basic task completion and to use internet technology for communication. The present study however, yields different results. ICT skills are ranked the eighth and tenth place deemed important for a successful collaboration by the students. Nevertheless, in collaborative performance, the most common skills used by the students are related to communication tools and technological facilities compared to the other four skills.

Table 7. Mapping of the respondents' factors to [Salas et al.'s \(2015\)](#) core processes.

No.	Factors in the present study	Factors in Salas et al.
1.	Clear communication	Communication
2a.	Team commitment	Team coordination
2b.	Time-management skills	
3.	Ability to retrieve information from the right sources	Team cognition
4.	Work-management skills	Team cognition
5a.	Clear goals	Team cognition
5b.	Team support	

The findings of the study have several implications for online instructors and course developers. Based on the students' feedback, communication, team coordination, and time-management skills are the three most essential skills needed for effective online teamwork. Instructors should give more attention to developing these skills among learners. More opportunities to develop the skills can be created in the online collaboration assignment, such as including the skills as part of the assessment evaluation. Student interaction can be fostered by encouraging instructors to use designated instructional design consisting of tasks which help to generate communication and knowledge construction ([Strauss & Rummel, 2020](#)). Effective task management and team development can be achieved by defining the roles, tasks and responsibilities of the project managers which proves to be a useful strategy in facilitating group dynamics ([Noguera et al., 2018](#)). More emphasis on the use of technological tools, while pedagogical guidance and technical support can be provided since online collaborative tools have been identified to facilitate student interaction and promote intra-group emotional support ([Hernandez-Selles et al., 2019](#)). Instructors should also be cautious to not allow learner frustrations to be turned into negative attitudes toward online teamwork in the long run. Therefore, course developers need to consider the challenges of online collaboration when designing online learning courses and assessments. The findings also suggest the need for a different approach when preparing assessments which involves online collaborative teamwork. Further research is needed to examine the kinds of evaluation instruments appropriate for online collaborative teamwork and also to understand which variables are worth to be assessed while taking into account the challenges faced in online collaboration.

6. CONCLUSION

In order to cut off the chain of Covid-19 spread; the government has obliged the learning to be conducted online. Various platforms are used in online learning and educators have decided to include more collaborative group tasks in their courses for

students to fulfil. Based on the research, the results illustrated that online collaborative performance and team dynamics were significantly correlated. The findings confirmed the positive relationships that exist between communication tools and technological facilities with group dynamics as the former is rated highly significant in order to help students participate in an online collaborative group task efficiently. Additionally, interview responses show that learners agree that good communication, clear goals, and team commitment are important elements for successful online collaboration.

The correlational study gives an educated insight into the interplay of online collaborative learning and the performance and team dynamics of undergraduate students in online learning environments. While the findings of this study have their contribution, future research is recommended. Due to the study only focusing on two local universities, this study cannot be taken to be representative of learners in other tertiary institutions in Malaysia. However, there are still elements of the results which may be transferable to other research contexts. Future research may further look into the facets of good communication that result in effective collaborative performance, be it offline or online. The type of skill set functional for productive team coordination is also worth investigating, while the competency domains in team cognition should be identified to better understand the mental processes involved in a successful teamwork collaboration.

Online education can benefit from collaborative learning, as this teaching strategy not only fosters social presence but also promotes learning of new content knowledge and collaboration skills. As far as practical implications go, educators can leverage these benefits by rethinking the design of their online courses to incorporate elements of collaborative learning and strategies to develop a sense of team dynamics such as by providing learners with additional support that helps them engage in a productive interaction. Doing so seems to support an increase in performance when taking online courses.

In conclusion, despite the potential to enhance students' online collaborative performance, collaborative learning is demanding for learners and educators alike. Yet, we hope that our study inspires others to implement collaborative learning into their online courses, as students can greatly benefit from well-designed online collaborative learning activities.

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