

Role of Video Conferencing Tools in Promoting Collaborative Learning among Students at the Higher Level

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ABSTRACT

This quantitative study investigated the role of Video Conferencing tools in promoting collaborative learning among students at higher level. The study population included all male and female students at public and private universities in Gujranwala City. The objectives of this study were to investigate how Video Conferencing tools such as Zoom, Google Meet, and Microsoft Teams support knowledge sharing, students' Engagement, and Teamwork. Using a descriptive survey method, data were collected from 375 male and female students from one public and two private universities of Gujranwala through a simple random sampling technique. A self-structured questionnaire of 30 statements was used, with validity confirmed by experts' opinions and reliability assessed using Cronbach's alpha. Data were analyzed using descriptive statistics, t-tests, and ANOVA. Findings of the study revealed positive students' perceptions, with mean scores of $M \approx 3.6-3.7$, indicating that the video conferencing tools significantly support knowledge sharing, engagement, and teamwork. Results showed no significant differences by gender or semester, but significant differences by institution type, with private university students showing higher engagement. The findings of this study further recommended that institutions may play their role in improving technological infrastructure and promoting digital skills to enhance collaborative learning in higher education.

Keywords: Video Conferencing tools, Collaborative learning, Knowledge sharing, Students' engagement, Teamwork.

Introduction

During the past years, the incorporation of digital tools has brought about a major shift in higher education (Calderon et al., 2023). This technological integration has reshaped pedagogical approaches, emphasizing the value of collaborative learning. Collaborative learning is described as an approach where learners work together for shared educational objectives, and it has proven beneficial for fostering key competencies such as critical thinking, problem-solving, and interpersonal communication. In such settings, technology serves as a vital enabler of collaboration (Mantilla et al., 2024).

Video conferencing is real-time communication via audio and live video between two or more distant locations. Advanced synchronous transmission technologies can effectively support educational uses of Video conferencing tools by providing innovative instructional strategies that improve communication and interaction between learners and educators (Al-Samurai, H., 2019). Professional organizations and universities now find it increasingly practical to use Video conferencing platforms like Zoom, Google Meet, and Microsoft Teams to encourage collaborative learning. These tools enable interaction between students and instructors and allow the sharing of files, presentations, and messages through both desktop and web-based applications (Krutka and Carano, 2016).

In higher education, Video conferencing tools are widely used to support learners' independent use of technology in real-time settings, fostering more genuine interaction among learners. (Fischer et al., 2017). Many instructors use Video conferencing platforms to share knowledge, enhancing engagement, teamwork and competency among students. Similarly, interaction between students and instructors in Video conferencing environments has opened new opportunities for advancing traditional pedagogy. Video conferencing has become not merely a substitute for face-to-face interaction but a catalyst for innovative collaborative learning experiences (Lawson et al., 2010).

Review of related Literature of the Study

Background of the Study

Although Videoconferencing technology is 50 years old, its educational use started much later. Early distance education used TV broadcasts and site-to-site systems, then shifted to computer-based online learning. After that, affordable web-based platforms renewed interest in videoconferencing for communication and engagement. COVID-19 in 2020 made Videoconferencing essential for online education. During the pandemic, institutions adopted it to erase physical distance between teachers and students (Chandra & Massner, 2021).

Video Conferencing tools

Video conferencing tools represent a mode of communication that enables students located in different places to engage with each other in real time through audio and video features, thereby

removing the requirement of being physically present. Their popularity has grown due to remote work and online meetings, as they enhance efficiency, lower travel expenses, and strengthen teamwork (Lakhan et al., 2023). According to Haqien and Rahman (2020), Zoom is considered an effective synchronous learning platform for students, allowing efficient delivery of educational content. They noted that it offers the convenience of initiating meetings through Gmail while ensuring user security.

Similarly, Sevilla (2020) mentioned Google Meet as a cloud-based conferencing solution capable of accommodating up to 250 participants in a meeting, supporting live streaming for as many as 100,000 viewers within a domain, and enabling meeting recordings to be saved on Google Drive. In addition, Al Maroof et al. (2020) highlighted that Google Meet facilitates the shift from traditional classroom learning to online education and creates a secure space for real-time interaction between educators and learners. Likewise, Microsoft Teams can host calls with up to 250 participants and includes functionalities such as screen sharing and call recording. It also offers versatile collaborative learning opportunities for both schools and universities.

Usage of Video conferencing tools in Education

Video conferencing tools provide effective point to point and multipoint real-time communication for distance education, though delays may also occur due to network and compression issues (Kumar, 2015). Hersh et al. (2024) found in their study that Video conferencing tools like Zoom, Teams and Meet improve accessibility for diverse learners through screen reader compatibility and recordings. Furthermore, Zhang et al. (2021) highlighted that the interactive features such as polls, quizzes, whiteboards and breakout rooms enhance engagement, promote active learning, collaborative knowledge construction and students' confidence. Allen & Seaman (2017) stated that the use of Video conferencing tools in education reduces institutional costs by minimizing travel and infrastructure needs, while Bower et al. (2015) also found that online learning sessions improve attendance, social presence and course completion compared to asynchronous learning.

Features of Video Conferencing tool

Video Conferencing tools allow individuals from different locations to connect through audio and video technology, featuring high-quality audio-video, screen sharing for presenting documents, recording and playback for later viewing, virtual backgrounds, chat and messaging for real-time communication, participant management tools like muting and access control, and security features such as encryption and password protection to ensure the confidentiality of students (Lakhan et al., 2023).

Collaboration

A study mentioned that collaboration is an effective approach for achieving better results than working independently, with benefits like innovative solutions, enhanced equity, improved engagement, risk minimization, and achieving outcomes by resource sharing and eliminating

redundancies. In short, Collaboration is perceived both a wise and an ethical approach (Stout & Keast 2021).

4Cs of Collaboration

According to 4Cs framework, Dabbagh et al. (2015) stated that Communication is the foundational element involving clear, inclusive and adaptive exchange to build trust and group discussion. Thrilling and Fadel (2012) described Coordination as the deliberate organization of tasks, roles and resources to align efforts and prevent duplication, similar to how Griffin et al. (2012) highlighted in their study Cooperation as the willingness to support others, compromise and prioritize collective success, which leads to equitable contribution and teamwork, and Amin et al. (2022) mentioned that Creativity encourages originality, innovation and flexible problem-solving, which improves academic success and outcomes.

Video Conferencing tools in promoting collaborative learning

Video conferencing tools (Zoom, Google Meet and Microsoft Teams) foster collaborative learning through real-time communication, resource sharing, and enhanced interaction with visual aids that reduce isolation. They also provide cost savings by eliminating travel and infrastructure, global reach for cross-cultural exchange, and time efficiency through instant scheduling and features like breakout rooms and polling. Their recording and playback features support asynchronous review and deeper understanding, while flexibility and accessibility allow participation from any location, ensuring inclusive learning (Mammadyarov, 2024).

Benefits of Video Conferencing tool

Video conferencing tools improve collaborative skills by enhancing trust and co-presence through real-time interactions (Adeoye et al., 2025). These tools also foster communication skills through digital dialogues, non-verbal cues and instant feedback, and technical skills through hands-on practices like sharing screen or files (Tran et al., 2024). At the same time, features like breakout rooms, polling and recording with peer feedback enhance presentation skills, while connecting with international peers cultivates global awareness among students (Labrie et al., 2022).

Barriers faced by students while using

As Video Conferencing tools have several benefits for students' collaborative learning, but there are some barriers to their use. Lange (2020) mentioned in his study that most students faced technological challenges like poor internet connection, power outages and unavailability of devices, which forced them out of sessions and caused demotivation. Same like, Simamora et al. (2020) stated that the students also face social barriers such as fear of being asked questions and performance anxiety. Magavi et al. (2021) stated in their research that environmental barriers like time differences, internet and geographical isolation create major hurdles in accessing online classes.

Research Objectives of the Study

1. To identify usage of Video conferencing tools in sharing knowledge among students at the higher level.
2. To examine usage of Video conferencing tools in enhancing students' engagement at the higher level.
3. To investigate usage of Video conferencing tools in supporting teamwork among students at the higher level.

Research Questions of the Study

1. How do Video conferencing tools facilitate knowledge sharing among higher-level students?
2. To what extent do Video conferencing tools enhance students' engagement at the higher level?
3. In what way do Video conferencing tools support teamwork among higher-level students?

Significance of the Study

This study is significant as it identifies the role of Video conferencing tools in promoting collaborative learning at the higher level. The importance of this study lies in the fact that this study not only clarifies the educational, social, and economic benefits of these tools but also highlights the technical, social, and environmental barriers faced by students while using them. This research will provide practical guidance to teachers, students, educational institutions, and policymakers to make online learning more effective and inclusive.

Research Methodology of the Study

The design of research was descriptive quantitative used to examine the role of Video Conferencing tools in promoting collaborative learning among students at the higher level. 11,481 students from three universities of Gujranwala city in Punjab, Pakistan, including University of the Punjab, Gift University and ITECH University, were considered as the accessible population of the study, from which 375 students were chosen through a simple random sampling technique using the Krejci & Morgan (1970) table as the sample of the study. Data were collected through physical visits to the selected universities in Gujranwala city. A self-constructed questionnaire was used for data collection. The questionnaire comprised four sections: demographic information, Zoom and knowledge sharing, Google Meet and students' engagement, and Microsoft Teams and teamwork. Expert opinions were taken to check the Validity of the instrument, while the reliability was analyzed using Cronbach's alpha (.85 for Zoom, .90 for Google Meet and .90 for Microsoft Teams). SPSS version 27.0 was used to analyze data. The analysis included descriptive statistics (mean, standard deviation and percentage) to summarize participants' responses regarding collaborative learning. In addition,

inferential statistics were applied, where independent-samples t-tests were used to examine distinctions in perceptions based on gender and institution, while one-way ANOVA was used to find out differences based on the semester of respondents.

Reliability Analysis of the Questionnaire

After completing data collection, data were entered into SPSS (version 27.0). To assess the reliability of all scales for the present sample of this study, internal consistency of the scales was examined by calculating Cronbach's Alpha coefficients and inter-item correlations using SPSS. The findings of this test are presented in Table 1.

Table 1 *Reliability of the scales*

Sr.no	Name of Scale	Number of Items	Cronbach Alpha value
1	Zoom & knowledge sharing	10	.85
2	Google Meet & students' engagement	10	.90
3	Microsoft team & teamwork	10	.90

The table shows that the (Zoom & Knowledge) scale has a Cronbach's alpha value of .85, which indicates high reliability. In addition, two scales (Google Meet & Students' engagement, Microsoft Teams & teamwork) showed an alpha value of .90. These results indicate that the scales are reliable.

Descriptive Statistics of scales

The mean and standard deviation for each scale item included in the study are presented in these tables. These values give us an idea of the average responses and how much they vary, helping us understand the overall trends across different scales

Mean and Standard deviation of factor Knowledge Sharing

This table result shows that respondents generally agreed that Zoom shares knowledge.

Table 2 Mean and standard deviation scores for the scale Zoom & Knowledge sharing

Sr no.	Statements	Mean	Standard Deviation
1.	I regularly use Zoom for attending online classes.	2.8	1.1
2.	I easily join and manage meetings on Zoom.	3.4	1.1
3.	It enables students to easily share ideas during online classes.	3.4	1.1
4.	Students present their work clearly using Zoom.	3.4	1.1
5.	Zoom's screen sharing feature helps in explaining concepts effectively.	3.7	2.2
6.	Zoom allows students to ask questions without hesitation.	3.6	1.0
7.	Zoom helps students learn from peers through presentations.	3.7	1.0
8.	Chat feature in Zoom supports quick exchange of information.	3.6	1.0
9.	Zoom recordings help students review shared knowledge later.	3.6	1.1
10.	I feel comfortable turning on my camera when useful.	3.5	1.1

This table shows that students highly rated Zoom's interactive features. The highest means were for screen sharing (M=3.7), learning from peers (M=3.7), asking questions (M=3.6), chat feature (M=3.6), and recordings (M=3.6), showing broad agreement with low SD (~1.0). This indicates that these features are most effective for knowledge sharing. Moderate scores were found for ease of joining meetings, sharing ideas, and presenting work (M=3.4), with wider variation (SD=1.1), indicating some students still face technical difficulties. The lowest score was for regular use of Zoom for attending classes (M=2.8, SD=1.1), showing moderate use and that some students prefer other platforms or face challenges.

Overall, students have a moderately positive perception of Zoom for collaborative learning, with mean scores ranging from 2.8 to 3.7.

Mean and Standard Deviation of the factor Students' Engagement

This table result shows that respondents generally agreed that Google Meet develops Students' engagement.

Table 3 *Mean and Standard Deviation scores for the scale (Google Meet and Students engagement)*

Sr no.	Statements	Mean	Standard Deviation
1.	Google Meet enhances interaction between students and instructors.	3.6	1.1
2.	Interactive tasks on Google Meet keep students actively involved.	3.7	.99
3.	Google Meet chat supports instant interaction during discussions.	3.6	1.0
4.	Quizzes during Google Meet sessions enhance engagement	3.7	1.1
5.	The screen sharing feature helps students collaborate effectively on tasks.	3.6	.97
6.	Raising hand feature helps students participate in an organized way.	3.6	1.1
7.	Students feel motivated to contribute in discussions on Google Meet.	3.7	.99
8.	Google Meet allows students to engage through both verbal and written communication.	3.6	1.0
9.	Google Meet use to share resources during discussions.	3.6	1.0
10.	Features of Google Meet help maintain students' interest	3.6	1.0

throughout the session

This table shows that all features of Google Meet were rated highly. Students agreed with interactive tasks ($M=3.7$, $SD=0.99$), chat feature ($M=3.7$), quizzes ($M=3.7$), screen-sharing ($M=3.7$, $SD=0.99$), raise hand feature ($M=3.7$), and motivation to contribute ($M=3.7$, $SD=0.97$) are effective in maintaining active participation, real-time communication and organized collaboration. Moderate but still positive scores were found for improving overall interaction ($M=3.6$), facilitating verbal or written communication ($M=3.6$), sharing resources

(M=3.6), and maintaining interest during sessions (M=3.6) with SD=1.0.

Overall, students have a positive perception of Google Meet for engagement, with mean scores ranging from 3.6 to 3.7 and low standard deviations (0.97 to 1.1), indicating consistent agreement.

Mean and Standard Deviation of the Teamwork factor

This table result shows that respondents generally agreed that Microsoft Teams fosters teamwork among students.

Table 4 Mean and Standard Deviation scores for the scale Microsoft Teams & Teamwork.

Sr no.	Statements	Mean	Standard Deviation
1.	Microsoft Teams allows students to work together in real time.	3.5	1.0
2.	File sharing in Teams improves coordination among students.	3.6	.97
3.	Students can assign and manage tasks effectively using Microsoft Teams.	3.6	.99
4.	Microsoft Teams supports equal participation in group activities.	3.5	.99
5.	Microsoft Teams encourages collaborative problem-solving among students.	3.6	.99
6.	Breakout rooms in Teams support small-group teamwork.	3.5	1.0
7.	Microsoft Teams helps in distributing responsibilities among group members.	3.5	.99
8.	Students can give and receive feedback easily through Teams.	3.5	1.0
9.	Video meetings on Microsoft Teams enhance teamwork and discussion.	3.6	.96
10.	Video meetings on Microsoft Teams enhance teamwork and discussion.	3.6	1.0

This table shows that students rated file sharing (M=3.6, SD=0.97), task management (M=3.6), collaborative problem-solving (M=3.6), and video meetings (M=3.6, SD=0.96) the highest. This indicates that these features are most effective in enhancing coordination and discussions. Moderate but still positive scores were found for real-time collaboration (M=3.5), equal participation (M=3.5), breakout rooms for small-group work (M=3.5), responsibility distribution (M=3.5), and feedback exchange (M=3.5), with SD around 1.0, showing some variation in how effectively students experience these features.

Overall, students have a positive perception of Microsoft Teams for teamwork, with mean scores ranging from 3.5 to 3.6 and low standard deviations (0.96 to 1.0), showing consistent agreement.

Mean Value and Differences Based on Gender

This table presents a comparison of responses from respondents based on gender. An independent- samples t-test was conducted to determine whether there were any significant differences in their mean values across the study variables.

Table 5 *Mean Values and Differences Based on the Gender (t-test Analysis)*

Scale	Gender	N	M	Std	T	Sig
Zoom & Knowledge sharing	Male	199	3.5	.88	.29	.166
	Female	176	3.5	.79	.30	
Google Meet & Students' engagement	Male	199	3.6	.77	.93	.079
	Female	176	3.7	.72	.93	
Microsoft team & Team work	Male	199	3.6	.77	.92	.079
	Female	176	3.7	.72	.93	

This table shows that there is no significant difference between male and female students regarding Zoom ($p=0.166$), Google Meet ($p=0.079$) and MS Teams ($p=0.079$), as all p-values are > 0.05 . **Mean Values and Differences Based on the Institution**

This table presents a comparison of responses from respondents in public or private institutions. An independent samples t-test was conducted to determine whether there were any significant differences in their mean values across the study variables.

Table 6 *Mean Values and Differences Based on the Institutions (t-test Analysis)*

Scale	Institution	N	M	Std	t	Sig
Zoom & Knowledge sharing	Public	137	3.1	.77	7.8	.398
	Private	238	3.7	.78	7.8	
Google Meet & Students' engagement	Public	137	3.3	.75	7.9	.021
	Private	238	3.9	.65	7.6	
Microsoft team & Teamwork	Public	137	3.3	.75	7.9	.021
	Private	238	3.9	.65	7.6	

This table shows that there is no significant difference for Zoom & Knowledge Sharing between public ($M=3.1$) and private ($M=3.7$) students ($p=0.398 > 0.05$), while there is a significant difference for Google Meet & Engagement ($p=0.021 < 0.05$) and Microsoft Teams & Teamwork ($p=0.021 < 0.05$), with private institution students reporting higher engagement and teamwork.

Analysis of variance (ANOVA) based on Semester

This table presents statistical results comparing the use of Video conferencing tools to promote knowledge, Students' engagement and teamwork across four semesters, i.e., 2,4,6, and 8.

Table 7 *Analysis of Variance (ANOVA) Based on semester*

Factor	Semester	Mean	SD	P	F	Sequence of differences
Zoom Knowledge sharing	2	3.32	.779	.419	7.7	8>6>4>2
	4	3.36	.838		21.4	
	6	3.68	.867		21.4	
	8	3.82	.786		.87	
Google Meet & Students' engagement	2	3.56	.717	.533	5.0	8>6>4>2
	4	3.59	.793		13.6	
	6	3.83	.676		13.8	
	8	3.92	.790		.63	
Microsoft team & Teamwork	2	3.56	.717	.533	5.0	8>6>4>2
	4	3.59	.793		13.6	
	6	3.83	.676		13.8	
	8	3.92	.790		.63	

This table shows that mean scores for Zoom (3.32 to 3.82), Google Meet (3.56 to 3.92) and Microsoft Teams (3.56 to 3.92) improved from semester 2 to 8, with semester 8 being the highest and semester 2 the lowest, but all differences were non-significant ($p = 0.419$ and $0.533 > 0.05$), meaning perception improves slightly with semesters but not significantly.

Findings

Students generally held positive perceptions regarding Video Conferencing tools for collaborative learning. The highest mean values were indicated for interactive features such as screen sharing, peer learning, chat interaction, and collaborative tasks ($M \approx 3.7$), indicating their strong contribution to learning activities.

Lower mean values were highlighted for aspects related to regular usage and participation, including attending online classes via Zoom ($M = 2.8$), ease of managing meetings, sharing ideas, and clarity in presentations ($M \approx 3.4-3.5$), reflecting moderate challenges in usage and engagement.

The findings indicate that interactive and collaborative functionalities of video conferencing tools are valued more highly than operational ease or frequency of use, emphasizing the importance of engagement-oriented features in online learning environments.

There were no statistically significant differences found based on gender across all variables, suggesting that male and female students share similar perceptions for the effectiveness of Video conferencing tools in collaborative learning.

Results indicated statistically significant variation based on the type of institution. Higher levels of engagement and teamwork were reported by students from private universities compared to those from public universities ($p < 0.05$), indicating variation in institutional learning experiences.

No statistically significant differences were observed across semesters, although a slight increase in mean scores among higher semester students suggests minimal influence of academic progression on perceptions.

Overall, video conferencing tools demonstrate a positive contribution to collaborative learning, particularly in enhancing knowledge sharing, student engagement, and teamwork among higher education students.

Delimitations of the Study

- This study was delimited to male and female students at the higher level of both private and public sectors of Gujranwala city.
- For quantitative data analysis, a survey was restricted to specific criteria of students who had experience using Video conferencing tools (Zoom, Google Meet, Microsoft Teams).

Recommendations of the study

Based on the findings of this study, the following recommendations are proposed to enhance the effective usage of Video Conferencing tools in higher education.

1. Higher education institutions may improve internet connectivity, provide updated devices, and ensure reliable access to video conferencing tools to support effective online and blended learning.
2. Teachers may be trained to effectively use video conferencing tools such as breakout rooms, screen sharing, polls, and chat features to enhance interactive and collaborative teaching.
3. Students may be encouraged to actively participate in online discussions, group work, and presentations to enhance their communication, teamwork, and collaborative skills.

4. Institutions may conduct regular workshops and training sessions to improve digital literacy among both teachers and students enabling more confident and effective use of digital platforms.
5. Efforts may be made to reduce the gap between public and private institutions in access to digital learning resources to ensure equal learning opportunities for all students.

Future Call for Researchers

This research calls other researchers to

1. Examine the long-term impact of Video conferencing tools on students' collaborative learning skills among higher education students.
2. Undertake a longitudinal study to investigate how Video conferencing tools contribute to the development of communication, teamwork, and problem-solving skills over time.
3. Explore the challenges in using Video conferencing tools and suggest ways to address technical and accessibility issues.

Conclusion

This study concludes that Video conferencing tools play a significant role in promoting collaborative learning among higher-level students by facilitating knowledge sharing, enhancing students' engagement, and promoting teamwork. The findings of the study revealed that platforms such as Zoom, Google Meet, and Microsoft Teams provide interactive features including screen sharing, chat, breakout rooms, and real-time communication, which collectively enrich students' learning experiences and collaboration. Overall, this study affirms that Video conferencing tools are valuable for supporting collaborative learning in higher education, although their effectiveness is influenced by institutional support, access to technology, and students' digital literacy levels.

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