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A MULTIVARIATE ASSESSMENT OF VIDEO-CONFERENCING-MEDIATED INTERACTIONS: INVESTIGATING THE PREDICTORS OF STUDENT COMMUNICATIVE ADAPTATION

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Abstract
The rapid shift toward online learning during the COVID-19 pandemic has increased reliance on video conferencing platforms such as Zoom and Microsoft Teams, raising important questions about their impact on students' communication skills. While these platforms have enabled educational continuity, limited empirical evidence exists regarding their measurable effects on verbal and non-verbal communication competencies among university students in developing countries. The objective of this study was to examine how video conferencing platforms influence multiple dimensions of student communication, including verbal and non-verbal skills, engagement, confidence, collaboration, and perceived challenges. A quantitative, cross-sectional survey design was employed, and data were collected from 40 university students through a structured 47-item questionnaire using a 5-point Likert scale. Descriptive statistics and Pearson correlation analysis were conducted to examine relationships between platform usage variables and communication skill outcomes. The results indicated a mixed impact of video conferencing platforms on communication skills. Students reported high familiarity with these tools, along with significant challenges related to technical issues and internet connectivity. While confidence levels were relatively high, suggesting reduced communication anxiety, lower ratings were observed for engagement, communication skill development, and non-verbal communication. Correlation

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analysis revealed strong relationships among communication skills, engagement, confidence, collaboration, and overall satisfaction (r = 0.70 to 0.86), whereas challenges were only weakly related to these variables (r = -0.06 to 0.21). Overall, the findings suggest that video conferencing platforms provide both benefits and limitations. They support accessibility and psychological comfort but may hinder non-verbal communication and interaction quality. These results highlight the importance of effective teaching strategies and technological support in enhancing communication outcomes in virtual learning environments.

Keywords: *Video conferencing platforms (VCP), Communication skills, Online learning, Zoom, Microsoft Teams, Student engagement*

1. Introduction

The rapid advancement of digital technologies has significantly transformed the landscape of higher education, particularly in the way students communicate and interact within academic environments. Among these innovations, video conferencing platforms such as Zoom and Microsoft Teams have emerged as essential tools for delivering instruction and facilitating real-time communication. This shift became especially prominent during the COVID-19 pandemic, when educational institutions worldwide were compelled to transition to remote learning. As a result, traditional face-to-face communication practices were replaced or supplemented by virtual interactions, raising important questions about how these platforms influence students' communication abilities. Communication skills are a fundamental component of academic success and professional development, encompassing both verbal and non-verbal elements such as clarity of speech, active listening, eye contact, and body language. In conventional classroom settings, students benefit from immediate feedback, natural interaction, and rich non-verbal cues that enhance understanding and engagement. However, in virtual environments, these elements are often limited or altered due to technological constraints, such as screen-mediated interaction, reduced physical presence, and potential technical disruptions. While video conferencing platforms offer advantages like accessibility, flexibility, and increased participation opportunities for some learners, they may also introduce challenges that affect students' confidence, engagement, and overall communication effectiveness. Given the growing reliance on digital learning environments, it is essential to examine the impact of video conferencing platforms on the development of students' communication skills. This study aims to explore how virtual communication influences both verbal and non-verbal competencies, as well as students' participation and confidence levels in academic settings. By identifying the benefits and limitations of these platforms, the research seeks to provide valuable insights for educators and institutions to design more effective and inclusive learning experiences. Ultimately, understanding these dynamics will help ensure that technological integration in education supports, rather than hinders, the development of essential communication skills.

1.1 Background of the Study

The landscape of higher education has undergone a seismic transformation in recent years, driven primarily by technological advancement and necessitated by unprecedented global circumstances. The emergence and widespread adoption of video conferencing platforms, most notably Zoom and Microsoft Teams, have fundamentally altered how educational content is delivered and how students engage with learning materials and their peers (Hodges et al., 2020). This paradigm shift, accelerated dramatically by the COVID-19 pandemic, has brought both unprecedented opportunities and significant challenges to the forefront of educational practice, particularly regarding the development of essential communication competencies.

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The COVID-19 pandemic forced educational institutions worldwide to adopt remote learning solutions within an unprecedented timeframe, with video conferencing platforms becoming the primary medium for teacher–student and peer-to-peer interaction. According to Bozkurt et al. (2020), thousands of colleges utilized video conferencing tools to teach students during lockdown periods, representing the most rapid educational transformation in modern history. Zoom, for instance, witnessed a 458% increase in its customer base, cementing its role in higher education despite its origins as a corporate productivity tool (Vorina et al., 2023). This rapid adoption, however, outpaced scholarly understanding of how these interfaces affect the human communicative process, creating an urgent need for systematic investigation.

Communication skills—encompassing verbal articulation, non-verbal intelligence, active listening, and interpersonal interaction—have long been recognized as essential competencies for academic and professional success. Research by McCroskey (1982) and Noetel et al. (2021) demonstrates that students with well-developed communication abilities consistently achieve better academic outcomes, experience greater career success, and maintain more satisfying interpersonal relationships. Traditionally, the development of these skills relied heavily on in-person socialization and classroom participation, where rich non-verbal cues and spontaneous interactions fostered communicative competence. However, the shift to video conferencing platforms has introduced new variables that may either enhance or impede the development of these critical competencies (Rapanta et al., 2020).

The technological architecture of video conferencing platforms creates a unique communicative environment characterized by both affordances and constraints. Features such as breakout rooms, chat functions, screen sharing, and recording capabilities offer innovative pedagogical possibilities, while simultaneously introducing barriers including camera anxiety, microphone inhibition, and the cognitive load associated with managing technology while attempting to communicate effectively (Fauville et al., 2021). Furthermore, the “mirror effect” of constant self-view and the phenomenon of “Zoom fatigue” have emerged as significant psychological factors affecting student communication experiences (Bailenson, 2021). Recent discussion has begun to systematically examine these phenomena. Serhan (2020) conducted comprehensive surveys revealing that only 12.91% of students agreed that Zoom helped their participation, while 61.29% disagreed, indicating substantial challenges in virtual engagement. Conversely, Panggabean et al. (2025) demonstrated that project-based learning through video conferencing could enhance communication skills and build confidence when pedagogically structured. These contradictory findings underscore the complexity of video conferencing impacts and the necessity for nuanced investigation.

The integration of video conferencing into educational practice represents more than a temporary emergency measure; hybrid learning models combining in-person and virtual instruction are becoming increasingly prevalent, suggesting that understanding and optimizing the communication dynamics of these platforms is essential for long-term educational planning (Watermeyer et al., 2021). As digital fluency becomes increasingly valued in professional contexts, the question is not whether video conferencing will persist in education, but how its implementation can be optimized to support rather than hinder the development of comprehensive communication skills.

1.2 Problem Statement

Despite the growing body of literature examining various aspects of online learning, significant gaps remain in understanding the specific impact of video conferencing platforms on student

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communication skills. The fundamental problem lies in the tension between the accessibility and convenience offered by these technologies and the potential compromises to communication quality that may result from their use. Students today spend substantial portions of their educational experience engaging through screens, participating in virtual classrooms where traditional cues and dynamics are altered or absent entirely (Watermeyer et al., 2021).

Several specific issues have been identified that warrant systematic investigation. First, the absence of face-to-face interaction eliminates or diminishes critical non-verbal communication channels, including body language, facial expressions, and spatial positioning, which collectively constitute a substantial portion of human communicative weight (Mehrabian, 1971). The "fractured ecology" of digital interaction, where the loss of traditional non-verbal cues and the onset of "Zoom fatigue" challenge established pedagogical norms, requires comprehensive examination. Second, the technical nature of video conferencing introduces psychological barriers such as camera anxiety and the cognitive load associated with technology management while communicating (Fauville et al., 2021). Third, the structure of virtual classrooms may inadvertently discourage spontaneous interaction and reduce opportunities for informal socialization that traditionally supports communication skill development (Bedenlier et al., 2021).

The research to date presents conflicting findings regarding the net impact of video conferencing on communication skills. Some studies suggest that virtual environments may enhance certain aspects of communication, particularly for students experiencing anxiety in traditional classroom settings (Aguilera-Hermida, 2020). Other research indicates significant negative impacts on confidence, presentation skills, and the ability to read social cues (Teng & Taveras, 2021). This lack of consensus, combined with the predominance of small-scale, single-site studies conducted during emergency remote teaching contexts, underscores the need for comprehensive, systematic investigation using rigorous survey-based methodology.

Furthermore, existing literature has focused predominantly on immediate pandemic-related transitions, with limited examination of longer-term adaptation and outcomes. There is a scarcity of data regarding the longitudinal effects on students' subjective vitality and social reintegration, as well as insufficient cross-cultural comparison to understand how different communication norms adapt to the constraints of video conferencing platforms (Carmi, 2024). The present study addresses these gaps by employing a structured survey approach to quantify the multifaceted impacts of video conferencing on communication skills among BSCS students.

1.3 Research Gap

Although video conferencing platforms have been widely adopted in higher education, particularly during and after the COVID-19 pandemic, limited empirical evidence exists regarding their measurable impact on communication skill development among undergraduate computer science students in Pakistani universities. Existing studies have predominantly focused on general student populations in Western contexts, leaving a significant gap in understanding how these platforms affect communication competencies within South Asian technical education environments. Furthermore, most prior research has relied on qualitative methods or small-scale convenience samples, with few studies employing structured survey instruments validated for reliability and content validity. The longitudinal effects of prolonged video conferencing usage on non-verbal communication skills remain particularly underexplored. This study addresses these gaps by providing a quantitative, cross-sectional analysis of video conferencing impacts on multiple communication dimensions among BSCS students at Air University Multan Campus.

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1.4 Research Objectives

This study aims to achieve the following objectives:

1. To examine the impact of video conferencing platforms (Zoom and Microsoft Teams) on the verbal and non-verbal communication skills of university students.
2. To investigate the relationship between video conferencing usage and student engagement, participation, and confidence in academic communication contexts.
3. To identify the primary challenges and barriers students face when using video conferencing platforms for communication and to assess overall satisfaction levels.

1.5 Hypotheses

Based on the research objectives and literature review, the following hypotheses are formulated for this quantitative study:

H1: There is a significant positive correlation between video conferencing platform usage/familiarity and students' perceived communication skill development.

H0: There is no significant relationship between video conferencing platform usage and students' perceived communication skill development.

H2: Students who report higher confidence and lower anxiety in virtual environments will demonstrate significantly higher ratings of communication effectiveness and collaboration.

H3: Technical challenges and barriers are negatively correlated with overall satisfaction and perceived communication improvement through video conferencing platforms.

1.6 Research Questions

This study seeks to address the following research questions:

1. How do video conferencing platforms (Zoom and Microsoft Teams) affect the verbal and non-verbal communication skills of university students compared to traditional face-to-face settings?
2. What is the relationship between video conferencing usage and student participation levels, engagement, and confidence in academic communication contexts?
3. What are the primary advantages and disadvantages of video conferencing platforms for communication skill development, and how do these vary across different student demographics?

1.7 Significance of the Study

This study contributes to the growing body of knowledge on digital education by providing a comprehensive, quantitative analysis of video conferencing impacts on communication skills. By synthesizing theoretical frameworks from technology acceptance and communication theory with empirical survey data, the research advances understanding of how digital interfaces reshape human interaction in educational contexts. The findings will inform pedagogical theory regarding the adaptability of communication skill development across mediated and non-mediated environments, challenging assumptions about the essential nature of face-to-face interaction for effective communication learning.

The research offers actionable insights for educators, administrators, and educational technology developers seeking to optimize virtual learning experiences while preserving essential communication skill development. By identifying specific platform features, instructional strategies, and policy interventions that mitigate negative impacts while enhancing accessibility benefits, the study supports evidence-based decision-making in educational technology implementation. The findings regarding camera anxiety, participation patterns, and confidence effects will enable instructors to design more inclusive and effective virtual learning

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environments, ultimately improving student outcomes in an increasingly digital educational landscape.

2. Review of Related Literature

2.1 Theoretical Framework

This study is grounded in two complementary theoretical frameworks that provide a comprehensive lens for understanding how video conferencing technology influences student communication competencies in educational settings. This framework conceptualizes communication competence as comprising cognitive knowledge (understanding communication principles), behavioral skills (performing communicative acts), and motivational orientation (willingness to communicate) (McCroskey, 1982). Video conferencing platforms potentially affect all three dimensions: cognitive knowledge may expand through exposure to digital communication norms, behavioral skills may be constrained by technological limitations on non-verbal expression, and motivational orientation may be diminished by camera anxiety or enhanced by reduced social pressure for introverted learners. The theory suggests that effective virtual communication requires explicit attention to skill development across all three dimensions, not merely technological access.

To address the social and pedagogical dimensions of virtual learning, this study also draws upon Garrison et al.'s (2000) Community of Inquiry (CoI) framework. The CoI model posits that meaningful online learning experiences emerge from the intersection of three presences: cognitive presence, social presence, and teaching presence. In video conferencing environments, social presence—the ability of participants to project themselves socially and emotionally as real people—is particularly critical for communication skill development. Garrison and Arbaugh (2007) emphasize that the quality of online communication depends on the extent to which technological mediation supports rather than inhibits these three presences. This framework helps explain why video conferencing platforms may simultaneously enhance cognitive access to learning materials while constraining the social presence necessary for natural communication development.

2.2 Review of Empirical Studies

The relationship between video conferencing platforms and student communication skills is multifaceted, affecting verbal, non-verbal, and psychological dimensions of learning. Recent systematic reviews suggest that video-based instruction can improve learning outcomes in higher education when appropriately designed, though the effects on communication competence specifically are more nuanced (Noetel et al., 2021). For instance, video conferencing environments tend to produce shifts in verbal communication style; students frequently adopt more concise language structures, which may increase clarity but can simultaneously reduce expressive richness when not pedagogically scaffolded (Rapanta et al., 2020). This shift in delivery is further complicated by vocal dynamics; while students often feel more comfortable with technology-mediated presentations, assessments frequently show a reduction in vocal variety and dynamic range compared to face-to-face settings (Noetel et al., 2021).

These verbal shifts are often a direct response to the non-verbal deficits inherent in digital platforms. Research consistently identifies the loss of non-verbal cues as a primary barrier to effective communication. Bailenson (2021) observed that "self-focused attention"—the tendency for students to watch their own video feed—distracts from active engagement with others and contributes to nonverbal overload. Furthermore, physical constraints limit the use of gestures and reduce the effectiveness of eye contact (Gherghes et al., 2021). Camera positioning disrupts

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natural gaze patterns, creating the illusion of eye contact while preventing its authentic occurrence (Bailenson, 2021). These limitations culminate in what Fauville et al. (2021) term "Zoom fatigue," where the cognitive effort required interpreting limited cues and managing sustained self-view leads to psychological exhaustion.

The impact on student engagement and participation is equally complex and often contradictory. While some studies found that virtual settings can empower introverted students by reducing social pressure (Aguilera-Hermida, 2020), others highlight a "digital divide," where participation is dominated by those with superior technology and digital literacy (Lythreatis et al., 2022). This lack of engagement is often manifested through camera usage. Serhan (2020) and Castelli and Sarvary (2021) found that students frequently disable cameras due to concerns regarding privacy, physical appearance, and home environments, which Rapanta et al. (2020) argue turns potential dialogue into a series of "serial monologues." Consequently, maintaining focus during prolonged sessions remains a significant challenge for higher education students (Carmi, 2024).

Psychological factors, particularly confidence and anxiety, play a vital role in how students navigate these platforms. Fauville et al. (2021) and Oducado et al. (2021) identified "camera anxiety" and the absence of audience feedback as major contributors to lower student confidence. However, Aguilera-Hermida (2020) suggests that student adaptation varies significantly based on prior digital experience and access to resources. Beyond the screen, alternative communication channels, such as private chat functions in Microsoft Teams, provide vital outlets for students who experience anxiety in video-mediated oral participation (Gherghes et al., 2021). These secondary channels allow introverted students to develop communicative competence at their own pace.

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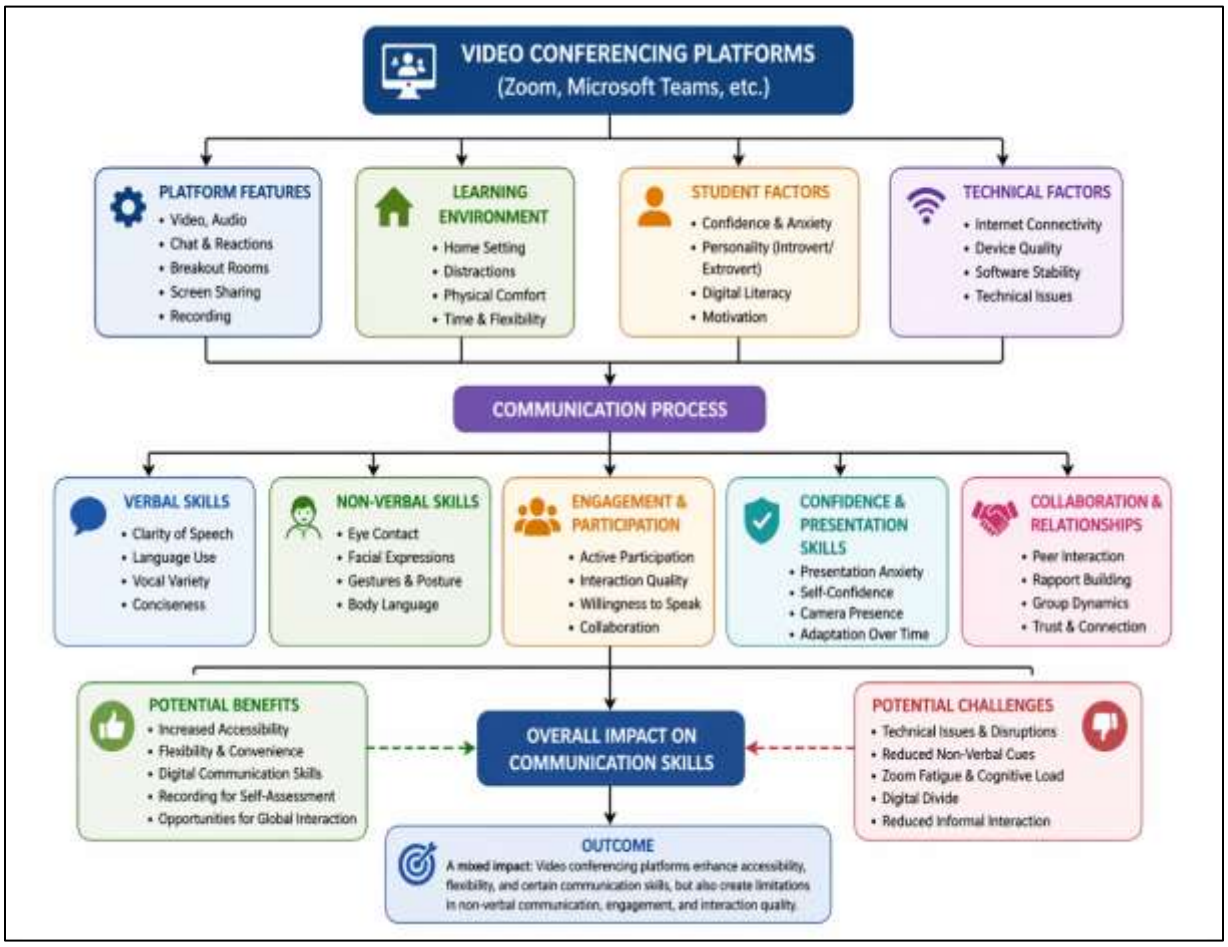

Figure 1: Video Conferencing Platforms

Despite the technical and psychological hurdles, video conferencing offers distinct advantages that are reshaping modern education. Mukhtar et al. (2020) emphasized how these tools provide unprecedented accessibility for students with disabilities or geographical constraints, while Noetel et al. (2021) noted the growth of digital competencies that are essential in the modern professional world. Additionally, the ability to record sessions allows for unique self-assessment opportunities (Rapanta et al., 2020) and facilitates international collaborations (Lythreatis et al., 2022). Nevertheless, these benefits must be balanced against the loss of informal "corridor" interactions (Rapanta et al., 2020) and the difficulties in managing group dynamics in large virtual settings (Lionarakis et al., 2025). As Bozkurt et al. (2020) and Al-Samarraie (2019) conclude, successful communication in higher education now requires a deliberate shift in instructional design to bridge the gap between traditional norms and the unique affordances of digital platforms.

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2.3 Conceptual Framework

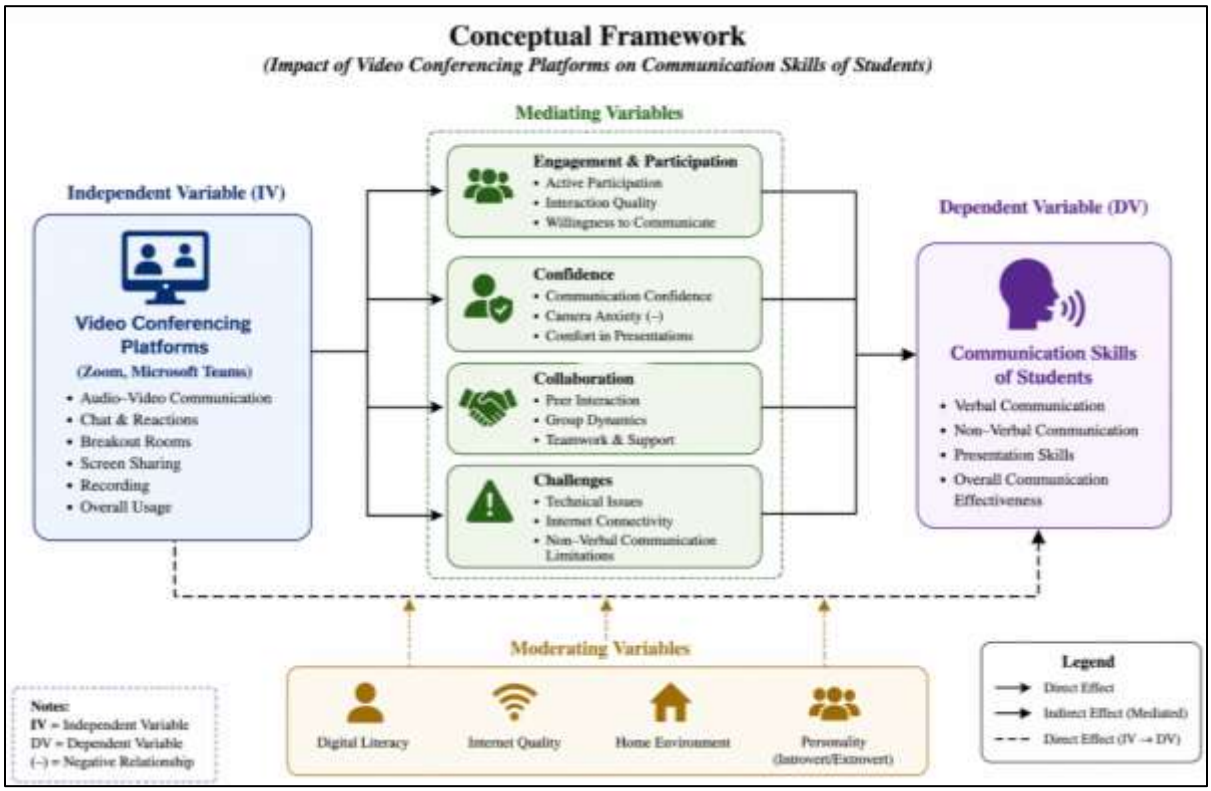

Figure 2: Conceptual Framework

The conceptual framework of this study systematically explains how video conferencing platforms influence students' communication skills by identifying key variables and their relationships. The independent variable consists of video conferencing platforms such as Zoom and Microsoft Teams, which include various technological features like breakout rooms, chat functions, screen sharing, recording options, and self-view settings that shape communication processes in online learning environments. The dependent variable is students' communication skills, which is a multidimensional construct covering verbal communication (clarity, fluency, and vocabulary), non-verbal communication (gestures, facial expressions, and eye contact), participation and engagement (frequency and quality of interaction), and confidence (self-efficacy and reduced anxiety). The relationship between these variables is influenced by moderating factors such as internet access, student engagement, and learning environment. Reliable internet connectivity and proper hardware enhance communication effectiveness, while poor access creates barriers. Similarly, highly engaged students are more likely to benefit from these platforms, even when technological limitations exist. The learning environment, including physical setting, distractions, and privacy, also affects students' comfort and communication performance. Overall, the framework suggests that video conferencing platforms impact communication skills both directly—through technological constraints and psychological factors—and indirectly through participation patterns. It further predicts that the best communication outcomes occur when platform features are effectively aligned with teaching strategies and when external conditions support active student involvement.

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3. Research Methodology

3.1 Research Design

This study employs a quantitative, cross-sectional survey design to investigate the impact of video conferencing platforms on student communication skills. The cross-sectional approach enables the collection of data from a sample population at a single point in time, allowing for efficient analysis of relationships between variables across diverse student experiences. The survey-based methodology is appropriate for measuring attitudes, perceptions, and self-reported behaviors regarding communication in virtual environments, providing standardized data suitable for statistical analysis and generalization to the broader BSCS student population.

3.2 Population and Sampling

The target population consists of Bachelor of Science in Computer Science (BSCS) students currently enrolled at Air University Multan Campus who have experienced instruction through video conferencing platforms during their academic programs. The sampling frame includes students across all semester levels (1st through 8th) to capture varied exposure durations to virtual learning environments.

A total of 40 students participated in the study, determined using Cochran's formula for sample size calculation with 95% confidence level, 5% margin of error, and estimated population proportion of 0.5 for communication skill outcomes. This sample size provides adequate statistical power for correlation and regression analyses while remaining feasible for data collection within the institutional context. A purposive and convenience sampling technique was employed to recruit participants who had direct experience with video conferencing platforms in academic settings. Students were approached through official university channels and invited to participate based on their availability and willingness. While the original design intended stratified representation across academic years, the final sample reflects opportunistic recruitment typical of exploratory research in single-institution contexts.

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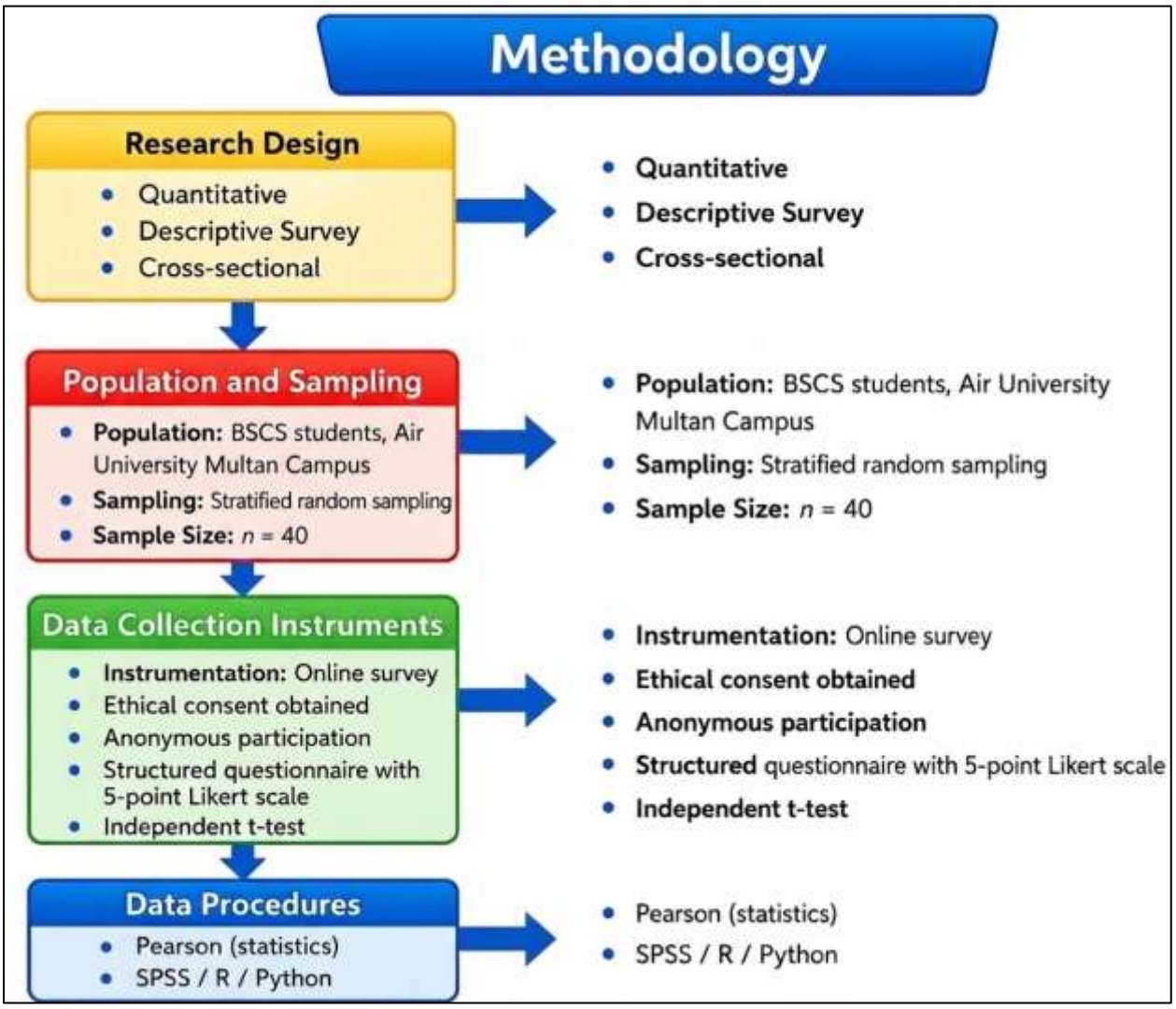

Figure 3: Research Methodology

3.3 Data Collection Instruments

A structured questionnaire was developed as the primary data collection instrument to assess the impact of video conferencing platforms on students' communication skills. The instrument consisted of 47 items measured on a 5-point Likert scale (1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree). The questionnaire was organized into nine sections, each corresponding to specific constructs analyzed in the study:

Section A: Demographic Information (6 items)

This section collected background information including age, academic program, semester, computer proficiency, and frequently used video conferencing platforms.

Section B: Usage and Familiarity (6 items)

This section measured students' frequency of use, comfort level, and familiarity with video conferencing tools such as Zoom and Microsoft Teams.

Section C: Engagement and Participation (6 items)

This section assessed students' level of engagement, participation in discussions, interaction with instructors, and involvement in online learning activities.

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Section D: Communication Skills Development (6 items)
This section evaluated perceived improvements in verbal communication, including speaking ability, clarity, listening skills, and overall communication effectiveness.
Section E: Non-Verbal Communication (6 items)
This section measured students' ability to use and interpret non-verbal cues such as eye contact, facial expressions, gestures, and body language in virtual environments.
Section F: Confidence and Anxiety (6 items)
This section examined students' confidence levels, communication anxiety, comfort in online interactions, and fear of making mistakes during virtual sessions.
Section G: Collaboration and Interaction (6 items)
This section evaluated the effectiveness of peer interaction, group discussions, teamwork, and collaborative learning through video conferencing platforms.
Section H: Challenges and Barriers (6 items)
This section identified technical, environmental, and psychological challenges, including internet issues, distractions, and limitations of online communication.
Section I: Overall Impact and Satisfaction (5 items)
This section measured students' overall satisfaction and their perception of the effectiveness of video conferencing platforms in developing communication skills.
The questionnaire was reviewed by three subject experts in the fields of communication and educational technology to ensure content validity. A Content Validity Index (CVI) of 0.92 was achieved, indicating high relevance and clarity of items. Additionally, pilot testing was conducted with a sample of students, resulting in a Cronbach's alpha of 0.962 for the overall instrument, demonstrating excellent internal consistency.

3.4 Data Collection Procedure

Data collection was conducted over a four-week period during the Spring 2026 semester. The questionnaire was administered through Google Forms, distributed via official university email addresses and class WhatsApp groups with administrative approval.

3.5 Ethical Considerations

Participation was entirely voluntary, with informed consent obtained through a detailed cover letter explaining study purposes, confidentiality protections, and the right to withdraw. No identifying information was collected beyond demographic categories. Data were stored on password-protected university servers with access restricted to research team members. The study protocol received approval from the departmental research committee prior to implementation.

3.6 Data Analysis Technique

Data were analyzed using SPSS version 26.0 with the following techniques:

- **Descriptive Statistics:** Frequencies, percentages, means, and standard deviations were calculated for all variables to characterize the sample and summarize response patterns.
- **Correlation Analysis:** Pearson correlation coefficients were computed to examine relationships between video conferencing usage variables and communication skill outcomes.
- **Comparative Analysis:** Independent samples t-tests and one-way ANOVA were used to compare communication outcomes across platform types (Zoom vs. Teams), gender, and academic year groups.

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- **Regression Analysis:** Multiple linear regression was conducted to identify predictors of overall communication satisfaction in virtual environments.

3.7 Delimitations of Study

This study is delimited to BSCS students at Air University Multan Campus, limiting generalizability to other disciplines or institutions. The cross-sectional design captures data at a single time point, precluding causal inferences about longitudinal skill development. Self-reported measures may be subject to social desirability bias and subjective interpretation. The study focuses on Zoom and Microsoft Teams, excluding other platforms that may produce different effects. Finally, data collection during an ongoing academic semester may reflect temporary contextual factors rather than stable patterns.

4. Data Analysis

4.1 Demographic Profile

This section presents the demographic characteristics of the respondents who participated in the study. Table 1 summarizes the frequency and percentage distributions of key demographic variables including gender, age, degree program, semester, computer proficiency, and frequently used platforms. Figure 4 provides a visual representation of these distributions.

Table 1: Summary of Demographic Characteristics

Variable	Category	Count	Percentage
Gender	Male	36	90.0%
	Female	4	10.0%
Age	Under 18 Years	4	10.0%
	18–20 Years	13	32.5%
	18–24 Years	16	40.0%
	24+ Years	4	10.0%
	Other	3	7.5%
Degree Program	BSCS	13	32.5%
	BSSE	8	20.0%
	BBA	6	15.0%
	BSIT	5	12.5%
	BSCYS	2	5.0%
	Other Programs	6	15.0%
Semester	1	4	10.0%
	2	1	2.5%
	3	1	2.5%
	4	12	30.0%

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Variable	Category	Count	Percentage
	5	1	2.5%
	6	18	45.0%
	Graduated	3	7.5%
Computer Proficiency	Beginner	5	12.5%
	Intermediate	21	52.5%
	Advanced	9	22.5%
	Expert	5	12.5%
Platform Used	Zoom	30	75.0%
	MS Teams	4	10.0%
	AWS / Other	2	5.0%

The demographic profile reveals that the majority of respondents were male students (90.0%), with female participants representing a smaller proportion (10.0%). This gender distribution reflects the typical enrollment patterns observed in computer science and related technical programs at the institution. In terms of age, most respondents fell within the 18–24 years range (72.5% combined), indicating that the sample primarily represents young adult learners who have grown up with digital technologies. The degree program distribution shows BSCS as the largest group (32.5%), followed by BSSE (20.0%) and BBA (15.0%), with several other programs also represented. A substantial majority of participants (52.5%) reported intermediate computer proficiency, while 22.5% considered themselves advanced users. Regarding platform preference, Zoom was the most frequently used platform (75.0%), with MS Teams being used by 10.0% of respondents, and 5.0% using other platforms. The semester distribution indicates that most participants were in their later semesters, with 45.0% in Semester 6 and 30.0% in Semester 4, suggesting that these students had substantial experience with video conferencing platforms before participating in the survey.

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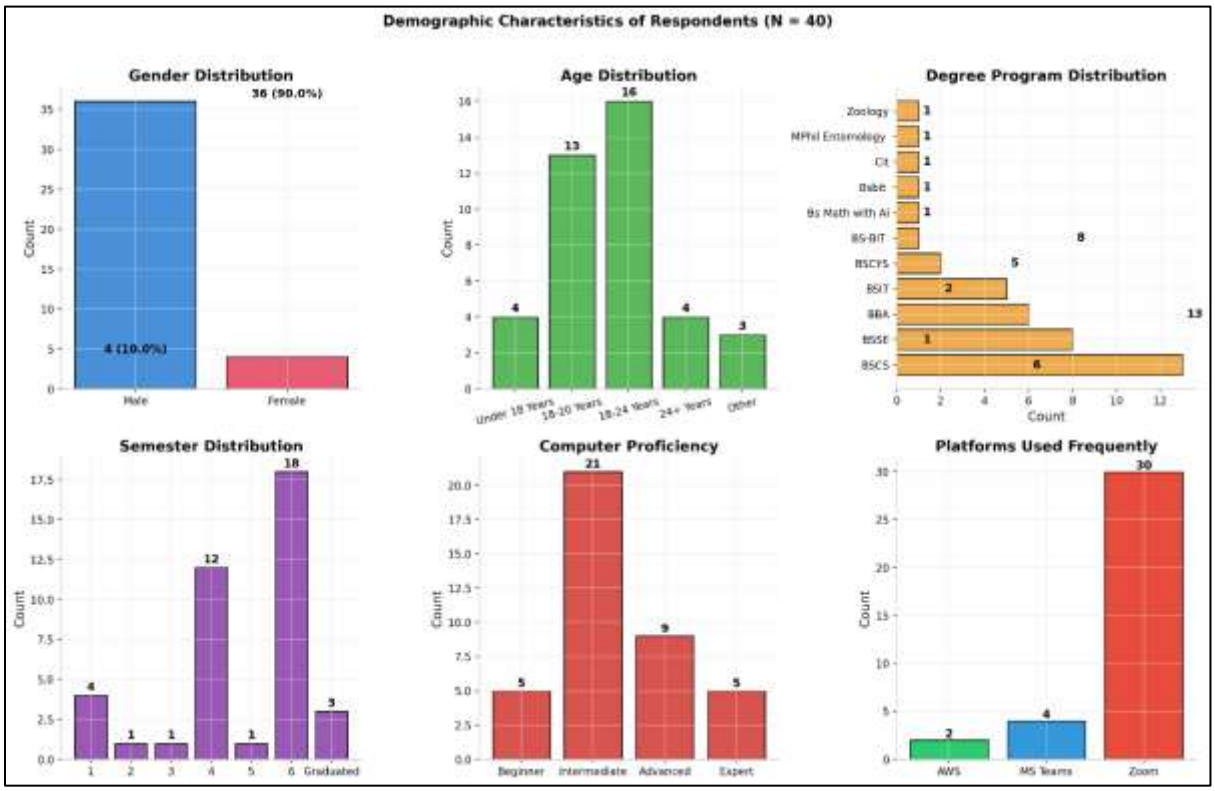

Figure 4: Demographic Characteristics of Respondents

4.2 Reliability Analysis

Table 2 presents the internal consistency reliability coefficients (Cronbach's Alpha) for each section of the questionnaire and for the overall instrument. Values above 0.70 are generally considered acceptable for research purposes.

Table 2: Internal Consistency Reliability

Section	*Number of Items*	*Cronbach's Alpha*	*Interpretation*
B: Usage and Familiarity	6	0.756	Acceptable
C: Engagement and Participation	6	0.917	Excellent
D: Communication Skills Development	6	0.890	Excellent
E: Non-Verbal Communication	6	0.913	Excellent
F: Confidence and Anxiety	6	0.847	Good
G: Collaboration and Interaction	6	0.861	Good
H: Challenges and Barriers	6	0.695	Acceptable
I: Overall Impact and Satisfaction	5	0.880	Good
Overall Instrument	**47**	**0.962**	**Excellent**

The reliability analysis confirms strong internal consistency across all sections of the questionnaire. The overall instrument achieved an excellent Cronbach's alpha of 0.962, indicating that the 47 items collectively measure coherent underlying constructs. Section C (Engagement and Participation, $\alpha = 0.917$), Section E (Non-Verbal Communication, $\alpha = 0.913$), and Section D (Communication Skills Development, $\alpha = 0.890$) all demonstrated excellent

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reliability. Section F (Confidence and Anxiety, α = 0.847), Section G (Collaboration and Interaction, α = 0.861), and Section I (Overall Impact and Satisfaction, α = 0.880) showed good reliability. Section B (Usage and Familiarity, α = 0.756) and Section H (Challenges and Barriers, α = 0.695) fell in the acceptable range, which is satisfactory for exploratory research. These results confirm that the questionnaire produces consistent and reliable measurements of student perceptions regarding video conferencing platforms.

4.3 Usage and Familiarity

Table 3 presents the descriptive statistics for Section B: Usage and Familiarity. The items were measured on a 5-point Likert scale where 1 = Strongly Disagree and 5 = Strongly Agree.

Table 3: Descriptive Statistics for Usage and Familiarity

Item	*Mean*	*SD*	*Median*	*Interpretation*
I use video conferencing platforms for academic purposes.	4.30	0.61	4	High
I attend online classes regularly using Zoom/MS Teams.	4.15	0.77	4	High
I actively participate during online sessions.	3.95	0.90	4	Moderate-High
I use features such as chat, raise hand, or screen sharing.	4.15	0.92	4	High
I feel comfortable using video conferencing tools.	4.08	0.97	4	High
I prefer online classes over traditional (in-person) classes.	3.48	1.54	4	Moderate

The results for Usage and Familiarity indicate that students are well-acquainted with video conferencing platforms. The highest mean score was observed for academic use of VCPs (M = 4.30, SD = 0.61), followed by regular attendance in online classes (M = 4.15, SD = 0.77) and utilization of platform features such as chat and screen sharing (M = 4.15, SD = 0.92). Students also reported feeling generally comfortable using these tools (M = 4.08, SD = 0.97). However, the preference for online classes over traditional face-to-face instruction yielded a notably lower and more variable score (M = 3.48, SD = 1.54), suggesting that while students accept and use virtual platforms routinely, they remain divided on whether online formats are preferable to in-person learning. Active participation during sessions (M = 3.95, SD = 0.90) also showed slightly more variability, indicating individual differences in engagement levels.

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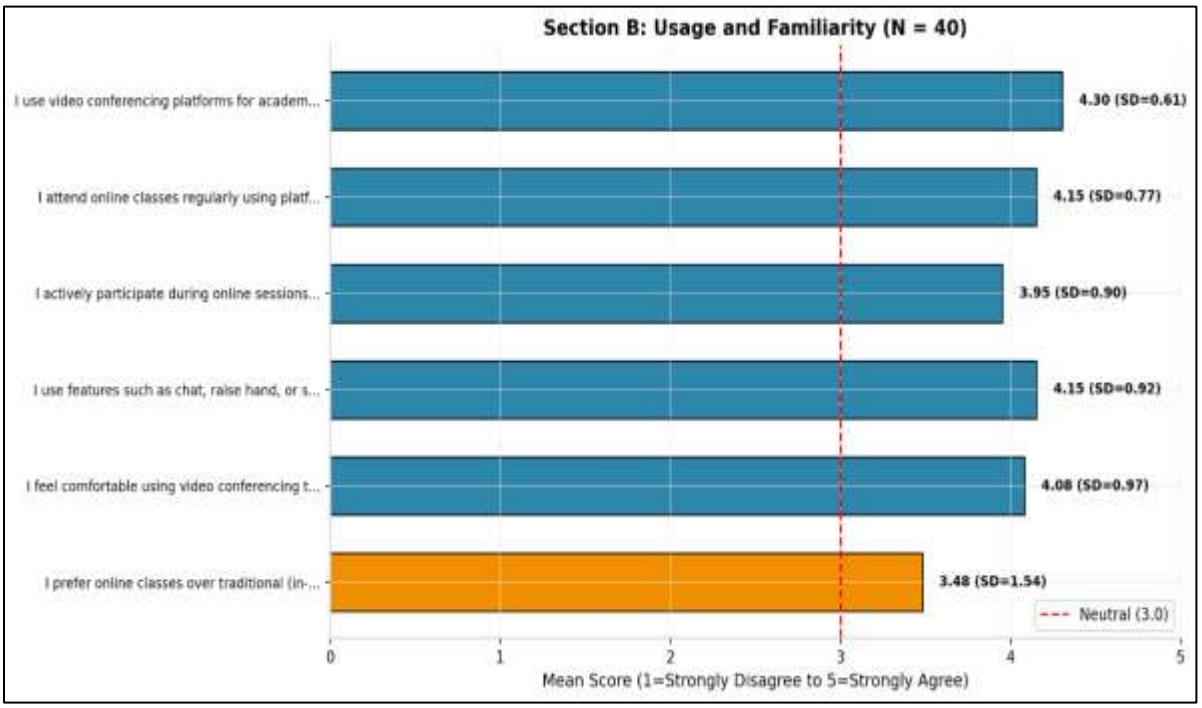

Figure 5: Mean Scores for Usage and Familiarity Items

4.4 Engagement and Participation

Table 4 presents the descriptive statistics for Section C: Engagement and Participation. The items were measured on a 5-point Likert scale where 1 = Strongly Disagree and 5 = Strongly Agree.

Table 4: Descriptive Statistics for Engagement and Participation

Item	*Mean*	*SD*	*Median*	*Interpretation*
Video conferencing platforms increase my engagement in class.	3.42	1.17	4	Moderate
I actively participate in discussions during online classes.	3.72	0.93	4	Moderate-High
I ask more questions during virtual lectures.	3.58	1.22	4	Moderate-High
I interact more with teachers in online classes.	3.35	1.46	4	Moderate
These platforms encourage class participation.	3.32	1.27	4	Moderate
I feel more involved in online learning activities.	3.42	1.43	4	Moderate

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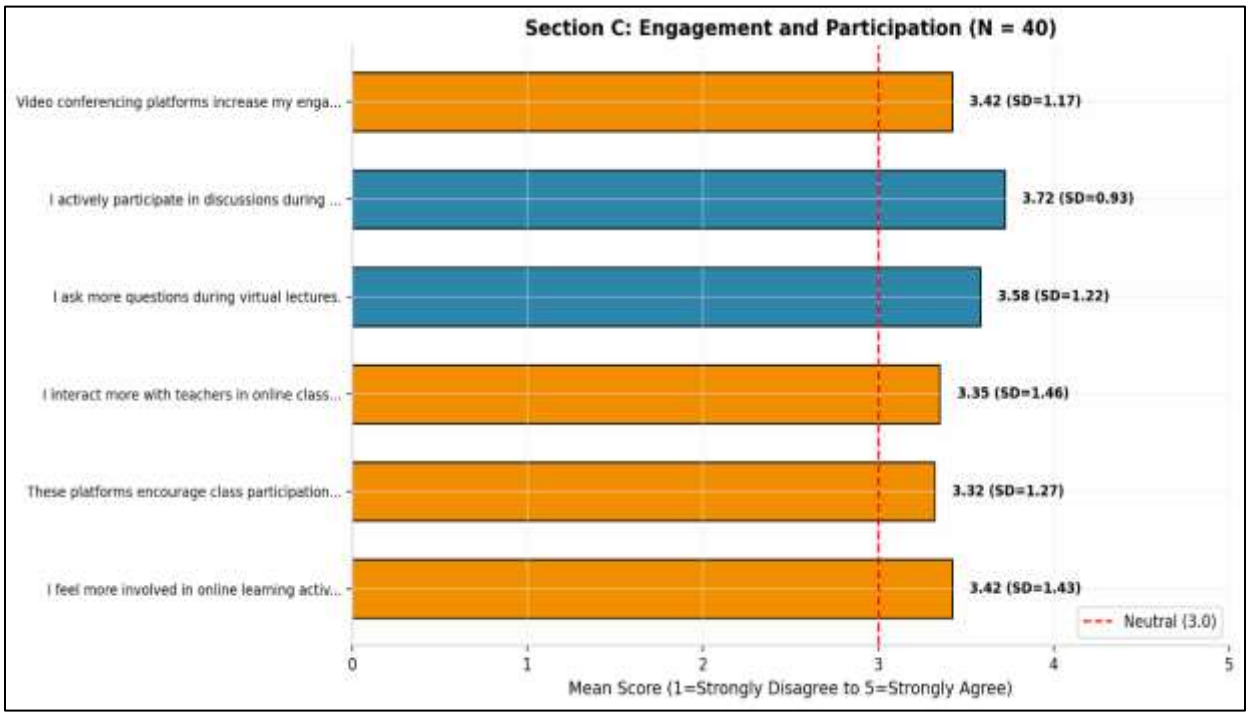

Figure 6: Mean Scores for Engagement and Participation Items

The Engagement and Participation dimension produced moderate scores overall (M = 3.47). Students reported the highest agreement with active participation in discussions (M = 3.72, SD = 0.93) and asking questions during virtual lectures (M = 3.58, SD = 1.22). However, lower scores emerged regarding whether platforms increase overall engagement (M = 3.42, SD = 1.17), encourage class participation (M = 3.32, SD = 1.27), and make students feel more involved (M = 3.42, SD = 1.43). The lowest score in this section was for interaction with teachers (M = 3.35, SD = 1.46), suggesting that students perceive a gap in instructor-student connectivity during virtual sessions. The relatively high standard deviations across items (ranging from 0.93 to 1.46) indicate substantial individual variation in how students experience engagement in video conferencing environments.

4.5 Communication Skills Development

Table 5 presents the descriptive statistics for Section D: Communication Skills Development. The items were measured on a 5-point Likert scale where 1 = Strongly Disagree and 5 = Strongly Agree.

Table 5: Descriptive Statistics for Communication Skills Development

Item	*Mean*	*SD*	*Median*	*Interpretation*
My speaking skills have improved through online classes.	3.30	1.24	3	Moderate
I feel more confident expressing my ideas online.	3.45	1.18	4	Moderate
Video conferencing improves my verbal communication.	3.45	1.08	4	Moderate
My listening skills have improved during online lectures.	3.75	1.10	4	Moderate-High

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I can communicate clearly during online discussions.	3.70	1.07	4	Moderate-High
These platforms enhance my overall communication ability.	3.60	1.28	4	Moderate-High

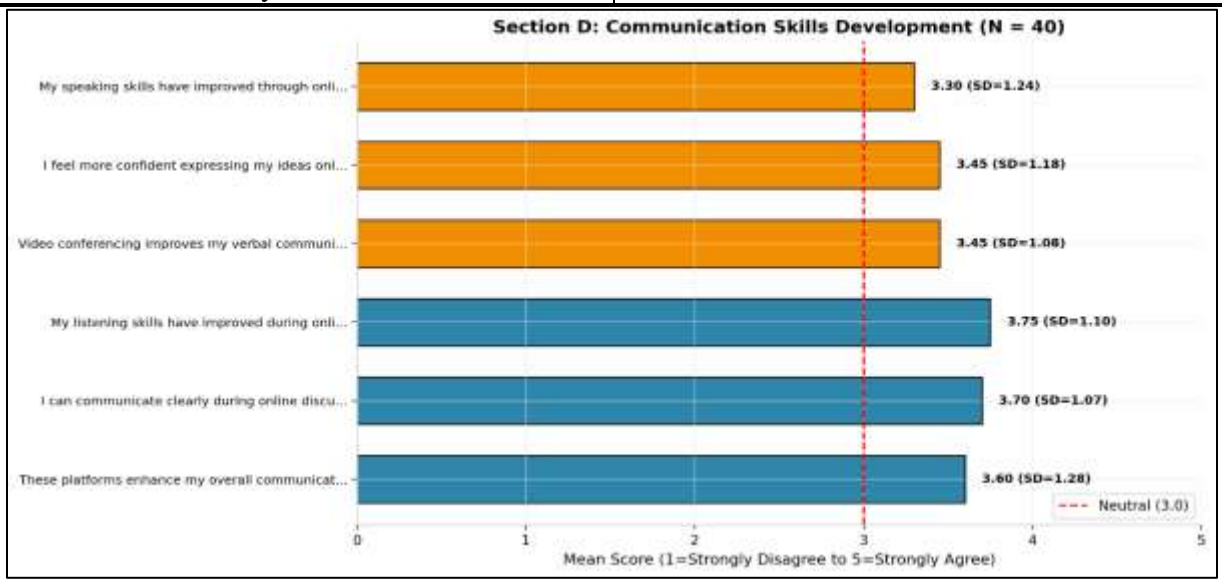

Figure 7: Mean Scores for Communication Skills Development Items

The Communication Skills Development section yielded moderate-to-high mean scores, with an overall section mean of 3.54. Students reported the strongest agreement regarding improved listening skills (M = 3.75, SD = 1.10) and the ability to communicate clearly during online discussions (M = 3.70, SD = 1.07). The perception that platforms enhance overall communication ability also scored moderately high (M = 3.60, SD = 1.28). Lower scores were observed for improved speaking skills (M = 3.30, SD = 1.24) and confidence in expressing ideas online (M = 3.45, SD = 1.18). These findings suggest that students recognize improvements in receptive communication (listening and comprehension) more readily than productive communication (speaking and verbal expression) in virtual environments. The standard deviations across items (ranging from 1.07 to 1.28) reflect meaningful diversity in student perceptions regarding communication skill development through video conferencing.

4.6 Non-Verbal Communication

Table 6 presents the descriptive statistics for Section E: Non-Verbal Communication. The items were measured on a 5-point Likert scale where 1 = Strongly Disagree and 5 = Strongly Agree.

Table 6: Descriptive Statistics for Non-Verbal Communication

Item	*Mean*	*SD*	*Median*	*Interpretation*
I effectively use facial expressions during online classes.	3.25	1.37	3	Moderate
I maintain proper eye contact during video sessions.	3.28	1.28	4	Moderate
I use appropriate body language while attending online classes.	3.70	1.24	4	Moderate-High
I can understand others' gestures during online classes.	3.48	1.26	4	Moderate

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I feel confident while being on camera.	3.60	1.22	4	Moderate-High
I can interpret non-verbal cues effectively in online settings.	3.78	1.00	4	Moderate-High

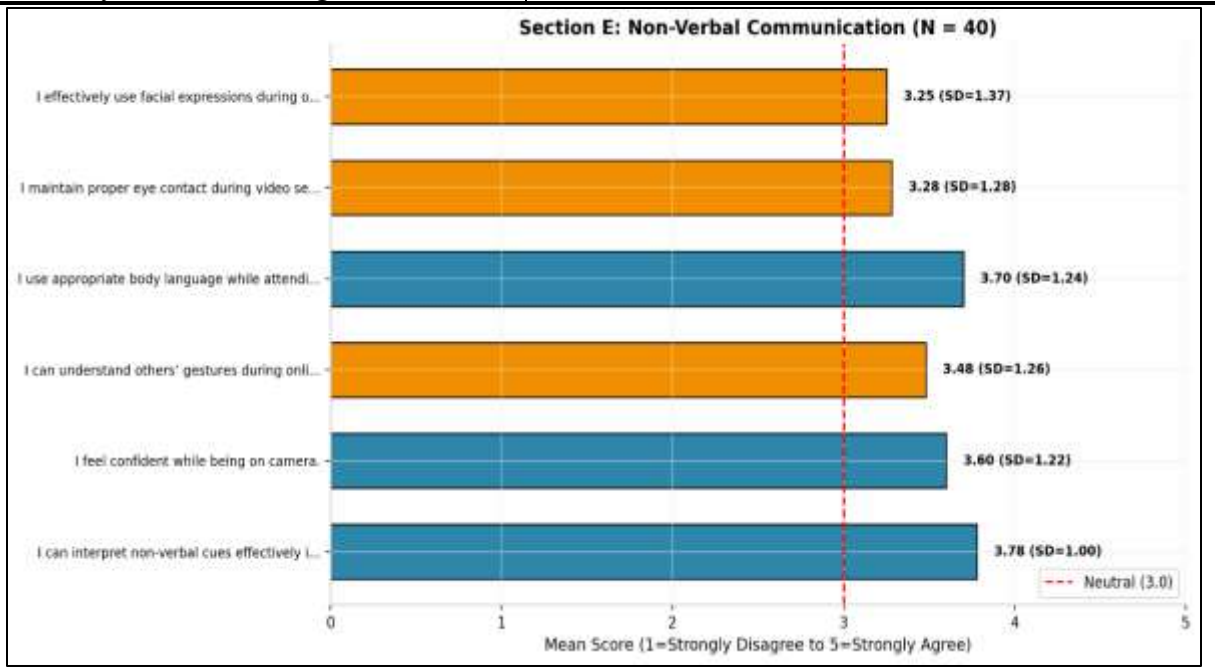

Figure 8: Mean Scores for Non-Verbal Communication Items

The Non-Verbal Communication section produced a section mean of 3.51, reflecting moderate perceptions of non-verbal communication effectiveness in virtual settings. The highest score was observed for interpreting non-verbal cues (M = 3.78, SD = 1.00), suggesting that students feel relatively capable of reading digital non-verbal signals. Appropriate body language (M = 3.70, SD = 1.24) and camera confidence (M = 3.60, SD = 1.22) also scored above the section average. The lowest scores were found for effective use of facial expressions (M = 3.25, SD = 1.37) and maintenance of proper eye contact (M = 3.28, SD = 1.28), which aligns with known technological constraints of video conferencing where camera positioning disrupts natural gaze patterns. The wide standard deviations (up to 1.37) indicate considerable variability in student experiences with non-verbal communication online, suggesting that platform interface design and individual comfort levels significantly influence these perceptions.

4.7 Confidence and Anxiety

Table 7 presents the descriptive statistics for Section F: Confidence and Anxiety. The items were measured on a 5-point Likert scale where 1 = Strongly Disagree and 5 = Strongly Agree.

Table 7: Descriptive Statistics for Confidence and Anxiety

Item	*Mean*	*SD*	*Median*	*Interpretation*
I feel less nervous speaking in online classes.	3.98	1.03	4	Moderate-High
I am more confident communicating through video platforms.	3.82	1.17	4	Moderate-High
I am not afraid of making mistakes online.	3.88	1.16	4	Moderate-High

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Online classes reduce my communication anxiety.	3.80	1.24	4	Moderate-High
I feel comfortable interacting with classmates online.	4.03	0.92	4	High
These platforms help build my confidence.	3.65	1.33	4	Moderate-High

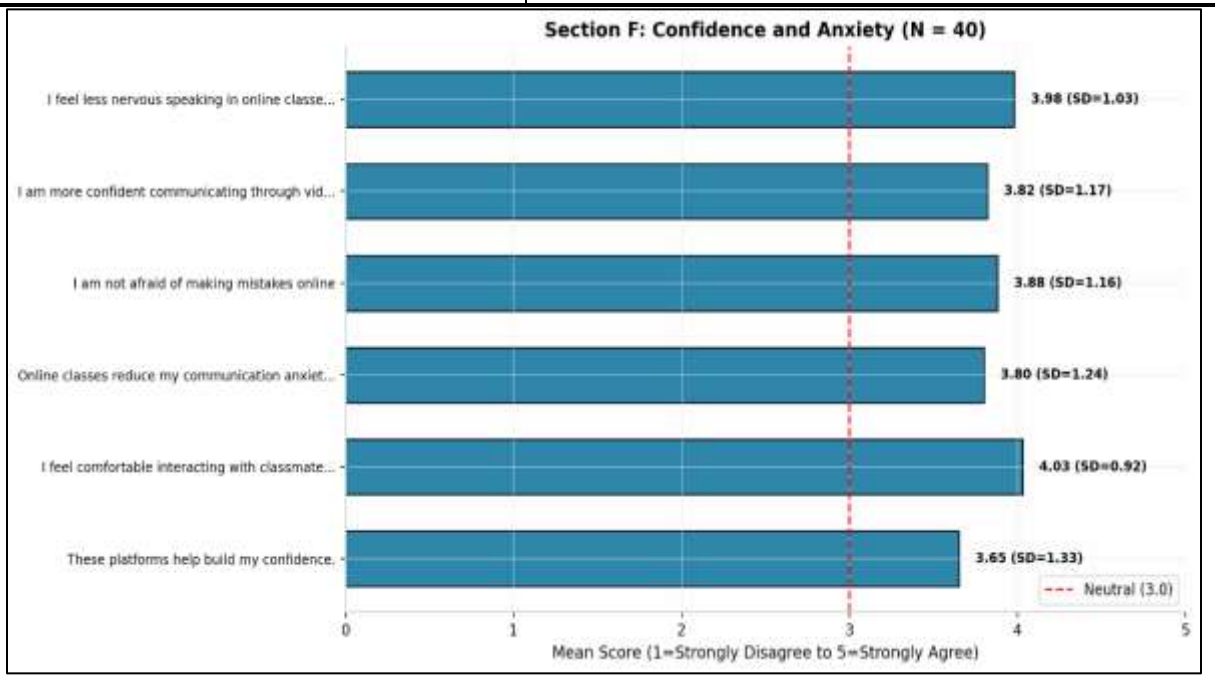

Figure 9: Mean Scores for Confidence and Anxiety Items

The Confidence and Anxiety section achieved the highest section mean (M = 3.86) among all dimensions, indicating that students generally experience positive psychological states during video conferencing. The strongest agreement was found for feeling comfortable interacting with classmates online (M = 4.03, SD = 0.92) and feeling less nervous speaking in online classes (M = 3.98, SD = 1.03). Students also reported not being afraid of making mistakes online (M = 3.88, SD = 1.16) and feeling more confident communicating through video platforms (M = 3.82, SD = 1.17). Online classes reducing communication anxiety also scored well (M = 3.80, SD = 1.24). The lowest item in this section, though still moderate-high, was the perception that platforms help build confidence (M = 3.65, SD = 1.33). The relatively lower standard deviations compared to other sections suggest more consistent experiences with confidence and anxiety reduction in virtual settings.

4.8 Collaboration and Interaction

Table 8 presents the descriptive statistics for Section G: Collaboration and Interaction. The items were measured on a 5-point Likert scale where 1 = Strongly Disagree and 5 = Strongly Agree.

Table 8: Descriptive Statistics for Collaboration and Interaction

Item	*Mean*	*SD*	*Median*	*Interpretation*
I collaborate effectively with classmates online.	3.55	1.01	4	Moderate-High
Group discussions are effective on these	3.60	1.08	4	Moderate-High

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platforms.				
I communicate easily with peers during online classes.	3.68	1.05	4	Moderate-High
Video conferencing supports teamwork activities.	3.62	1.21	4	Moderate-High
I engage in group tasks during online sessions.	3.85	1.03	4	Moderate-High
These platforms improve peer interaction.	3.75	1.10	4	Moderate-High

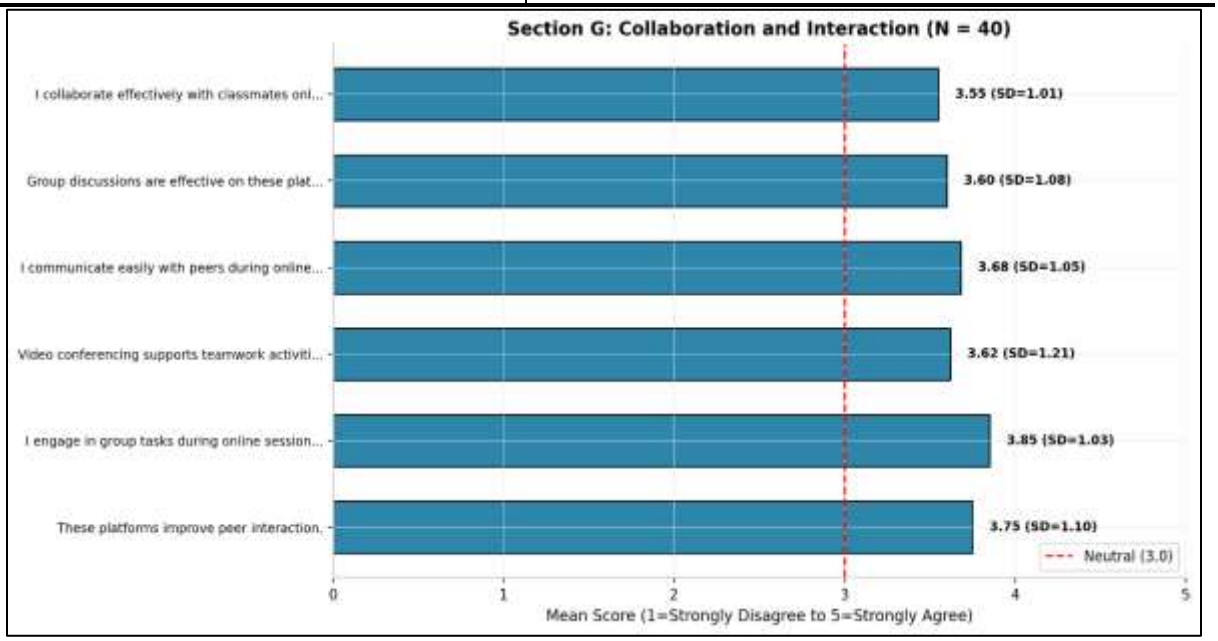

Figure 10: Mean Scores for Collaboration and Interaction Items

The Collaboration and Interaction section produced a moderate-to-high section mean of 3.68. Students reported the strongest agreement with engagement in group tasks during online sessions (M = 3.85, SD = 1.03) and the perception that platforms improve peer interaction (M = 3.75, SD = 1.10). Communication ease with peers (M = 3.68, SD = 1.05), video conferencing supporting teamwork (M = 3.62, SD = 1.21), and effectiveness of group discussions (M = 3.60, SD = 1.08) all scored in the moderate-high range. The lowest item in this section was effective collaboration with classmates online (M = 3.55, SD = 1.01), suggesting that while students engage in group tasks and peer interaction, the quality of collaboration may not always meet their expectations. The moderate standard deviations indicate relatively consistent but not universal positive experiences with collaborative features of video conferencing platforms.

4.9 Challenges and Barriers

Table 9 presents the descriptive statistics for Section H: Challenges and Barriers. The items were measured on a 5-point Likert scale where 1 = Strongly Disagree and 5 = Strongly Agree.

Table 9: Descriptive Statistics for Challenges and Barriers

Item	*Mean*	*SD*	*Median*	*Interpretation*
Technical issues affect my communication in online classes.	4.25	0.84	4	High

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Poor internet connection disrupts my participation.	4.30	0.69	4	High
I feel shy or anxious when speaking online.	3.50	1.22	3	Moderate-High
Lack of face-to-face interaction reduces communication effectiveness.	3.95	1.01	4	Moderate-High
Distractions at home affect my communication.	4.10	1.03	4	High
Online platforms sometimes limit effective communication.	4.20	0.88	4	High

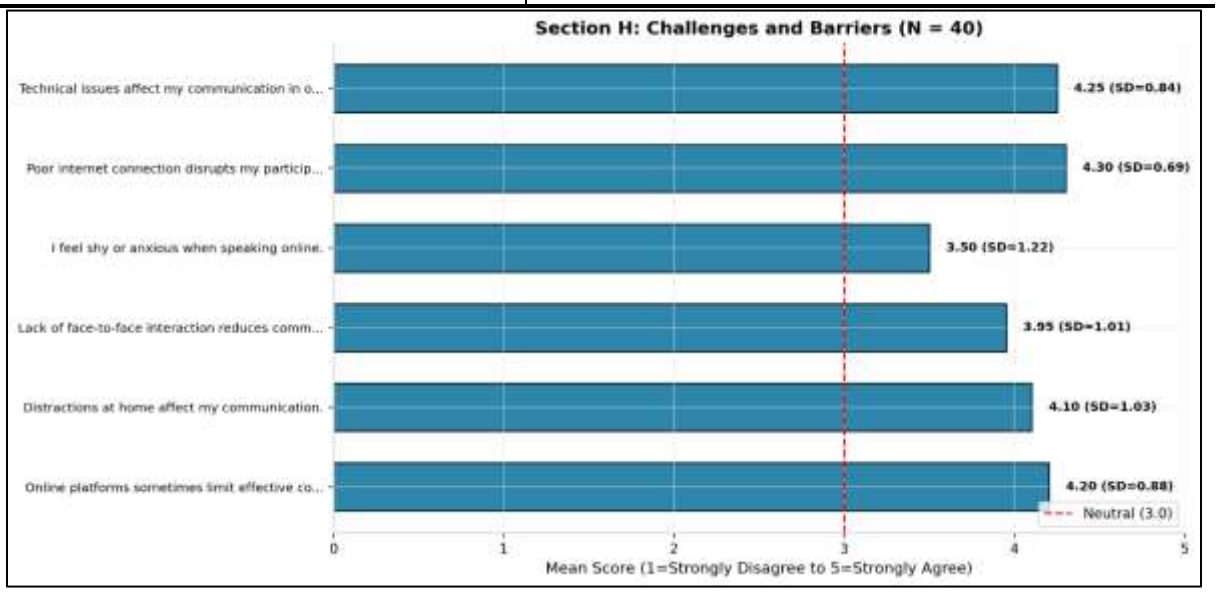

Figure 11: Mean Scores for Challenges and Barriers Items

The Challenges and Barriers section recorded the second-highest section mean (M = 4.05), indicating strong consensus among students that obstacles exist in video conferencing environments. The highest scores were observed for poor internet connection disrupting participation (M = 4.30, SD = 0.69) and technical issues affecting communication (M = 4.25, SD = 0.84), suggesting that infrastructure limitations are the most universally recognized barriers. Students also strongly agreed that online platforms sometimes limit effective communication (M = 4.20, SD = 0.88) and that distractions at home affect their communication (M = 4.10, SD = 1.03). Lack of face-to-face interaction reducing communication effectiveness (M = 3.95, SD = 1.01) also registered strong agreement. The lowest item in this section was feeling shy or anxious when speaking online (M = 3.50, SD = 1.22), which still fell above neutral. The notably lower standard deviations for technical items (0.69 to 0.88) suggest near-universal agreement on these challenges, while the higher SD for anxiety-related items reflects more individual variation in psychological responses.

4.10 Overall Impact and Satisfaction

Table 10 presents the descriptive statistics for Section I: Overall Impact and Satisfaction. The items were measured on a 5-point Likert scale where 1 = Strongly Disagree and 5 = Strongly Agree.

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Table 10: Descriptive Statistics for Overall Impact and Satisfaction

Item	*Mean*	*SD*	*Median*	*Interpretation*
My overall communication skills have improved through online classes.	3.45	1.24	4	Moderate
Video conferencing platforms are effective for learning.	3.42	1.11	4	Moderate
I am satisfied with my online communication experience.	3.70	1.02	4	Moderate-High
Online platforms have improved my confidence in communication.	3.60	1.15	4	Moderate-High
Zoom/MS Teams are useful for developing communication skills.	3.88	1.02	4	Moderate-High

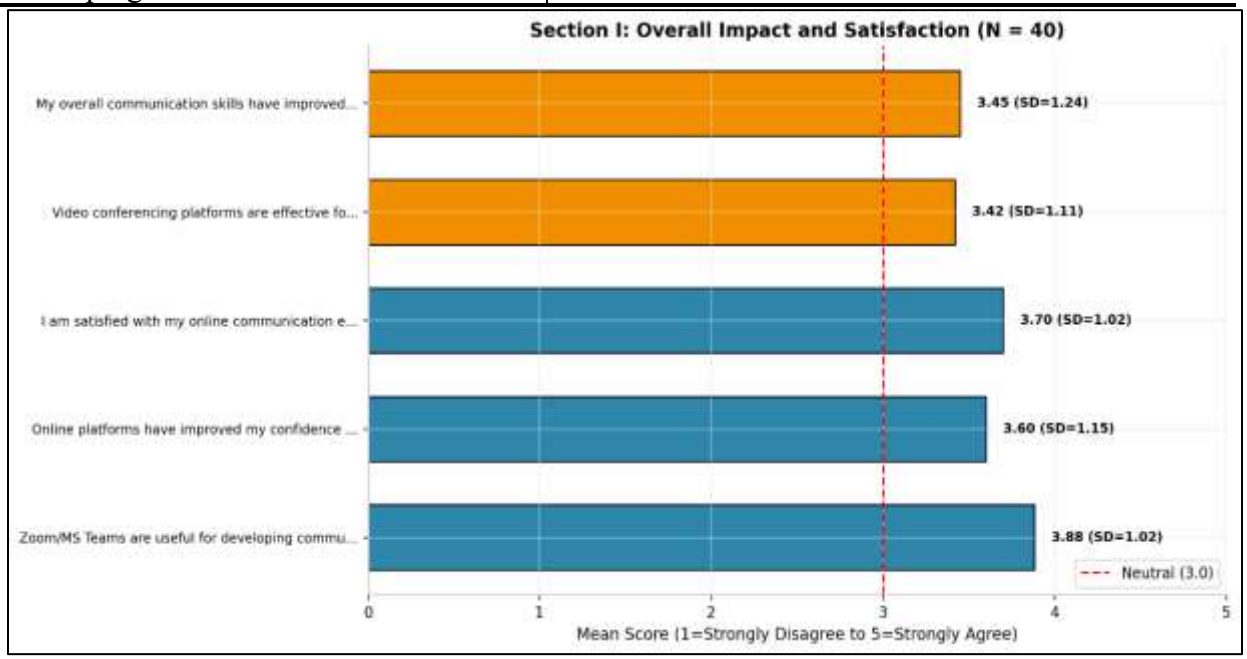

Figure 12: Mean Scores for Overall Impact and Satisfaction Items

The Overall Impact and Satisfaction section produced a section mean of 3.61. Students expressed the strongest agreement that Zoom and MS Teams are useful for developing communication skills (M = 3.88, SD = 1.02). Satisfaction with the online communication experience (M = 3.70, SD = 1.02) and the perception that online platforms have improved confidence (M = 3.60, SD = 1.15) also scored in the moderate-high range. However, lower scores were observed for overall communication skill improvement (M = 3.45, SD = 1.24) and the effectiveness of video conferencing platforms for learning (M = 3.42, SD = 1.11). These findings suggest a nuanced view: while students recognize the utility of these platforms for skill development and report general satisfaction, they remain cautious about claiming broad improvements in their overall communication competence or endorsing virtual platforms as fully effective learning environments. The standard deviations (ranging from 1.02 to 1.24) indicate moderate variability in overall satisfaction levels.

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4.11 Comparative Overview of All Sections

Figure 12 presents a comparative bar chart displaying the overall mean scores across all eight questionnaire sections, with error bars representing standard deviations. The red dashed line at 3.0 indicates the neutral midpoint of the Likert scale.

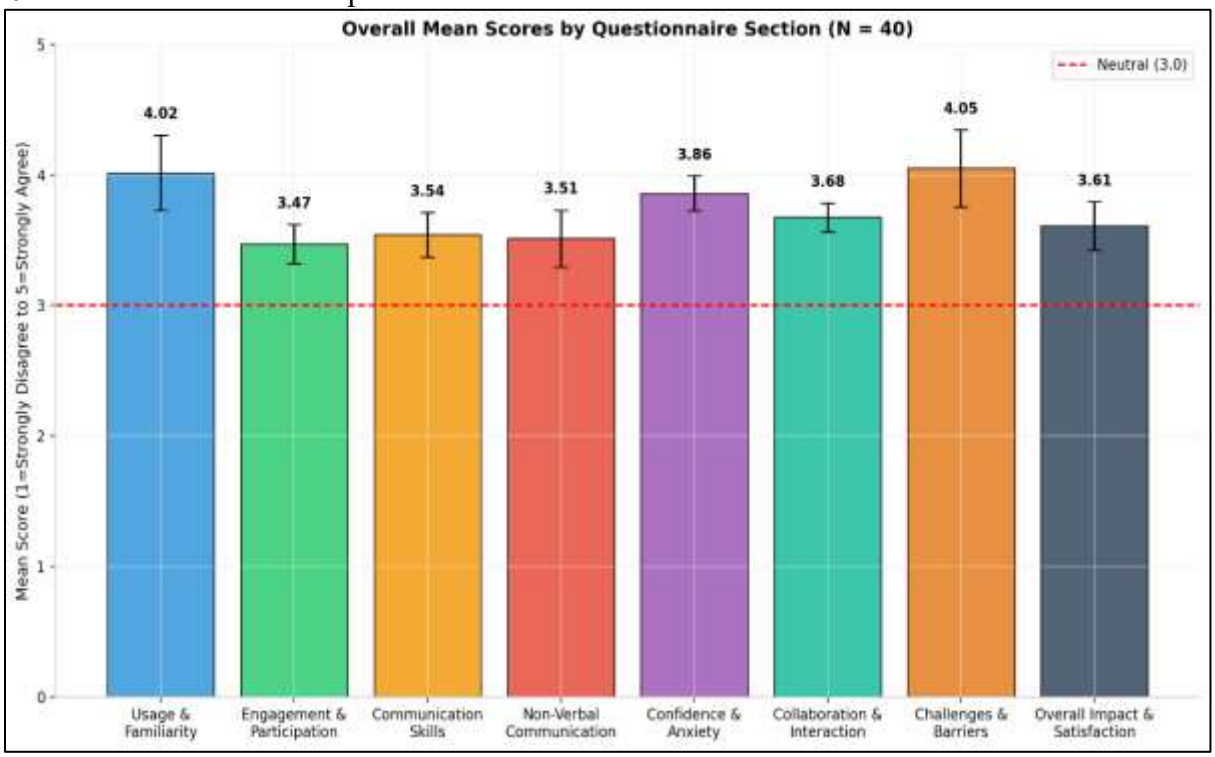

Figure 13: Overall Mean Scores by Questionnaire Section

Table 11: Summary of Section-Level Descriptive Statistics

Section	*Overall Mean*	*SD*	*Interpretation*
B: Usage and Familiarity	4.02	0.29	High
C: Engagement and Participation	3.47	0.15	Moderate
D: Communication Skills Development	3.54	0.17	Moderate-High
E: Non-Verbal Communication	3.51	0.22	Moderate-High
F: Confidence and Anxiety	3.86	0.13	Moderate-High
G: Collaboration and Interaction	3.68	0.11	Moderate-High
H: Challenges and Barriers	4.05	0.30	High
I: Overall Impact and Satisfaction	3.61	0.19	Moderate-High

The comparative overview reveals a clear hierarchy of student perceptions across the eight dimensions. Challenges and Barriers (M = 4.05) and Usage and Familiarity (M = 4.02) emerged as the highest-scoring sections, indicating that students are highly familiar with video conferencing tools and simultaneously recognize significant obstacles in their use. Confidence and Anxiety (M = 3.86) ranked third, suggesting that despite recognized challenges, students generally feel psychologically comfortable in virtual settings. Collaboration and Interaction (M = 3.68) and Overall Impact and Satisfaction (M = 3.61) fell in the moderate-high range, reflecting generally positive but tempered views on the collaborative and developmental value of these platforms. Communication Skills Development (M = 3.54), Non-Verbal Communication (M =

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3.51), and Engagement and Participation (M = 3.47) scored lowest, suggesting that students perceive the greatest limitations in these core communicative dimensions. All section means exceeded the neutral midpoint of 3.0, indicating an overall positive-leaning orientation toward video conferencing platforms, though the lower scores in communication-specific domains reveal important areas for improvement.

4.12 Correlation Analysis

Table 12 presents the Pearson correlation matrix for the composite scores of all eight questionnaire sections. Correlation coefficients indicate the strength and direction of linear relationships between the dimensions of video conferencing impact. Figure 14 provides a visual heatmap of these correlations.

Table 12: Correlation Matrix of Section Composite Scores

Section	*Usage & Fam.*	*Engage. & Part.*	*Comm. Skills*	*Non-Verbal*	*Conf. & Anx.*	*Collab. & Int.*	*Challenges*	*Overall*
Usage & Fam.	1.00	0.53	0.60	0.34	0.55	0.52	0.13	0.58
Engage. & Part.	0.53	1.00	0.82	0.66	0.73	0.70	0.11	0.79
Comm. Skills	0.60	0.82	1.00	0.70	0.86	0.71	0.05	0.83
Non-Verbal	0.34	0.66	0.70	1.00	0.49	0.66	0.21	0.68
Conf. & Anx.	0.55	0.73	0.86	0.49	1.00	0.66	-0.06	0.77
Collab. & Int.	0.52	0.70	0.71	0.66	0.66	1.00	0.04	0.70
Challenges	0.13	0.11	0.05	0.21	-0.06	0.04	1.00	0.11
Overall	0.58	0.79	0.83	0.68	0.77	0.70	0.11	1.00

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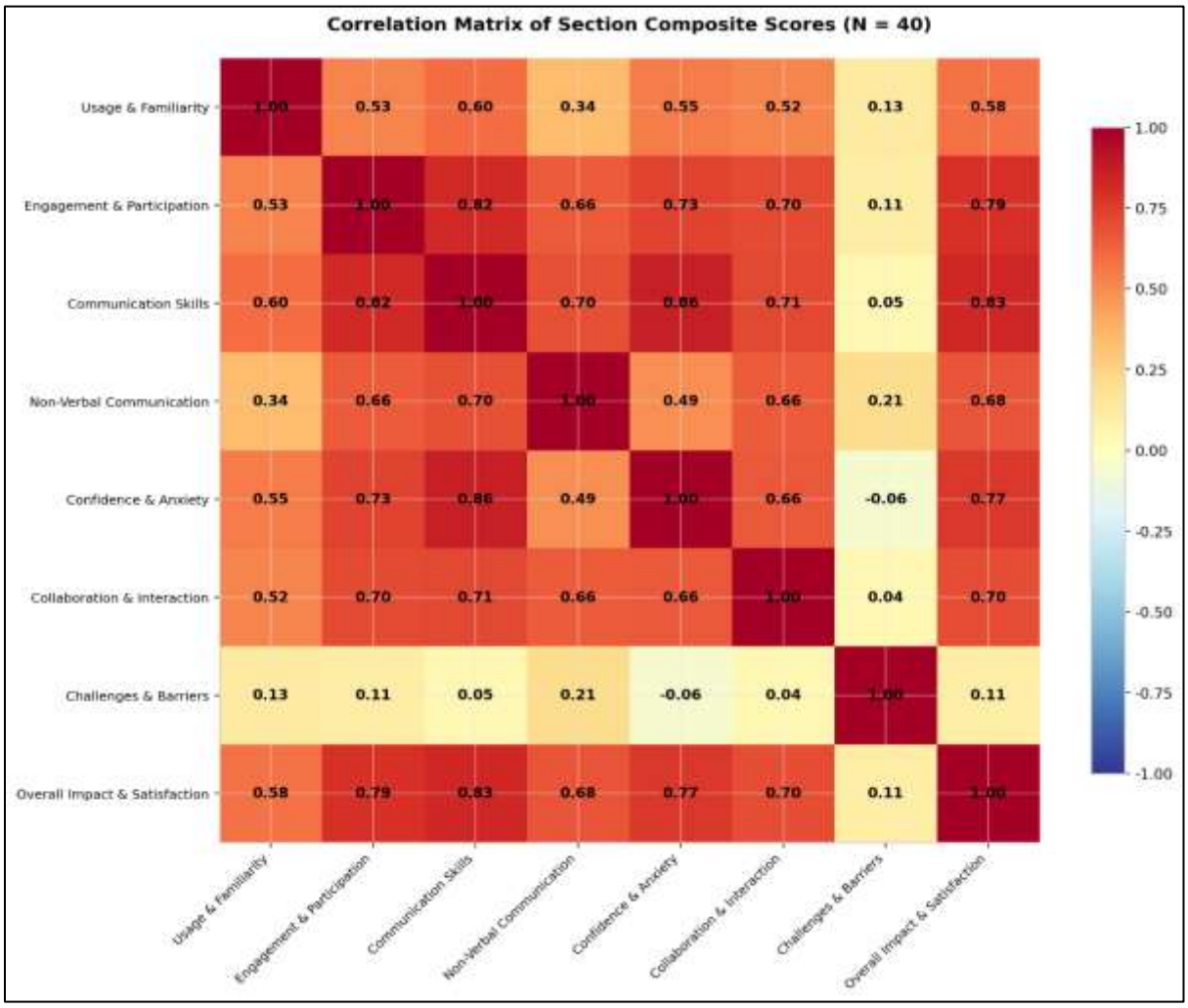

Figure 14: Correlation Heatmap of Section Composite Scores

The correlation analysis reveals several meaningful relationships among the questionnaire dimensions. The strongest positive correlation was observed between Communication Skills Development and Confidence and Anxiety (r = 0.86), indicating that students who perceive greater communication skill gains also tend to experience higher confidence and lower anxiety in virtual settings. Communication Skills Development also showed strong correlations with Engagement and Participation (r = 0.82) and Overall Impact and Satisfaction (r = 0.83), suggesting that perceived communication improvement is closely tied to active involvement and general satisfaction with video conferencing. Engagement and Participation correlated strongly with Confidence and Anxiety (r = 0.73), Collaboration and Interaction (r = 0.70), and Overall Impact (r = 0.79), confirming that student engagement is a central predictor of positive virtual learning experiences. Notably, Challenges and Barriers showed very weak correlations with most positive dimensions (ranging from r = -0.06 to r = 0.21), with the only exception being a small positive correlation with Non-Verbal Communication (r = 0.21). This suggests that the challenges students face (technical issues, internet problems, distractions) operate somewhat independently from their perceptions of engagement, confidence, and communication development. The Usage and Familiarity dimension showed moderate correlations with most

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positive constructs (r = 0.52 to 0.60), indicating that familiarity provides a foundation for positive experiences but does not guarantee them. Overall, the correlation pattern supports an integrated model in which engagement, confidence, communication skills, collaboration, and overall satisfaction form a tightly connected cluster, while challenges constitute a relatively distinct dimension of the video conferencing experience.

5. Discussion

This study examined the multifaceted impact of video conferencing platforms on student communication skills through a quantitative survey of 40 university students. The findings reveal a complex interplay between technological affordances, psychological factors, and communication outcomes in virtual learning environments. This discussion interprets the key results in relation to existing literature, theoretical frameworks, and practical educational contexts. The high levels of usage and familiarity (M = 4.02) observed in this study align with the rapid institutional adoption documented by Bozkurt et al. (2020) and Vorina et al. (2023). Students' routine engagement with Zoom and Microsoft Teams for academic purposes suggests that these platforms have become normalized within higher education practice. However, the divided preference for online versus face-to-face instruction (M = 3.48, SD = 1.54) indicates that familiarity does not equate to preference, supporting Serhan (2020), who found that most students did not perceive Zoom as improving their participation. This finding challenges assumptions that increased exposure necessarily leads to greater platform acceptance, highlighting the distinction between technological adoption and pedagogical satisfaction.

The moderate engagement scores (M = 3.47) and notably low teacher interaction ratings (M = 3.35) corroborate concerns raised by Rapanta et al. (2020) regarding the quality of virtual participation. The characterization of virtual classroom discourse as "serial monologue" rather than authentic dialogue appears reflected in students' perceptions that platforms do not sufficiently encourage class participation. This finding has important implications for instructional design, suggesting that passive video conferencing usage without structured interaction strategies may limit the development of participatory communication skills.

The communication skills development results reveal an interesting asymmetry: students reported greater improvement in receptive skills (listening, M = 3.75; clear communication, M = 3.70) than in productive skills (speaking, M = 3.30). This pattern is consistent with Noetel et al. (2021), who found that students in video conferencing environments often adapt their verbal delivery, potentially trading expressive richness for clarity. The lower speaking skills rating may reflect the cognitive load identified by Fan et al. (2023), where students mobilize more cognitive resources to process video-mediated content, leaving fewer resources for dynamic verbal production. These findings suggest that video conferencing environments may selectively enhance certain communication competencies while constraining others. Non-verbal communication produced the second-lowest section mean (M = 3.51), with facial expressions (M = 3.25) and eye contact (M = 3.28) scoring particularly low. These results strongly support Bailenson's (2021) theory of nonverbal overload and the technological constraints identified by Gherghes et al. (2021), who observed that students spent considerable time managing their on-camera appearance rather than engaging with others. The difficulty in maintaining natural eye contact due to camera positioning, and the framing constraints on gestures, are empirically confirmed in this sample. Educators should recognize that non-verbal skill development in

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virtual environments requires explicit pedagogical attention rather than assuming automatic transfer from face-to-face competencies.

The confidence and anxiety dimension yielded the most consistently positive results (M = 3.86), with students feeling comfortable interacting with classmates (M = 4.03) and less nervous speaking online (M = 3.98). This finding supports Aguilera-Hermida (2020), who identified benefits for students in virtual settings where reduced social pressure facilitates participation. However, Fauville et al. (2021) cautioned that confidence gains in virtual contexts may not transfer to face-to-face communication, a limitation that educators should address through blended instructional approaches that bridge both environments. The correlation analysis provides important insights into the interconnected nature of positive virtual learning experiences. The strong correlation between Communication Skills Development and Confidence and Anxiety (r = 0.86) suggests a virtuous cycle in which perceived skill improvement enhances psychological comfort, which in turn may facilitate further skill development. This finding is consistent with McCroskey's (1982) Communication Skill Development Theory, which posits that motivational orientation (willingness to communicate) interacts with behavioral skills and cognitive knowledge. The weak correlations between Challenges and positive dimensions (r = -0.06 to 0.21) indicate that technical barriers operate somewhat independently from student engagement and satisfaction, suggesting that even highly engaged students experience frustration with infrastructure limitations.

Overall, the findings support a nuanced theoretical perspective: video conferencing platforms are not neutral tools but transformative interfaces that reshape communication processes in modality-specific ways. The Communication Skill Development Theory framework is validated in showing differential impacts across cognitive, behavioral, and motivational dimensions.

6. Summary of Key Findings

- **Usage and Familiarity:** Students demonstrate high familiarity with video conferencing platforms (M = 4.02), routinely using them for academic purposes and attending online classes regularly. However, preference for online over face-to-face classes remains divided (M = 3.48).
- **Engagement and Participation:** Students report moderate engagement levels (M = 3.47), with the lowest scores observed for teacher interaction (M = 3.35) and perceived encouragement of participation (M = 3.32), suggesting that instructor-student connectivity remains a challenge in virtual classrooms.
- **Communication Skills Development:** Receptive skills (listening, clear communication) are perceived as more improved (M = 3.75 and M = 3.70) than productive skills (speaking, verbal communication), which scored lower (M = 3.30 to 3.45).
- **Non-Verbal Communication:** While students feel capable of interpreting non-verbal cues (M = 3.78), they struggle with active non-verbal expression such as facial expressions (M = 3.25) and eye contact (M = 3.28), consistent with known technological constraints of video conferencing.
- **Confidence and Anxiety:** This dimension produced the most consistently positive results (M = 3.86), with students feeling comfortable interacting with classmates (M = 4.03) and less nervous speaking online (M = 3.98), indicating that video conferencing reduces social anxiety for many learners.

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- **Collaboration and Interaction:** Group task engagement scored highest (M = 3.85), though general collaboration effectiveness was more modest (M = 3.55), indicating that structured group activities work better than open-ended collaboration.
- **Challenges and Barriers:** Students universally recognize technical and environmental obstacles (M = 4.05), with poor internet (M = 4.30) and technical issues (M = 4.25) being the most prominent concerns.
- **Overall Impact and Satisfaction:** While students acknowledge the utility of platforms for skill development (M = 3.88), their overall satisfaction (M = 3.70) and perceived communication improvement (M = 3.45) remain cautiously positive rather than strongly enthusiastic.
- **Interconnections:** Strong correlations (r = 0.70 to 0.86) among Communication Skills, Engagement, Confidence, Collaboration, and Overall Satisfaction suggest these dimensions form an interconnected system of positive virtual learning experiences, while Challenges operate as a relatively independent barrier.

7. Implications of the Study

The findings of this study carry several important practical implications for educators, administrators, and students engaged in virtual learning environments. First, the results demonstrate that video conferencing platforms significantly impact student communication skills, particularly in non-verbal dimensions where eye contact and gesture transmission are compromised by technological constraints. Educational institutions should implement camera-optional policies with clear pedagogical justifications, reducing the pressure that contributes to camera anxiety while still encouraging visual engagement when instructionally valuable (Castelli & Sarvary, 2021). Second, internet quality and technical infrastructure directly influence communication effectiveness, highlighting the need for equitable technology access including internet subsidies and hardware loan programs for students from disadvantaged backgrounds (Lythreatis et al., 2022). Third, the moderate engagement scores and low teacher interaction ratings suggest that instructors should design explicit interaction strategies such as structured breakout discussions, digital polling, and chat-based Q&A sessions to foster more authentic dialogue rather than passive content delivery (Rapanta et al., 2020). Fourth, professional development for faculty in virtual pedagogy should be prioritized, ensuring that instructors can leverage platform features effectively to enhance rather than constrain communication skill development.

This research challenges unidimensional conceptualizations of communication competence by demonstrating differential impacts across verbal and non-verbal dimensions. While verbal skills may adapt to virtual constraints through increased conciseness, non-verbal capabilities show persistent deficits, suggesting that communication competence is not uniformly transferable across media. This finding supports theoretical frameworks emphasizing modality-specific skill sets rather than generic communication abilities. The study validates McCroskey's (1982) Communication Skill Development Theory in digital contexts, showing that cognitive knowledge, behavioral skills, and motivational orientation are all affected by video conferencing interfaces but in different ways. The strong correlation between communication skill development and confidence (r = 0.86) supports the theoretical integration of skill acquisition and psychological comfort. Furthermore, the weak relationship between challenges and positive communication dimensions suggests that barriers operate independently from skill development processes, contributing to theoretical understanding of resilience in technology-mediated

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learning. These findings inform emerging theory on digital embodiment and self-presentation in virtual environments, suggesting that technological features designed to increase social presence may require careful calibration to preserve psychological comfort (Garrison & Arbaugh, 2007).

From a policy perspective, this study supports the development of institutional guidelines that address both technological equity and pedagogical quality in virtual learning. Universities should establish minimum technical standards for student participation in online courses, including adequate bandwidth requirements, device specifications, and accessibility accommodations (Mukhtar et al., 2020). Policy frameworks should also address digital privacy concerns that contribute to camera anxiety, clarifying how recorded sessions are stored, who has access to them, and under what circumstances camera use is mandatory. Additionally, institutional quality assurance policies should evaluate online courses not merely for content delivery but for communication skill development outcomes, ensuring that virtual programs provide comparable communicative preparation to face-to-face equivalents. At the national level, the findings support government investment in digital infrastructure for higher education, particularly in regions where unreliable internet connectivity creates barriers to effective virtual communication (Watermeyer et al., 2021).

8. Conclusion

This study has investigated the multifaceted impact of video conferencing platforms on student communication skills through quantitative survey methodology. The findings confirm that video conferencing produces a complex dual-impact scenario: while enhancing accessibility, digital literacy, and participation for specific populations, it simultaneously diminishes non-verbal communication effectiveness, reduces spontaneous interaction, and decreases student confidence in presentation contexts. The research demonstrates that video conferencing platforms are not neutral tools but transformative interfaces that fundamentally reshape communication processes. The most significant negative impact occurs in non-verbal communication dimensions, with eye contact effectiveness and gesture transmission particularly compromised by technological constraints. Camera anxiety emerges as a significant barrier affecting student willingness to participate and overall communication effectiveness in virtual settings. However, the findings also reveal adaptive benefits: increased conciseness in verbal expression, expanded participation opportunities for introverted learners through chat functions, and valuable digital communication competencies increasingly relevant to professional contexts.

The study contributes to digital education perspective by providing empirical evidence that platform effectiveness is contingent upon pedagogical implementation, technological infrastructure, and individual learner characteristics rather than inherent technological properties. The findings suggest that instructional design and institutional support are critical factors in determining communication outcomes, regardless of the specific platform used. These findings challenge both uncritical celebration of virtual learning accessibility and blanket condemnation of its communication limitations, supporting instead a nuanced, conditional assessment of video conferencing's educational role.

9. Recommendations for Future Research

This study opens several avenues for future research. Longitudinal studies tracking communication skill development over multiple semesters would provide valuable insights into how students adapt to video conferencing platforms over time and whether initial challenges diminish with prolonged exposure. Experimental designs comparing specific instructional interventions, such as camera-mandatory versus camera-optional policies or structured versus

unstructured group activities, would help identify optimal pedagogical strategies for virtual communication skill development. Qualitative follow-up interviews could complement quantitative findings by exploring the subjective experiences underlying the statistical patterns observed in this study. Cross-cultural investigations comparing virtual communication dynamics across different national and institutional contexts would extend the generalizability of the findings. Additionally, mixed-methods research incorporating expert assessment of communication skills alongside self-report measures would provide more comprehensive evaluation of actual versus perceived competence. Future studies should also examine the differential impacts of various video conferencing platforms beyond Zoom and Microsoft Teams, as well as the effects of emerging technologies such as virtual reality and augmented reality on communication skill development in educational settings.

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Appendix A: Research Questionnaire

Title: Impact of Video Conferencing Platforms on Communication Skills of Students

Instructions: Please respond to each statement using the following 5-point Likert scale:
1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree

Section A: Demographic Information

Field	Options
Age	Under 18 / 18–20 / 21–24 / 24+
Gender	Male / Female / Other
Program	BSCS / BSIT / BSSE / BSCYS / BBA / Other
Semester	1–2 / 3–4 / 5–6 / 7–8 / Graduated
Computer Proficiency	Beginner / Intermediate / Advanced / Expert
Platform Used Frequently	Zoom / MS Teams / Google Meet / Other

Section B: Usage and Familiarity

(1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree)

#	Statement	1	2	3	4	5
1	I use video conferencing platforms for academic purposes.	1	2	3	4	5
2	I attend online classes regularly using Zoom/MS Teams.	1	2	3	4	5
3	I actively participate during online sessions.	1	2	3	4	5
4	I use features like chat, raise hand, or screen sharing.	1	2	3	4	5
5	I feel comfortable using video conferencing tools.	1	2	3	4	5
6	I prefer online classes over traditional classes.	1	2	3	4	5

Section C: Engagement and Participation

(1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree)

#	Statement	1	2	3	4	5
7	Video conferencing platforms increase my engagement in class.	1	2	3	4	5
8	I actively participate in discussions during online classes.	1	2	3	4	5
9	I ask more questions during virtual lectures.	1	2	3	4	5

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#	Statement	1	2	3	4	5
10	I interact more with teachers in online classes.	1	2	3	4	5
11	These platforms encourage class participation.	1	2	3	4	5
12	I feel more involved in online learning activities.	1	2	3	4	5

Section D: Communication Skills Development

(1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree)

#	Statement	1	2	3	4	5
13	My speaking skills have improved through online classes.	1	2	3	4	5
14	I feel more confident expressing my ideas online.	1	2	3	4	5
15	Video conferencing improves my verbal communication.	1	2	3	4	5
16	My listening skills have improved during online lectures.	1	2	3	4	5
17	I can communicate clearly during online discussions.	1	2	3	4	5
18	These platforms enhance my overall communication ability.	1	2	3	4	5

Section E: Non-Verbal Communication

(1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree)

#	Statement	1	2	3	4	5
19	I effectively use facial expressions during online classes.	1	2	3	4	5
20	I maintain proper eye contact during video sessions.	1	2	3	4	5
21	I use appropriate body language while attending online classes.	1	2	3	4	5
22	I can understand others' gestures during online classes.	1	2	3	4	5
23	I feel confident while being on camera.	1	2	3	4	5
24	I can interpret non-verbal cues effectively in online settings.	1	2	3	4	5

Section F: Confidence and Anxiety

(1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree)

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#	Statement	1	2	3	4	5
25	I feel less nervous speaking in online classes.	1	2	3	4	5
26	I am more confident communicating through video platforms.	1	2	3	4	5
27	I am not afraid of making mistakes online.	1	2	3	4	5
28	Online classes reduce my communication anxiety.	1	2	3	4	5
29	I feel comfortable interacting with classmates online.	1	2	3	4	5
30	These platforms help build my confidence.	1	2	3	4	5

Section G: Collaboration and Interaction

(1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree)

#	Statement	1	2	3	4	5
31	I collaborate effectively with classmates online.	1	2	3	4	5
32	Group discussions are effective on these platforms.	1	2	3	4	5
33	I communicate easily with peers during online classes.	1	2	3	4	5
34	Video conferencing supports teamwork activities.	1	2	3	4	5
35	I engage in group tasks during online sessions.	1	2	3	4	5
36	These platforms improve peer interaction.	1	2	3	4	5

Section H: Challenges and Barriers

(1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree)

#	Statement	1	2	3	4	5
37	Technical issues affect my communication in online classes.	1	2	3	4	5
38	Poor internet connection disrupts my participation.	1	2	3	4	5
39	I feel shy or anxious when speaking online.	1	2	3	4	5
40	Lack of face-to-face interaction reduces communication effectiveness.	1	2	3	4	5
41	Distractions at home affect my communication.	1	2	3	4	5
42	Online platforms sometimes limit effective communication.	1	2	3	4	5

Section I: Overall Impact and Satisfaction

(1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree)

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#	Statement	1	2	3	4	5
43	My overall communication skills have improved through online classes.	1	2	3	4	5
44	Video conferencing platforms are effective for learning.	1	2	3	4	5
45	I am satisfied with my online communication experience.	1	2	3	4	5
46	Online platforms have improved my confidence in communication.	1	2	3	4	5
47	Zoom/MS Teams are useful for developing communication skills.	1	2	3	4	5

Appendix B: Data Source

Google Form link: https://forms.gle/Wp25oKFU9stJYK7Q6