

Article

Comparative Case Study of Teamwork on Zoom and Gather.Town

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Abstract: Teamwork is a strategy for successful learning. With the Coronavirus outbreak, many universities began to rely on synchronous video conferencing and/or metaverse platforms. This study examines the difference between undergraduate students' perceptions and experiences of teamwork on Zoom and Gather.Town. A mixed-method comparative case study was conducted in which a questionnaire survey was administered to 20 undergraduate students in Korea, followed by in-depth interviews and participant observation; reflective journal writing was also examined. The data were quantitatively and qualitatively analyzed. The results show that the students had a higher perception of teamwork on Gather.Town than on Zoom. Gather.Town was effective because of the sense of presence and mobility of space it afforded, the social presence it facilitated through avatars, empowerment, and openness of emotions, and the differences in the interface and social platform. The findings can aid in the selection of platforms to suit the needs of students and instructors and in the design and implementation of effective teamwork activities on the selected platform.

Keywords: teamwork; metaverse; Gather.Town; Zoom; sense of presence; sense of belonging; education for social responsibility



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1. Introduction

Teamwork has been emphasized as an important factor in successful group performance. A team is an organization distinct from a group that shares a clear goal in which close cooperative relationships are formed to achieve the goal [1]. For successful teamwork, there must be a strong sense of group consciousness, a sense of belonging based on interdependence, and open and active interaction among members [2]. With the outbreak of the Coronavirus disease 2019 (COVID-19), many educational institutions conducted their activities remotely. Teachers were faced with the challenge of conducting team-based cooperative learning activities online. Initially, team activities were conducted using real-time video-conferencing platforms such as Zoom, WebEx, and Microsoft Teams.

There have been several studies of how these real-time video-conferencing platforms have been applied in collaborative learning activities, which have reported somewhat contradictory results [3,4]. According to Lowenthal, Dunlap, and Snelson [5], real-time video-conferencing platforms are effective in alleviating the learning isolation that can manifest in distance learning and in promoting social interactions through real-time engagement; however, other studies have argued that real-time video-conferencing platforms offer limited room for interaction and collaboration with instructors and fellow students [6,7]. For example, when two or more people are talking at the same time during a video-conferencing session, it is difficult to determine which screen is the speakers. During video conferencing, participants are hesitant to participate in group discussions because they need the courage to claim the right to speak. Ultimately, these problems can create a hindrance to learning by making the participants passive [8]. Problems with real-time video conferencing include a passive attitude, such as

silence on the part of the learner and decreased concentration owing to “Zoom fatigue” from staring continuously at the camera [9,10].

Owing to the development of the metaverse environment, Gather.Town, Roblox, iFlands, and so on have begun to be used as alternative platforms for team activities. The metaverse platform allows participants to communicate and interact with others verbally and non-verbally in the virtual world through their avatars [11], thus providing an environment that enhances the sense of reality [6,12] with the distinctive characteristics of video-conferencing platforms. As a result of these characteristics, educational activities using the metaverse have increased recently. A typical example is Gather.Town, a metaverse platform used in university education. Gather.Town is a 2D-based virtual world that uses avatars, close chatting, and personal space and provides room for natural and effective team communication [6,13,14]. Therefore, a few studies sought to verify the advantages and disadvantages between real-time video conferencing and the metaverse platform. For example, one study [7] compared Spatial.io, a 3D-based metaverse platform, Gather.Town, and Zoom, and found that Gather.Town was highly effective in enabling interactions with other learners through the use of collaborative tools such as shared whiteboards and built-in board games, unlike Zoom and Spatial.io. Another study [6] compared Gather.Town and Zoom and found that the former enhanced the sense of presence in a space, promoted greater participation through fun elements, and increased social connectivity among group members, as opposed to Zoom.

The rationale for considering a differential effect of the functional differences of platforms on team activities is grounded in the affordance theory, which posits that human behavior varies based on the characteristics of the environment and how such characteristics are perceived [15,16]. The effects of the metaverse environment team activities differ from those of a real-time video-conferencing system by affording very different environmental characteristics. As the metaverse environment is in the early stages of development, it has been the subject of few studies thus far. Such research has focused on how real-time video conferencing and metaverse platforms are used in university classrooms and their advantages and disadvantages as online learning tools. However, there is a paucity of comparative studies of both platforms focusing on teamwork. Accordingly, this study examines the differences and the advantages and disadvantages of teamwork on two platforms, Zoom and Gather.Town by seeking to answer the following research questions.

1. Is there any difference in the college students’ perceptions of teamwork on Zoom versus Gather.Town?
2. What are the differences in teamwork among college students on Zoom versus Gather.Town?

This study provides insights for the selection of a platform to suit different purposes and details the processes involved in teamwork on both Zoom and Gather.Town to aid educators in designing and implementing effective teamwork activities on each platform.

2. Literature Review

2.1. Teamwork in an Online Environment

When carried out online, teamwork can compensate for the lack of social presence by facilitating students’ immersion to induce voluntary and participatory learning activities [17,18]. In the course of learning, students can acquire professional knowledge and interpersonal skills [19]. However, as the online collaborative environment is more complex than face-to-face collaboration, the following factors must be considered for the former to be successful. Teamwork in educational contexts enables dynamic learning and the ability to collaborate to achieve common team goals; inculcates in students their responsibility for learning outcomes; enhances social relationships and communication skills; and promotes the cognitive and affective domains [20,21]. The quality of learning is improved as a result, and rich learning experiences are activated through interactions among team members [22].

First, the activation of teamwork is based on team interactions, such that while each member establishes a communication and information transfer system, the team remains

interdependent in the collaboration process [23]. In online collaborative learning environments, students need effective collaboration tools that enable flexible interactions and peer support by supporting and enhancing communication, collaboration, and coordination [24,25]. Second, smooth communication between team members enhances their understanding and helps them share their feelings with each other. Ultimately, emotional exchanges are helpful in facilitating a collaborative process to achieve a given common task or goal [26]. Third, the interactions within teams can create new knowledge through the acquisition and sharing of external knowledge [27] because the knowledge, experience, and skills of each team member constitute a driving force that activates new knowledge and collaboration [28]. Fourth, team members can express and exchange emotions, form interdependent relationships, and achieve tasks based on participation and consensus. Team members solve common tasks through active communication, which affords team members learning practice that is sustainable. Learning practice is sustainable through continuous reflection and feedback. Fifth, for effective collaborative activities, it is important for each member to recognize the emotions of the other members, allowing the opinions, thoughts, and actions of the team members to be integrated through communication, and as a result, the learning process changes based on the situations of the others [27]. A team that recognizes the emotions of others can perform effective teamwork. Finally, the sense of belonging among team members is important for effective teamwork. Team members construct the knowledge they need in order to solve problems through a sense of collaborative belonging [29]. For meaningful collaborative activities in the educational context, first, a delivery and sharing system that supports the joint tasks among team members and teams is essential [30,31]. Second, close interactions between team members and teams are essential [32], as are dependence and emotional exchange. Third, a sense of team belonging [33] is very important in performing a collaborative task effectively.

2.2. Teamwork via Zoom

As non-face-to-face education has become commonplace with the outbreak of the COVID-19 pandemic, online video-conferencing systems, such as Zoom, Google Meet, and WebEx, have been relied on to support remote engagement and interactions. Virtual work environments are being used as educational environments. Universities have thus installed and used synchronous video-conferencing systems within their learning management system (LMS) [6].

Zoom was developed to support online synchronous video conferencing. It enables recording, voting, screen-sharing, text chatting, and engagements in breakout rooms. Zoom facilitates thumbnail views of all participants with video feeds if the cameras are turned on. Participant thumbnails are arranged in a grid format by default. There is also a personal speaker mode in which the speaker's video feed is enlarged, and non-speaker thumbnails are placed in a carousel view above. Zoom provides breakout rooms for group work and offers the option to randomly place people in a room or assign people to pre-configured groups. Zoom also allows space for participants to choose the breakout rooms they want to join. However, communication between breakout rooms is not possible. Therefore, while Zoom is useful for learning and is user-friendly, it has limitations in terms of the social interactions it facilitates [7].

Studies of classes conducted via Zoom have acknowledged the educational advantages and pointed out the limitations of this platform. First, classes conducted on Zoom have higher compatibility than offline classes in terms of sharing digital materials and enabling discussion and activities in breakout rooms [34,35]. Second, Zoom, through synchronous video conferencing, can increase the sense of teaching and social presence, which is a powerful learning mechanism that allows users to imitate offline interactions [36,37] because Zoom can provide an environment for collaboration as a system that can interact while seeing another person's face and listening to their voice [38,39]. Third, Zoom has a recording function allowing students to watch recorded lessons repeatedly [40]. However, owing to the functional limitations of the system, Zoom is limited in enabling interactions

between learners and instructors in the course of teamwork. First, it is difficult for an instructor to monitor the activities of the learner in real time in a small meeting room environment [41,42]. Second, there is limited intimacy owing to the lack of communication and interaction between members, given the restrictions on regular exchanges and sharing activities between teams [43,44]. Moreover, Zoom fatigue has received attention in the literature. It is defined as the physical and cognitive fatigue caused by the intensive use of Zoom, accompanied by related symptoms such as headache, fatigue, anxiety, exhaustion, discomfort, and stress [9,10].

2.3. Teamwork on Gather.Town

Gather.Town is a metaverse platform that has been used recently by universities. The primary characteristic of the metaverse is that learners communicate and interact with others verbally and non-verbally in the virtual world through their avatars [11]. Second, Gather.Town enhances spatial presence because the avatars move freely in the virtual space and interact physically [12,45]. A Zoom session is said to take place within a “room”, whereas a Gather.Town session is said to take place within a “space” [14]. Gather.Town is an intuitive, online proximity-based video-conferencing platform that provides a 2D space with an 8-bit display that is pre-designed for users to access a “space” and allows the user’s avatar to move freely within that space [6,14,46]. The platform can also interact with websites, share video files and documents, and utilize various objects to co-create and link them all together [46]. Gather.Town enables effective communication by designing specific learning spaces in advance that facilitates easy movement within the virtual classroom and collaboration spaces. This environment can promote communication between learners.

One study showed that Gather.Town has advantages over Zoom in cooperative learning as it enables free movement between private and public spaces and facilitates a sense of space, subjectivity, fun, participation, and social connection [6]. Undergraduate students had a high perception of the connectivity between peers and instructors and of the collaboration and support on Gather.Town, as well as the enjoyment of using it [47]. This positive perception, as identified in the study, emerged from the fact that Gather.Town felt like a game in which one could ask fellow learners and instructors for help, and unlike Zoom, where movement is facilitated by an instructor, the students themselves were free to move into collaborative spaces.

3. Research Methods

To answer the research questions, a mixed-method case study research (MMCSR) approach was adopted that applied quantitative and qualitative methods to gain an in-depth understanding of comparative analysis [48]. MMCSR offers unique advantages for researchers to understand and address complex research problems and issues [49] as it does not involve separate methodologies; rather, the permeable and fluid boundaries between methods allow any of them to lead and/or support research [50]. Thus, it is an appropriate research method for this study.

3.1. Case Study and Participants

This study was conducted in an undergraduate course on educational methods and technology from March to July 2022 at the Department of Education at P University, South Korea. It was a demonstration course that had been developed to strengthen the distanced-education capabilities of prospective teachers. Given the purpose of the course, it was delivered in a blended learning format, including online real-time, non-real-time, and face-to-face classes. Lectures and collaborative activities were conducted using Zoom and Gather.Town. Over 15 weeks, real-time classes were conducted on Zoom and Gather.Town, with a focus on students’ teamwork. Table 1 shows the course schedule.

Table 1. The course schedule.

Week	Teaching Methods	Key Contents and Activities
1	Face-to-face	<ul style="list-style-type: none"> ▪ Blended teaching method and learning content ▪ Orientation for learning activities ▪ Team composition
2	Online non-real-time	<ul style="list-style-type: none"> ▪ The core essence of teaching and lessons ▪ Strategies for selecting teaching methods and instructional model
3	Online non-real-time	<ul style="list-style-type: none"> ▪ Questioning strategies in lectures ▪ Habruta and game-style instructional strategies
4	Online (Zoom)	<ul style="list-style-type: none"> ▪ Cooperative Learning JIGSAW and STAD Strategies ▪ Maker Education
5	Face-to-face	<ul style="list-style-type: none"> ▪ Summary of the class model covered in the 3rd to 4th weeks ▪ Practice using ZOOM
6	Online (Zoom)	<ul style="list-style-type: none"> ▪ Teamwork: Lesson design activity 1, using the class method (1 or 2 or more) covered in Weeks 3 to 4
7	Online (Zoom)	<ul style="list-style-type: none"> ▪ Teamwork: Lesson design activity 2, using the class method (1 or 2 or more) covered in Weeks 3 to 4
8	Face-to-face	<ul style="list-style-type: none"> ▪ Presenting and sharing the results of the first task of Teamwork
9	Face-to-face	<ul style="list-style-type: none"> ▪ Real-time and non-real-time online teaching strategies
10	Face-to-face	<ul style="list-style-type: none"> ▪ Online education content creation tool (MSPPT) and editing tool (VREW) practice
11	Face-to-face	<ul style="list-style-type: none"> ▪ Intelligent Information Society (4th Industrial Revolution) and Class ▪ Get-Town Utilization Practice
12	Online (Gather.Town)	<ul style="list-style-type: none"> ▪ Online and Offline Blended Lesson Strategy ▪ Real-time and non-real-time online class blending design strategy
13	Online (Gather.Town)	<ul style="list-style-type: none"> ▪ Teamwork: Blended Lesson Design Activity 1
14	Online (Gather.Town)	<ul style="list-style-type: none"> ▪ Teamwork: Blended Lesson Design Activity 1
15	Face-to-face	<ul style="list-style-type: none"> ▪ Presentation and sharing of results of the second task of the Teamwork

While the case study covered the entire course, the students' activities centered on three weeks of using Zoom (Weeks 5, 6, and 7) and three weeks of using Gather.Town

(Weeks 12, 13, and 14). Week 5 was lecture-centered and focused on the instructional models. Weeks 6 and 7 focused on teamwork activities via Zoom, as noted above. Week 12 was lecture-centered, wherein the instructor delivered lectures on online and offline blended class strategies and real-time and non-real-time online class blending design strategies. In Weeks 13 and 14, students engaged in teamwork for the “Blended Class Design” task on Gather.Town. As several students were not familiar with learning on Gather.Town, they had to practice its use in Week 11. The participants included the instructor and 20 enrolled students of the course. The instructor holds a doctoral degree in Educational Technology and had taught university courses in the field for 15 years at the time of the study. She developed the course with the strong intention of enhancing students’ capacities to cope with the educational environment of the future by equipping them with the competencies to use advanced teaching methods and cutting-edge educational technologies. The aim was to focus on cultivating the core competencies of future education and learning, such as complex problem-solving abilities, creativity, social–emotional competency, negotiation, judgment, and decision-making abilities. There were 20 participants, comprising 12 sophomores, 7 juniors, and 1 senior. There were 6 male and 14 female participants. All participants were undergraduate students at P university at the time of the study. Table 2 presents the participants’ demographic information.

Table 2. Demographic information of the participants ($N = 20$).

Classification		N (%)	Classification	N (%)	Classification	N (%)	
Sex	Male	6 (30%)	Proficiency with Gather.Town	Not proficient	Humanities and Social Science	16 (80%)	
	Female	14 (70%)		Less proficient			2 (10%)
Year of university studies	Sophomore	12 (60%)		Average	9 (45%)	Science and Technology	3 (15%)
	Junior	7 (35%)		Proficient	4 (20%)		
	Senior	1 (5%)		Highly proficient	5 (25%)	Physical Education	1 (5%)

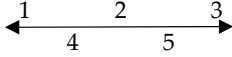
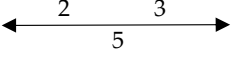
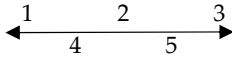
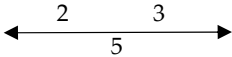
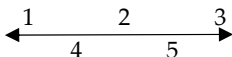
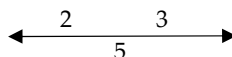
Originally, 24 participants had enrolled in the course at the School of Education, but 4 of them were excluded because of their insincere responses to the questionnaire. Of the rest, 18 had above-average proficiency with Gather.Town. In the first class, students were informed of the purpose of the study and were asked if they wanted to participate. All of them agreed to participate voluntarily. Participants were placed in groups of five or six for teamwork activities. There were five teams in all, including students from two or more majors. For effective collaboration, teams were formed in the first week of the course. Team building activities were initiated that involved the students’ creating team names and slogans and building team characters.

3.2. Quantitative Data Collection and Analysis

Quantitative data collection and analysis were focused on understanding the level of students’ experience and perception of teamwork on Zoom and Gather.Town. To develop the questionnaire, a literature review was conducted with a focus on teamwork in online learning, especially on Zoom and Gather.Town. The literature review focused on a study that compared Zoom and Cooperative Learning in Gather.Town [6] and questionnaires that were used in previous studies [51–55]. The questionnaire used in the current study comprised 10 questions focusing on six areas drawn from the literature review: the vitalization of team activities, the formation of relationships among team members, the interactions

among teams, the expression of emotions, the recognition of others' emotions, and the formation of a sense of belonging. Items in the questionnaire were rated on a 5-point Likert scale that ranged from not at all to very much. A "Schematic Rating Scale" was used. An example of the questionnaire is shown in Table 3. To analyze the differences in perception of teamwork experiences on Zoom and Gather.Town, an independent-samples *t*-test was performed, and SPSS 26 was used for analysis.

Table 3. Example survey questions.

Zoom	Question	Gather.Town
	Support to vitalize team activity	
	Support to form relationships between team members	
	Support to increase interaction between teams	

3.3. Qualitative Data Collection and Analysis

For qualitative data collection, a combination of methods was used, including a review of the students' and instructors' reflection journals, in-depth interviews, and document analysis [56]. First, all participants were asked to maintain reflection journals during and after the course. The reflection journals served as an effective source of data on the participants' emotions and feelings, latent learning, and growth that are not easily elicited through other methods. All 24 students were initially asked to carry out this step, though, as mentioned, 4 were excluded for their insincere responses. The researchers provided the participants with guiding questions and limited guidelines for a more purposeful production of a good-quality reflection journal [57]. The guiding questions for the reflection journal were as follows: "How was the interaction among team members on Zoom and Gather.Town?," "How do emotional expressions and exchanges take place among team members?," and "What were the advantages and disadvantages of using Zoom and Gather.Town for teamwork? Please write two or more items for each." The reflection journals for students and instructors had 65 and 15 pages in all, respectively. Second, in-depth interviews were conducted with six students and the instructor. As the instructor was one of the authors of this study, another researcher interviewed the instructor. Two researchers conducted interviews with three students each. The interviews were audio-recorded for transcription and analysis. In all, the student interviews took 11 h, and the instructor interview took 2 h. All interviews were semi-structured. Key interview questions were provided beforehand to allow the participants to consider their answers. Table 4 lists the interview questions.

A qualitative analysis was conducted to identify the differences in the characteristics of students' teamwork between Zoom and Gather.Town. This was followed by an initial code generation process that resulted from the interplay of research questions and data gathered. The data collection and analysis influenced and shaped each other through interactive cycles in the research process. Based on the analysis, four main characteristics distinguished teamwork on Zoom from that on Gather.Town were identified.

Table 4. The interview questions.

Participants	Interview Questions
Students	<ul style="list-style-type: none"> ▪ Which of the online learning forms do you prefer over the other and why? ▪ How was your participation in the online learning in Zoom class and Gather.Town? ▪ How differently did you express your feelings in the two settings? ▪ Which was more effective for Teamwork and why? ▪ What made effective your learning and interaction with others in online learning?
Instructor	<ul style="list-style-type: none"> ▪ What was the major purpose of designing and delivering the course? ▪ In your experience as the instructor, how different were the students' engagement and depth of learning in both forms? ▪ If there were differences, what were they? What do you think made the difference? ▪ What are the strengths and weaknesses of using Zoom and of Gather.Town?

Table 5 presents the four themes, sub-themes, and codes.

Table 5. Data analysis.

Themes	Sub-Themes	Codes
Sense of presence	Intuitive function (menu) of the platform	Easy-to-learn functions of the avatar (dancing, clapping, etc.)
	Sense of presence	Classroom-like environment Students (avatars) sitting on the chairs Special mobility
	Attention and focus	Decentered management free movement between teams
Exchange of emotion	Emotional expression	Use of emoticons and avatars
	Recognizing others' emotions	Visualization of emotion Word balloon
Sense of belonging	Non-verbal exchange	Gestures of avatars ZZZZZ keys
	Intimacy	Easy development of intimacy Strong sense of intimacy between students and between each student and instructor
Multi-dimensional interaction	Tools of communication	Speech bubbles, avatars
	Active and quick feedback	The function of visiting other teams

4. Results

4.1. Quantitative Results

The results captured the students' perceptions of teamwork on Zoom and Gather.Town (Table 6). The perceptions of students about teamwork using Zoom and Gather.Town were 18.95 and 26.75, respectively. The mean difference was statistically significant ($t = -6.183$, $p < 0.001$). In all items, that is, activation of teamwork, relationships among team members,

team interactions, expression of one's emotions, recognition of others' emotions, and a sense of belonging, the average of teamwork using Gather.Town was higher than Zoom. The mean difference was statistically significant. Thus, Gather.Town provided more support than Zoom, which is essential for teamwork.

Table 6. Differences in the perceptions of teamwork on Zoom and Gather.Town.

	ZOOM		Gather.Town		<i>t</i>	<i>p</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
activation of teamwork	3.25	1.07	4.75	0.44	−5.790 ***	0.000
relationships between team members	3.25	0.97	4.70	0.47	−6.033 ***	0.000
team interactions	2.95	1.19	4.25	0.79	−4.074 ***	0.000
expression of my emotions,	3.00	0.92	4.30	0.86	−4.611 ***	0.000
recognition of the emotions of others	3.20	1.01	4.10	0.79	−3.151 **	0.003
a sense of belonging	3.30	1.03	4.65	0.49	−5.290 ***	0.000
Total	18.95	4.93	26.75	2.73	−6.183 ***	0.000

** $p < 0.01$, *** $p < 0.001$.

4.2. Why Do Students Prefer Gather.Town to Zoom

This section presents the results of the analysis of the qualitative data collected through reflection journals and in-depth interviews. The qualitative data supported the quantitative results in that most participants responded that their teamwork on Gather.Town was freer, more effective, and more meaningful. This section discusses the distinctive characteristics of the students' teamwork on Gather.Town and Zoom.

4.2.1. Sense of Presence

A heightened sense of presence on Gather.Town vitalized teamwork more than on Zoom. The qualitative data showed teamwork on Gather.Town to be far more vitalized than on Zoom because the former offered students an environment in which they experienced teamwork on par with that in a face-to-face classroom environment. First, objects such as desks, chairs, avatars, blackboards, and the total view of the classroom on Gather.Town gave the students a strong sense of special presence. On Zoom, the students felt that their activities were confined to small "rooms" in which they only recognized their team members and classroom-like objects such as desks, chairs, boards, and spaces between sets of desks. Unlike on Zoom, students on Gather.Town were able to see their team members and other teams, instructors, desks, chairs, and avatars. Owing to such functionalities of Gather.Town, there was a sense of presence, and the participants engaged in more teamwork. Some of the students' reflection journals and interviews are presented below.

Zoom is like a video conference, but Gather.Town is an online classroom . . . (omitted)...In an online virtual world, the characters sit together in the classroom looking at the teacher, so it feels like we are sitting and taking a class together (Interview with Min Jun).

Although it is a non-face-to-face class, in Gather.Town I had the impression that I was directly participating in the class rather than sitting in front of the camera (Interview with Do Yoon).

Gather.Town is highly realistic because it has a desk, chair, and blackboard, like a real classroom (Interview with Woo Jin).

Mobility, or the possibility for students to move around, is another feature of Gather.Town that enhanced the students' sense of presence. Students reported that it promoted their participation in team activities by enhancing their sense of reality. On Zoom, when an instructor creates and allocates students to breakout rooms, they move into small rooms where

they remain until their activities end. On Gather.Town, students can move around freely in the classroom, meet and talk to the instructor, and visit other team rooms whenever they want. In the process, students are more active in their team activities. The following excerpts show how students experienced the mobility feature on Gather.Town:

In Zoom, when the professor suddenly put us in the small meeting rooms. Then the kids didn't talk for 10 min because everyone looked at each other...(omitted)...it just suddenly moves like this, and it's a bit difficult to grasp what is going on...(omitted)...But if you want to say something to the professor in Gather.Town, you can go out and find the professor. However, in Zoom, I have to wait for the professor to come in, so I think the time to have such silence is probably a little longer in Zoom (Interview with Woo Jin).

I encouraged them to go to other teams to see collaborative activities, but honestly, I didn't think they would, but students freely and actively go to other teams to listen to stories and go back to their own teams to share and do upgraded assignments. The activity of avatars can be seen going to different teams, so I was able to confirm that part (Instructor's interview).

Figure 1 below maps a student's movement in the course of teamwork on Gather.Town. The student moved from his own to other teams in order to understand the activities unfolding in each one. He visited the instructor to ask for support for his team. He then returned to his own team and reported what he had gathered. This way, students were active learners on Gather.Town, as they felt that they were in a real classroom.

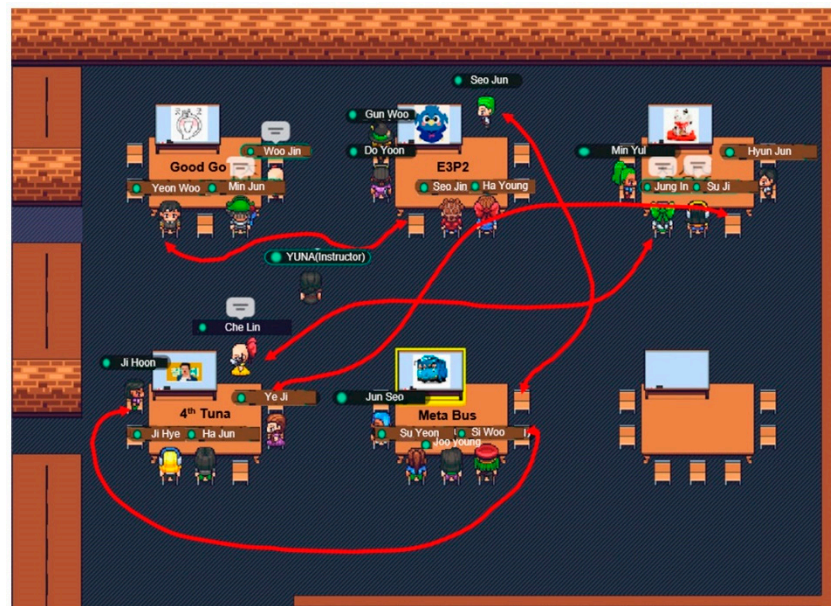


Figure 1. A student's movements during teamwork on Gather.Town.

The sense of spatial presence on Gather.Town was linked to the enhancement of social presence for several students. Their avatars on Gather.Town made the students feel that others were listening to them, as the avatars expressed gestures and emotions when they spoke. Many students reported that they felt that they were speaking to nobody on Zoom, as some students often turned off their cameras. However, on Gather.Town students expressed their responses and emotions more freely by controlling their avatars. Shier students became more comfortable with expressing themselves so that others felt that they did exist and spent time really listening to them. The lack of a sense of presence made online teamwork on Zoom difficult and less engaging for students [6,12]. Zoom, which is arguably the most commonly used platform for online learning, offers limited possibilities for students to feel a strong sense of presence [6,7]. Gather.Town was more powerful in enabling the sense of presence within the classroom-like space.

4.2.2. Exchange of Emotions

On Gather.Town, students expressed and shared their emotions more freely with others. The features of Gather.Town made the students engage more in classroom activities and feel more connected to other students. The difference in the interface between both platforms highlighted the differences in the recognition and expression of emotions and the process of opening up and sharing emotions among team members, as affordance theory shows that different environments make students act differently [16]. When students express their emotions more freely, they build intimacy with each other. When they are drawn toward each other, they participate more actively in teamwork. On Zoom, it is difficult to accurately read the emotions of the other person unless the camera is turned on. Gather.Town provides various emojis so that students can convey their emotions more diversely and vividly. On Gather.Town, emojis are displayed on the avatar, which makes it easier and more realistic to express and read emotions. The excerpts below show how students felt about using avatars and emojis:

When using the emotion expression function in Zoom, the attention of the participant is concentrated on me, and I felt concentration anxiety. However, in the case of Gather.Town, I expressed my emotions and responses whenever I wanted without any hesitation, free from concentration anxiety (Interview with Yeon Woo).

I am an introverted person, you know, so it is not easy for me to express my opinion and my feelings in a class....In Gather.Town, I am able to express my emotions through emojis and dancing functions without having to speak directly... (omitted). ...When collaborating or discussing face-to-face or on Zoom, it is difficult to express emotions because there are friends who are shy and passive like me, but I think this was easy in an environment like Gather.Town (Interview with Si Woo).

The instructor noted that shy students actively expressed their emotions and responses through their avatars. The instructor said that “students who were passive in Zoom expressed themselves using emoji and dancing functions in Gather.Town. I think that students can do it because they do not need to do it with their faces on zoomed-in cameras, which makes them nervous” (instructor’s journal).

Openness in expressing emotions marks the representative difference between both platforms in terms of emotional exchange. Zoom creates an environment where it is difficult to express emotions comfortably without attracting the attention of others in a rather stiff meeting atmosphere. Gather.Town creates an open environment where passive and shier students can express their emotions easily. The game-like functions of avatars on Gather.Town made the students feel comfortable and helped them express their emotions, and the jumping and dancing functions of avatars were fun components of Gather.Town. The burden of openness to emotions was reduced on Gather.Town, because students could express their emotions through an agent that represented them best. The freedom in the process of opening up and expressing and sharing emotions on Gather.Town promoted emotional exchange among the team members. Whereas this feature may seem strange to people in the West, it can be interpreted from a cultural perspective. Korean students are far more vigilant about expressing their emotions and opinions in spaces and occasions like the classroom. Avatars thus afforded them alternative means to express themselves. As a student wrote in her journal: “I thought that Koreans feel pressure to express their feelings and opinions in a face-to-face environment. For this reason, I think that using Gather.Town, emotional exchange is relatively comfortable and smooth compared to zooming or face-to-face classes through avatars, etc.” (Woo Jin’s journal). Emotional exchange is a crucial component of successful teamwork in learning. Connelly and Turel [58] found that the level of free exchange of emotion affected the quality of teamwork positively in virtual team performance. Emotional authenticity was crucial for the participants. When they compared their teamwork on Zoom and Gather.Town, students reported that they freely expressed their emotions and perceived others’ emotions on Gather.Town, feeling that there were, in fact, others present when they spoke or did something. The authenticity of emotional expression and the sense of presence were thus strongly connected.

4.2.3. Sense of Belonging

Students' increased sense of belonging was another characteristic of their teamwork on Gather.Town. The quantitative analysis showed that there was a statistically significant difference between Zoom and Gather.Town in the sense of belonging. The qualitative data strongly support the quantitative result that Gather.Town creates a positive atmosphere that increases the sense of belonging among team members. The sense of belonging is the most important component of all types of learning environments for students to do well [59], as it improves their academic engagement and achievement and enhances their self-confidence and self-efficacy [60–62]. Building a sense of community and belonging is always challenging for instructors, especially in online learning settings [63]. The instructor in this study was no exception, as she had also experienced problems in building a strong sense of belonging online. However, she found that using Gather.Town helped build a sense of community among student teams, thus increasing their sense of belonging. Here, we identify the aspects of Gather.Town that increased students' sense of belonging in their teamwork online.

First, the modes of non-verbal communication on Gather.Town facilitated a positive team atmosphere and increased the students' sense of belonging. On Gather.Town, various functions of non-verbal communication, such as gestures, raising hands to express agreement, dance moves, and playful avatar behaviors, helped dissolve any tension and hesitancy on the part of students and created a pleasant team atmosphere.

Zoom lacks non-verbal clues due to its small screen....(omitted) Gather.Town can create a positive team atmosphere by allowing us to use many functions such as hand gestures and gestures that contain expressions of agreeing to the other person's opinion. I was able to create a pleasant team atmosphere by using the Z key to make the avatar dance (Interview with Ha Jun).

Considering Gather.Town, such a playful gesture could melt the tension between the members.... In particular, the dance gesture made it possible for us to collaborate in a joyful team atmosphere (Interview with Ji Hoon).

Owing to the increased sense of belonging, teamwork on Gather.Town was perceived differently by students and the instructor as being from that on Zoom. The participants considered Zoom task-oriented and Gather.Town relationship-oriented.

In Zoom, I really felt that I was there only to get the task done, to accomplish what I was supposed to do, but in Gather.Town, it was different. The team atmosphere was comfortable and friendly by allowing fun, sometimes even private, communication with the team members (Interview with Seo Jun).

While Zoom is almost 100% task-oriented, Gather.Town was less task-oriented as some of the students' conversation was not about the task but about other issues and themselves. While Zoom is a completely public space, as students perceive, Gather.Town seems to be a combination of public and private spaces at an appropriate level (Instructor's journal).

The students' personal communication about private matters may be seen as a kind of distraction from the task. However, this was not necessarily the case, as it allowed students to get to know each other and build a stronger sense of belonging among themselves. How can a sense of belonging gain strength without members getting to know each other? The students' private conversation was not harmful to teamwork but rather contributed to teamwork by increasing their sense of belonging.

Gather.Town enhanced the sense of belonging by increasing students' awareness and visualization of team activities. It has a classroom, desks, chairs for all students, and rooms for team activities, so team member avatars gather in the space. Students are aware of each other's existence. Visualizing other students' gestures, emotions, and movements can increase their awareness of their existence. The visually evident instructor also contributes to students' sense of belonging. Unlike Zoom, on Gather.Town, students always see the instructor's avatar and feel that the instructor can come to the team anytime, and vice versa. They are in a team space and do not feel that they are confined by the space. They do not feel disconnected from other teams or the instructor. Gather.Town thus allows students to

feel that they are one with other students and the instructor within a shared space. One student reflected on this as follows:

I feel like Gather.Town is more dynamic than Zoom. When I was doing teamwork activities, I didn't just suddenly move to a small meeting room, but rather I felt that I was moving to the room with other students. By doing this and seeing the others' avatars, I felt that the team's cohesion was strengthened. There was definitely a feeling it gave (Interview with Jun Seo).

The students and instructor experienced a sense of belonging far more strongly on Gather.Town than on Zoom owing to the features we explained above. As Gather.Town allows students to create far broader and less complicated spaces online, the students' sense of belonging with special awareness gained strength, which can offer alternative possibilities and create a more engaging teamwork environment.

4.2.4. Multi-Dimensional Interactions

As the quantitative results show, increased and active interactions were revealed as major characteristics of Gather.Town. Whereas interactions on Zoom are more rigid and one-way, interactions on Gather.Town are flexible, interactive, and more student-driven, as the platform allows students to actively search for interaction opportunities among team members, between teams, and with the instructor. The level of interactions within and between teams is crucial for teamwork learning regardless of the learning environment, an important and well-known aspect of collaborative learning pointed out in the early 1970s [64,65]. In online learning settings, especially after the outbreak of COVID-19, students and instructors experienced challenges in effective interactions online [66]. However, online learning can be effective for teamwork with increased interaction, given the possibility for and accessibility of multilevel interaction, resource sharing, and higher-order thinking skills [67]. With the benefits of advanced technology, students can be co-creators of the learning contents and subjective learning agents who lead the interaction within and between teams [68]. The qualitative analysis revealed the dimensions and ways in which Gather.Town promotes interactions in the course of students' online teamwork more effectively than Zoom. First, Gather.Town and its functionalities helped students interact with other team members in freer and more simultaneous and interactive ways than Zoom. The excerpts below show how students experienced interaction in the course of their teamwork.

In the case of Gather.Town, you can use it freely because your own conference room is always open. This means you can publish and view material at any time, but Zoom has the constraint of posting and sharing only at that time in real time (Interview with Gun Woo).

Everyone at Zoom turns off their microphones and gains the right to speak, so there is definitely a sense of pressure. There is a sense of pressure and pressure about that kind of thing, so I can't talk more comfortably, and I'm more careful about my words and actions... (Interview with Ha Jun).

Zoom is based on real-time data sharing and interaction. Only one student's opinion or data can be shared at a time. However, Gather.Town allows multiple students to share data and opinions simultaneously, as the team activity space on Gather.Town is always open for all students to freely post and share information. The visualization of interactions through speech bubbles and avatars makes students feel that their interactions are live and vivid. On Zoom, students have to attract the attention of other members and speak alone without fully knowing whether others are listening, which makes some of them hesitant to speak. On Gather.Town, any student can speak and share at any time without feeling burdened.

More dramatic differences were observed in interactions between teams. Interactions between teams took place more actively on Gather.Town than on Zoom. Students visited other teams frequently to learn about their situation or to share opinions while performing a task. This was astonishing and was not seen on Zoom. Students found visiting and listening to another team a fun factor in online engagement.

In each small meeting room on Zoom, the instructor can participate with teams in the middle of the meeting, but it is difficult for other students to know what is going on in other rooms. It is difficult for students to share their opinions and give feedback between teams (Interview with Ji hoon).

In the case of Gather.Town, I felt that it was very effective in terms of data sharing, as you could see the results of other teams (Interview with Seo Jin).

I think it was more fun when we had meetings with other groups and secretly watched them. I think I laughed a lot at that (Interview with Ji Hoon).

On Gather.Town, students actively and frequently interacted with their instructor. On Zoom, students had to wait for the instructor to enter their room, and they never knew when the instructor would visit. On Gather.Town, students could go to the instructor whenever they had questions or needed advice or guidance, and they did so frequently. Gather.Town significantly reduced the burden on students who felt encumbered to seek their instructors' help. The excerpts presented below show how students and the instructor experienced interactions among themselves.

In the case of Gather.Town, you can directly ask questions to the professor during team activities and watch other groups' activities. I felt the teamwork was more lively and effective because of the features of Gather.Town (Interview with Jun seo).

In the case of Zoom, I have to visit each small room, but there is a limit to providing immediate feedback. Especially on Zoom, students don't know where I am. Yet, in the case of Gather.Town, students know where I am and what I am doing. There is no waiting for students to ask me questions through chat, and I can come to them right away to give them feedback and comments on their work (Instructor's interview).

From the instructor's point of view, Gather.Town is far more effective in terms of checking what is going on with the students. The instructor felt that, while Gather.Town can be distracting in some ways, it promotes interactions during their teamwork activities. Given that interaction is a fundamental element for effective teamwork, Gather.Town was far more powerful than Zoom. Finally, not all students preferred Gather.Town for its features and its impact on teamwork over Zoom. Some presented different experiences and perceptions of the characteristics discussed above. For example, most students considered simultaneous data sharing on Gather.Town useful and positive, whereas some found it distracting.

In this section, we provided the four aspects of students' teamwork experiences on Gather.Town and Zoom. Overall, Gather.Town provided students with more interactive, freer, and more effective teamwork opportunities. In terms of the quality of students' teamwork process and the outcome, the instructor strongly felt the quality of the learning process and product produced through Gather.Town was significantly superior to those of Zoom settings:

The teamwork task of the Gather.Town classes was to design a teaching plan for a blended class. For Zoom classes, it was to design a lesson plan using one or more of the teaching methods, such as Habruta classes, make-up classes, and these cooperative learning classes that I had already taught. The teamwork task for Gather.Town classes was much more difficult than that of Zoom classes. I marked their products using a rubric, and the result was surprising. The products of the Gather.Town classes earned much higher scores than the Zoom products. When looking at the students' level of satisfaction, it was found that their satisfaction with their learning outcomes on Gather.Town was much higher than in Zoom classes (Instructor's interview).

Considering the instructor's evaluation of the learning products, it can be argued that students' teamwork in Gather.Town enabled a higher quality of learning products than on Zoom. In this respect, we conclude that the Gather.Town environment strengthens the four aspects of teamwork activities that contribute to the improvement of learning processes as well as products [19–22].

5. Conclusions

Learning based on teamwork had a positive effect on the learning process and outcomes by inducing the active participation of learners [22]. As online learning has grown with the outbreak of COVID-19, research on teamwork in an online environment has gained importance. The online learning environment can be synchronous or asynchronous, and the process and results of teamwork activities vary based on the type of platform. In this study, learners perceived Gather.Town as more effective than Zoom in facilitating team activities, the exchange of emotions among team members, a sense of belonging, and interactions within and between teams. These results can be interpreted through affordance theory, according to which the possibility of behavior varies based on the environment in question [15,16]. The environment, functions, and interfaces provided by Zoom and Gather.Town's platforms influenced teamwork.

Unlike Zoom, Gather.Town provided a positive environment for team activities by enabling a sense of presence in the space. According to the learners, Zoom had a passive characteristic of sitting in front of a camera. Gather.Town offers a sense of reality as though one were in a real classroom, with objects like desks, chairs, and blackboards and spatial mobility through avatars. The sense of presence enhances participation in team activities. Studies have shown that metaverse platforms like Gather.Town enhance the sense of physical presence in an environment such as an actual classroom [6,12], and spatial mobility through avatars promotes a sense of learning control and collaboration among learners [69]. Gather.Town promotes teamwork with its gaming-like features, where individuals can decorate their avatars and team spaces and have the ability to move, dance, and jump via their avatars. Game-like features of metaverse platforms such as Gather.Town enhance learner interest [6,47]. According to the situational interest theory, transient characteristics or stimuli in the environment arouse interest in learning topics [70,71]; these situational interests increase learning participation [72]. From this perspective, Gather.Town can be interpreted as promoting participation in teamwork by enhancing situational interest more strongly than Zoom.

Gather.Town facilitated an emotional exchange by making it easier for members to express and share their emotions. Emotional exchanges among team members increase interdependence and help them achieve a common task or goal [26,73]. Zoom creates a rigid video-conferencing atmosphere, but Gather.Town creates a positive team atmosphere by enhancing the social presence of peers through avatars. Gather.Town allows users to display emoticons directly on the avatar's head, which makes it easy to express and exchange emotions. On Gather.Town, an avatar's dancing and jumping behaviors create a positive and open team atmosphere that makes it easy to express and share emotions. Studies have shown that social interactions through avatars enhance emotional rapport [5,73].

Unlike Zoom, Gather.Town increased members' sense of belonging by providing a more sociable platform function. It increased the sense of belonging through the provision of team space and visualization of team spirit, which Zoom could not provide. Gather.Town provides an independent team space through team desks and chairs and allows team symbols or team names to be expressed in the team space. In addition, the dynamic movement of team members' avatars in the team space contributes to enhancing solidarity, intimacy, and a sense of belonging to the team. A sense of team belonging is very important in performing teamwork effectively. Team-belonging encourages active participation in teamwork by promoting responsibility among team members [33,74], revealing that the presence of one's own and one's colleagues' avatars in the metaverse environment itself promotes the connection between colleagues and raises a sense of community.

Unlike Zoom, Gather.Town facilitates interactions among team members, given its various functional characteristics. Learners said that Zoom created a rigid video-conferencing atmosphere that encouraged passive interactions owing to the burden of gaining a voice and speaking. However, Gather.Town promotes interactions among team members through its game-like features by cultivating a sense of belonging among team members, increasing opportunities for emotional exchange, and facilitating easy transitions between

open and private conversations through its chat functions. The most dramatic interaction on Gather.Town is the capacity it affords for interactions between teams. Learners can easily access other teams' spaces and activities, so interactions among teams remain active. In online learning, interactions among students are reduced owing to the lack of social presence [75,76], so enhancing such interactions can have a significant impact. Najjar [47] found that Gather.Town increased access to instructors and peers for questions and collaborations more than Zoom did. The characteristics of Gather.Town that naturally promote intra- and inter-team interactions can promote student immersion and participation in the team collaboration process.

Various online platforms have been provided that allow members to collaborate effectively in an environment where they cannot easily meet physically. However, it is an increasingly important challenge to select an appropriate online collaboration platform according to the given environmental constraints, the nature of the collaboration task, and the characteristics of necessary interactions among members. This study provides basic information necessary for making such decisions by revealing how the characteristics and functions provided by Zoom and Gather.Town platforms affect the affordance of team collaboration.

6. Limitations and Future Research

This study has several limitations. First, it did not involve an experimental control group design. Thus, we were unable to verify the relative impacts of Gather.Town and Zoom on team collaboration. Future research should focus on the relative effectiveness of the two platforms through an experimental design. Second, this study was conducted in a university setting. Conducting the same study with elementary and secondary schools would serve to verify whether teamwork on online platforms manifests differently across age groups.

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References

1. Harris, P.R.; Harris, K.G. Managing effectively through teams. *Team Perform. Manag.* **1996**, *2*, 23–36. [[CrossRef](#)]
2. Fisher, S.G.; Hunter, T.A.; Macrosson, K.W.D. Team or group? Managers' perceptions of the differences. *J. Manag. Psychol.* **1997**, *12*, 232–242. [[CrossRef](#)]
3. Mejia, R.M.; Meraz, J. Video conferencing: A global alternative for education majors to learn from their peers. *Insights Chang. World J.* **2011**, *1*, 3–9.
4. Strijbos, J.-W.; Fischer, F. Methodological challenges for collaborative learning research. *Learn. Instr.* **2007**, *17*, 389–393. [[CrossRef](#)]
5. Lowenthal, P.R.; Dunlap, J.C.; Snelson, C. Live synchronous web meetings in asynchronous online courses: Reconceptualizing virtual office hours. *Online Learn. J.* **2017**, *21*, 177–194. [[CrossRef](#)]
6. Latulipe, C.; De Jaeger, A. Comparing student experiences of collaborative learning in synchronous CS1 classes in gather. Town vs. zoom. In Proceedings of the 53rd ACM Technical Symposium on Computer Science Education, Providence, RI, USA, 2–5 March 2022; pp. 411–417. [[CrossRef](#)]

7. Sriworapong, S.; Pyae, A.; Thirasawasd, A.; Keereewan, W. Investigating students' engagement, enjoyment, and sociability in virtual reality-based systems: A comparative usability study of spatial. io, Gather. town, and Zoom. In Proceedings of the International Conference on Well-Being in the Information Society: When the Mind Breaks, Turku, Finland, 25–26 August 2022; Volume 1626, pp. 140–157. [[CrossRef](#)]
8. Serhan, D. Transitioning from face-to-face to remote learning: Students' attitudes and perceptions of using zoom during COVID-19 pandemic. *Int. J. Technol. Educ. Sci.* **2020**, *4*, 335–342. [[CrossRef](#)]
9. Pfund, G.N.; Harriger, J.; Hill, P.L. Video chat usage and the big five in women during the COVID-19 pandemic. *Pers. Individ. Dif.* **2021**, *171*, 110537. [[CrossRef](#)] [[PubMed](#)]
10. Riedl, R. On the stress potential of videoconferencing: Definition and root causes of Zoom fatigue. *Electron. Mark.* **2022**, *32*, 153–177. [[CrossRef](#)]
11. Tilak, S.; Glassman, M.; Kuznetcova, I.; Peri, J.; Wang, Q.; Wen, Z.; Walling, A. Multi-user virtual environments (MUVes) as alternative lifeworlds: Transformative learning in cyberspace. *J. Transform. Educ.* **2020**, *18*, 310–337. [[CrossRef](#)]
12. Ziker, C.; Truman, B.; Dodds, H. Cross reality (XR): Challenges and Opportunities across the Spectrum. In *Innovative Learning Environments in Stem Higher Education: Opportunities, Challenges, and Looking Forward*; Springer: Berlin/Heidelberg, Germany, 2021; pp. 55–77. [[CrossRef](#)]
13. Harapan, E.; Fitria, H. The interpersonal communication skills and perceptions of the leadership style on teachers' commitment. *J. Iqra' Kaji. Ilmu Pendidik.* **2021**, *6*, 140–153.
14. Fitria, V.; Al Giffari, H.A.; Al Falah, D.; Razin, M.Z. Analyzing the practice of South Korea's public diplomacy in Indonesia: An approach with communication pyramid of public diplomacy. *J. Soc. Stud.* **2021**, *17*, 197–220. [[CrossRef](#)]
15. Chemero, A. An outline of a theory of affordances. *Ecol. Psychol.* **2003**, *15*, 181–195. [[CrossRef](#)]
16. Gibson, J. *The Ecological Approach to Visual Perception*; Houghton Mifflin: Boston, MA, USA, 1979.
17. Jonassen, D.M.; Land, S. *Theoretical Foundation of Learning Environment*; Rawrence Erlbaum Associates Publishers: Mahwah, NJ, USA, 2000.
18. Palloff, R.M.; Pratt, K. *Building Learning Communities in Cyberspace: Effective Strategies for the Online Classroom*; Jossey-Bass Publishers: San Francisco, CA, USA, 1999.
19. Zhang, Y. Practice on curriculum teaching of microcomputer principles and interface technology based on CSCL. In Proceedings of the 8th International Conference on Computer Science & Education, Colombo, Sri Lanka, 26–28 April 2013; pp. 1363–1367. [[CrossRef](#)]
20. Barkley, E.F.; Major, C.H.; Cross, K.P. *Collaborative Learning Techniques: A Handbook for College Faculty*, 2nd ed.; Jossey-Bass: San Francisco, CA, USA, 2014.
21. Klischner, P.A. Using integrated electronic environments for collaborative teaching/learning. *Res. Dial. Learn. Instruct.* **2001**, *2*, 1–9.
22. Myers, J. Cooperative learning: A personal journey. *J. Educ.* **1992**, *174*, 118–143. [[CrossRef](#)]
23. Mathieu, J.E.; Heffner, T.S.; Goodwin, G.F.; Salas, E.; Cannon-Bowers, J.A. The influence of shared mental models on team process and performance. *J. Appl. Psychol.* **2000**, *85*, 273–283. [[CrossRef](#)]
24. Strijbos, J.W.; Martens, R.L.; Jochems, W.M.G. Designing for interaction: Six steps to designing computer-supported group-based learning. *Comput. Educ.* **2004**, *42*, 403–424. [[CrossRef](#)]
25. Sellés, N.H.; Sanmamed, M.G.; Carril, P.C.M. Planning collaborative learning in virtual environments. *Comun. Media Educ. Res. J.* **2014**, *22*, 25–32. [[CrossRef](#)]
26. Jarvenpaa, S.L.; Leidner, D.E. Communication and trust in global virtual teams. *Organ. Sci.* **1999**, *10*, 791–815. [[CrossRef](#)]
27. Dechant, K.; Marsick, V.J.; Kasl, E. Towards a model of team learning. *Stud. Contin. Educ.* **1993**, *15*, 1–14. [[CrossRef](#)]
28. Nonaka, I.; Takeuchi, H. The Knowledge-Creating Company. How Japanese companies create the dynamics of innovation. *Long Range Plann.* **1996**, *4*, 592. [[CrossRef](#)]
29. Johnson, D.W.; Johnson, R.T. (Eds.) *Cooperation and the Use of Technology*; Simon & S. Macmillan: New York, NY, USA, 1996.
30. Henri, F.; Rigault, C. *Collaborative Distance Education and Computer Conferencing*; Springer: Berlin, Germany, 1996.
31. Panitz, T. Collaborative versus Cooperative Learning: A Comparison of the two Concepts which will Help Us Understand the Underlying Nature of Interactive Learning. *Creat. Educ.* **1999**, *3*, 2–13.
32. Graham, J.R.; Barter, K. Collaboration: A social work practice method. *Fam. Soc.* **1999**, *80*, 6–13. [[CrossRef](#)]
33. Stoytcheva, M. Developing a sense of belonging in a collaborative distance learning course: Breaking isolation in online learning. In *AIP Conference Proceedings*; AIP Publishing LLC: Melville, NY, USA, 2020; Volume 2333. [[CrossRef](#)]
34. Alia, N.N.; Antasya, N.A.; Aireen, N.E.; Amy, N.N.; Malthane, B.R. Students' perceptions of zoom video conferencing platform during the Covid-19 pandemic: A case of Malaysian University. *J. Manag. Educ.* **2022**, *5*, 51–64. [[CrossRef](#)]
35. Gordon, M. Synchronous teaching and learning: On-Ground versus Zoom. *Int. J. Educ. Hum. Dev.* **2020**, *6*, 11–19.
36. Conklin, S.; Garrett Dikkers, A.G. Instructor social presence and connectedness in a quick shift from face-to-face to online instruction. *Online Learn.* **2021**, *25*, 135–150. [[CrossRef](#)]
37. Wallace, S.; Schuler, M.S.; Kaulback, M.; Hunt, K.; Baker, M. Nursing student experiences of remote learning during the COVID-19 pandemic. *Nurs. Forum* **2021**, *56*, 612–618. [[CrossRef](#)] [[PubMed](#)]
38. Lipponen, L. Exploring foundations for computer-supported collaborative learning. *CSCL.* **2002**, *2*, 72–81. [[CrossRef](#)]

39. Paavola, S.; Lipponen, L.; Hakkarainen, K. Epistemological foundations for CSCL: A comparison of three models of innovative knowledge communities. In Proceedings of the Computer Support for Collaborative Learning: Foundations of a CSCL Community, Boulder, CO, USA, 7–11 January 2002; pp. 24–32. [CrossRef]
40. Fahrudin, F.; Jana, P.; Setiawan, J.; Rochmat, S.; Aman, Y.; Yuliantri, R.D.A. Student perception of online learning media platform during the COVID-19 pandemic. *J. Educ. Technol.* **2022**, *6*, 126–132. [CrossRef]
41. Joe, I. Study on Operational Case of non-face-to-face Realtime Online Korean Classes and Improvement Direction: Focused on the Full-Scale Operation of Korean Language Education Institutions. *TKFL* **2020**, *58*, 241–265. [CrossRef]
42. Jang, J. A study on the Flipped Learning for Improving the Effects of an Online Lecture, Content Based Korean Class. *Lang. Facts Perspect.* **2021**, *53*, 201–228.
43. Kim, G. A Study on Interactions during non-face-to-face Korean Classes: A Study on Real-Time Remote Classes Conducted through Zoom. *Hanguel* **2021**, *6*, 519–545.
44. Ju, Y.; Park, D.; Jung, K.; Son, S.; Jing, Q. One semester on online: The lesson of digital face to face classes' experience. *J. Educ. Technol.* **2020**, *36*, 805–838. [CrossRef]
45. Jeong, Y.; Lim, T.; Rye, J. The effects of spatial mobility on metaverse based online class on learning presence and interest development in higher education. *J. Korean Assoc. Educ. Inform. Media* **2021**, *27*, 1167–1188.
46. McClure, C.D.; Williams, P.N. Gather. town: An Opportunity for Self-Paced Learning in a Synchronous, Distance-Learning Environment. *Compass J. Learn. Teach.* **2021**, *14*, 1–19.
47. Najjar, N.; Stubler, A.; Ramaprasad, H.; Lipford, H.; Wilson, D. Evaluating. In Proceedings of the 53rd ACM Technical Symposium on Computer Science Education, Providence, RI, USA, 2–5 March 2022; pp. 112–118. [CrossRef]
48. Creswell, J.; Plano Clark, V. *Designing and Conducting Mixed Methods Research*, 3rd ed.; Sage: Thousand Oaks, CA, USA, 2018.
49. Plano Clark, V.L.; Foote, L.A.; Walton, J.B. Intersecting mixed methods and case study research: Design possibilities and challenges. *Int. J. Mult. Res. Approach* **2018**, *10*, 14–29. [CrossRef]
50. Carolan, C.M.; Forbat, L.; Smith, A. Developing the DESCARTE model: The design of case study research in health care. *Qual. Health Res.* **2016**, *26*, 626–639. [CrossRef]
51. Park, E.; Sung, J. An exploratory study on social presence in synchronous distance course: Focused on the cases of Christian education classes. *Korean Soc. Stud. Christ. Relig. Educ.* **2020**, *64*, 203.
52. Cleveland-Innes, M.; Campbell, P. Emotional presence, learning, and the online learning environment. *IRRODL* **2012**, *13*, 269–292. [CrossRef]
53. Segan, L.D. Using the gather platform to support peer-learning and community in a virtual Bioengineering Laboratory course. In Proceedings of the ASEE Annual Conference & Exposition, Minneapolis, MN, USA, 26–29 June 2022; Available online: <https://peer.asee.org/41045> (accessed on 22 October 2022).
54. Sarsar, F.; Kisla, T. Emotional presence in online learning scale: A scale development study. *Turk. Online J. Distance Educ.* **2016**, *17*, 50–61. [CrossRef]
55. Wijnstra, J. Making Great Online Spaces: The Influence of the Online Platform of GatherTown on the Creativity of the Students at the University of Groningen. Ph.D. Thesis, University of Groningen, Groningen, The Netherlands, 2021.
56. Creswell, J.W.; Fetters, M.D.; Ivankova, N.V. Designing a mixed methods study in primary care. *Ann. Fam. Med.* **2004**, *2*, 7–12. [CrossRef]
57. Park, S.; Lee, S.; Choi, M. A study on effects of well-structured cognitive reflection journal on metacognition and learning achievement. *J. Eng. Educ. Res.* **2008**, *11*, 5–14.
58. Connelly, C.E.; Turel, O. Effects of team emotional authenticity on virtual team performance. *Front. Psychol.* **2016**, *7*, 1336. [CrossRef]
59. Strayhorn, T.L. *College Students' Sense of Belonging: A Key to Educational Success for All Students*; Routledge: Abingdon-on-Thames, UK, 2012.
60. Freeman, T.M.; Anderman, L.H.; Jensen, J.M. Sense of belonging in college freshmen at the classroom and campus levels. *J. Exp. Educ.* **2007**, *75*, 203–220. [CrossRef]
61. Osterman, K.F. Students' need for belonging in the school community. *Rev. Educ. Res.* **2000**, *70*, 323–367. [CrossRef]
62. Thomas, L. Building student engagement and belonging in higher education at a time of change. *Paul Hamlyn Found.* **2012**, *100*, 1–99.
63. Thomas, L.; Herbert, J.; Teras, M. A sense of belonging to enhance participation, success and retention in online programs. *Int. J. FYHE* **2014**, *5*, 69–80. [CrossRef]
64. Vygotsky, L. *Mind in Society: The Development of Higher Psychological Processes*; Harvard University Press: Cambridge, MA, USA, 1978.
65. Dillenbourg, P.; Baker, M.; Blaye, A.; O'Malley, C. The evolution of research on collaborative learning. In *Learning in Humans and Machines: Towards an Interdisciplinary Learning Science*; Reinman, P., Spada, H., Eds.; Emerald Group Publishing Limited: Pergamon, Turkey, 1996; pp. 189–211.
66. Wildman, J.L.; Nguyen, D.M.; Duong, N.S.; Warren, C. Student teamwork during COVID-19: Challenges, changes, and consequences. *Small Group Res.* **2021**, *52*, 119–134. [CrossRef]
67. Oliveira, I.; Tinoca, L.; Pereira, A. Online group work patterns: How to promote a successful collaboration. *Comput. Educ.* **2011**, *57*, 1348–1357. [CrossRef]
68. Froyd, J.; Simpson, N.; Learning, S.-C. Student-centered learning addressing faculty questions about student centered learning. In *Course, Curriculum, Labor, and Improvement Conference*; National Science Foundation: Washington, DC, USA, 2008; Volume 30, pp. 1–11.

69. Suzuki, S.N.; Kanematsu, H.; Barry, D.M.; Ogawa, N.; Yajima, K.; Nakahira, K.T.; Shirai, T.; Kawaguchi, M.; Kobayashi, T.; Yoshitake, M. Virtual experiments in metaverse and their applications to collaborative projects: The framework and its significance. *Procedia Comput. Sci.* **2020**, *176*, 2125–2132. [[CrossRef](#)]
70. Urdan, T.; Turner, J.C. Competence motivation in the classroom. In *Handbook of Competence and Motivation*; Elliot, A.J., Dweck, S.C., Eds.; Guilford Publications: New York, NY, USA, 2005; pp. 297–317.
71. Hidi, S.; Renninger, K.A. The four-phase model of interest development. *Educ. Psychol.* **2006**, *41*, 111–127. [[CrossRef](#)]
72. Linnenbrink-Garcia, L.; Patall, E.A.; Messersmith, E.E. Antecedents and consequences of situational interest. *Br. J. Educ. Psychol.* **2013**, *83*, 591–614. [[CrossRef](#)]
73. Molinari, G.; Chanel, G.; Betrancourt, M.; Pun, T.; Bozelle Giroud, C. Emotion feedback during computer-mediated collaboration: Effects on self-reported emotions and perceived interaction. To See the World and a Grain of Sand: Learning across Levels of Space, Time, and Scale. In *Proceedings of the CSCL, 2013 Conference Proceedings, Bali, Indonesia, 18–22 November 2013*; pp. 336–343.
74. Moller, L.A.; Harvey, D.; Downs, M.; Godshalk, V. Identifying factors that effect learning community development and performance in asynchronous distance education. *Q. Rev. Distance Educ.* **2000**, *1*, 293–305.
75. Kwon, K.; Liu, Y.H.; Johnson, L.P. Group Regulation and Social-Emotional Interactions Observed in Computer Supported Collaborative Learning: Comparison between Good vs. Poor Collaborators. *Comput. Educ.* **2014**, *78*, 185–200. [[CrossRef](#)]
76. Sellés, N.; Carril, P.C.; Sanmamed, M. Computer-Supported Collaborative Learning: An analysis of the relationship between interaction, emotional support and online collaborative tools. *Comput. Educ.* **2019**, *138*, 1–12. [[CrossRef](#)]

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