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A Reflection on Action Approach to Teamwork Facilitation

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A Reflection on Action Approach to Teamwork Facilitation

Abstract

Working in teams has been recognized as an essential 21st-century skill. Introducing teamwork in the undergraduate classroom is crucial as it allows the students to work with individuals with diverse skillsets and learn from one another. It is important to note that just creating a team and allowing the students to work does not foster teamwork skills. Inculcating teamwork skills requires a consciousness on the part of the instructor and the teaching assistants. Pedagogies such as cooperative learning have been recognized as effective in helping students develop teamwork skills. We introduced a joint reflection on action approach to developing teamwork skills among novice students as part of a sophomore-level systems analysis and design course. In this evidence-based practice paper, we report on students' reflections regarding their perceptions of teamwork. This study approaches the following research questions: What are students' reflections about the role of communication while working in teams in a cooperative project-based learning environment?

The guiding pedagogical framework for this course is cooperative learning. The course requires the students to work in teams in a semester-long software development project. To elicit reflection on action about their teamwork experience. Specifically, we exposed students to concrete experiences as part of their teamwork interactions, which became the basis for observations and reflections. For this, the semester-long project was complemented with one reflection-on-action activity. In the activity, students were asked to watch a video of secrets of successful teamwork and were asked to reflect on their perceptions about the role of communication within teams. The students' reflections on the activity were analyzed using qualitative inductive thematic analysis to understand the students' perceptions regarding teamwork and communication within teams.

Keywords: cooperative learning, teamwork, team communication, undergraduate students

1.0 Background

The industry expects young graduates to possess professional skills such as teamwork, communication, critical thinking, and problem-solving [1], [2]. Just developing technical skills is not enough; industries need people who have the ability to collaborate and work with employees from diverse backgrounds [3]. Communication and teamwork have been identified as critical 21st-century skills that every young graduate must develop [2], [4], [5]. Studies [3], [6], [7] have demonstrated that teamwork has many benefits for students that help them improve their skills, such as promoting communication and collaboration skills and letting the student take over the role of arranging tasks. As a result, teamwork or group work becomes a common approach for most instructions and organizations to prepare students for their future careers.

Communication is integral to teamwork, and it is one of the critical elements for team success. Communication serves as the medium for the team members to share their opinions, feedback, and challenges with other team members. Recent studies have suggested that there has been an increasing focus on active and team-based learning in the context of higher education settings [2], [8]. But there is less focus on how students can develop good communication skills while working in a team setting, especially in STEM classrooms [6]. Also, it is essential to note that working in teams does not necessarily help students develop communication skills. Instructors must help students understand the benefits of teamwork communication. Matusovich et al. [9] conducted a longitudinal study that interviewed engineering faculty members to understand the importance of teamwork and communication in an engineering classroom. The study found that almost all the faculty agreed that communication and teamwork are vital skills for an engineering student. Still, there is a significant lack of teaching regarding the two topics. The faculties also agreed that students learn communication skills most effectively through implementation and real experience. Such experiences include working in teams towards goals representing a natural industrial setting; also, there should be a structured project that enriches and emphasizes the importance of communication across all stages within the project.

Another study conducted by Jaiswal et al. [2] argued that the role of the instructor is crucial in helping the students develop teamwork skills. The study revealed that teams that demonstrated high interpersonal relationships and group processes were proficient in communicating with their team members. Also, the students demonstrated high academic performance and teamwork skills. Therefore, this study uses the reflection on action approach [10] to understand students' perception (reflection) about teamwork communication after a session on teamwork communication by the instructor and watching a video on the importance of teamwork communication in the classroom (action). The study intends to answer the following research question (RQ): What are student reflections about the role of communication while working in teams in a cooperative project-based learning environment?

2.0 Theoretical Framework

The Dickinson and Mcintyre model [11] was identified as the theoretical framework for this study as this model represents the seven essential elements of teamwork. The model categorizes the seven elements into three phases, input, process, and output. The model emphasizes the role of

communication within a team and considers it as the link that connects all the other six elements of teamwork [12]. Figure 1 below demonstrates that the model's input component comprises team orientation and team leadership. The throughput or intermediate components are monitoring, feedback, and backup, and the output is coordination. Communication is crucial in each phase, and each phase is incomplete without communication. According to Dickinson and McIntyre, a critical feature of teams' performance is the coordination of their decisions and activities to attain shared goals. This model suggests that for a team to succeed, team members are interdependent to share information and coordinate activities, which requires team communication skills.

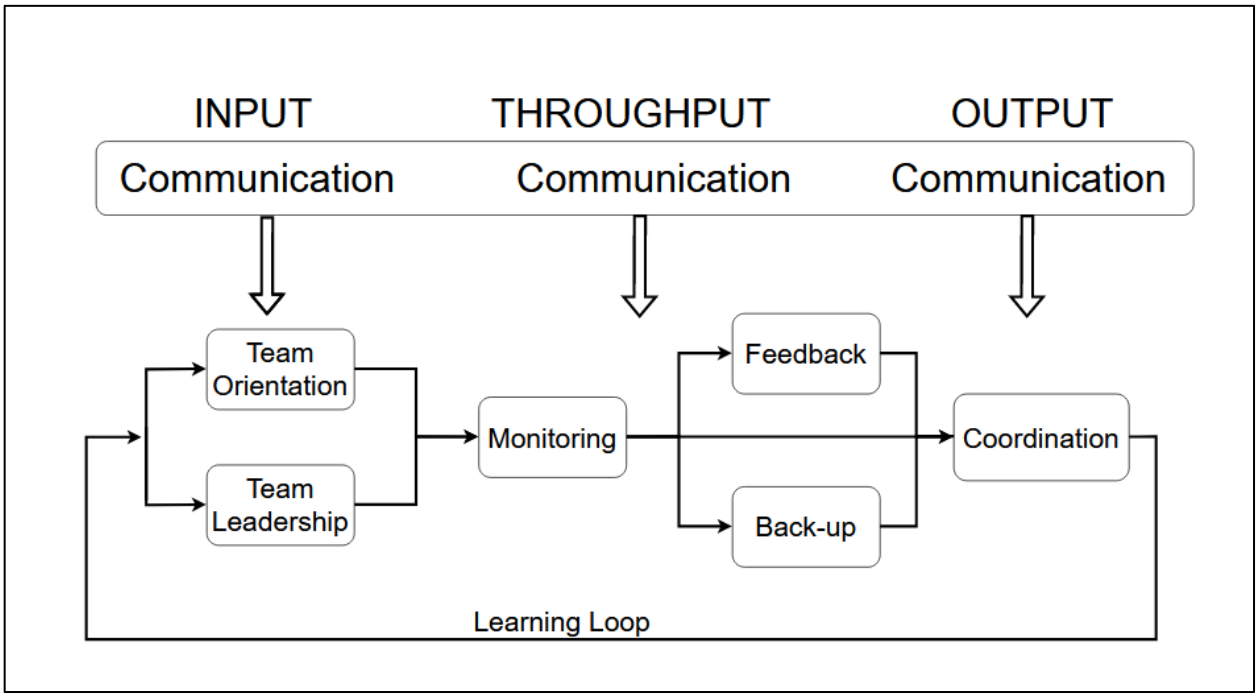

Figure 1: Dickinson and McIntyre's teamwork model [11]

2.1 Implications of the Theoretical Framework for Learning Design

The implications of the theoretical framework for the study focused on designing a learning experience that would promote students' development of teamwork skills, with a particular emphasis on team communication and coordination. For this, we introduced a joint reflection on the action approach grounded in transformative pedagogy [13]. Transformative pedagogy encourages students to examine their assumptions critically, grapple with social issues, and engage in social action [14]. Specifically, the delivery of the course was grounded in the five main principles of transformative Pedagogy, including (1) creating a safe environment, (2) encouraging students to think about their experiences, beliefs, and biases, (3) using teaching strategies that promote student engagement and participation such as discussions and reflections, (4) posing real-world problems that address societal inequalities; and (5) helping students implement action-oriented solutions [14]. Using transformative pedagogy as a foundation, students engaged in cycles where they participated in a semester-long project working as team members and, at the same time, continuously reflected on their experiences. The cycles involved exposing students to concrete

experiences as part of their teamwork interactions, which became the basis for observations and reflections.

Dickinson and McIntyre's teamwork model [11] guided the design of the activity. A reflection activity was designed to promote better communication among team members in a team. The reflection activity consisted of a three-step procedure. Students were first presented with a brief introduction about a research project Google launched with more than 180 teams. Students were then prompted to watch a video where they were exposed to a summary of the research project called Aristotle (Secrets of successful teamwork: Insights from Google [15]). The report concluded on behaviors of teams that made them the more effective: (1) quality and distribution of conversational turn-taking and (2) members having a high average of social sensitivity and active listening. The latter two elements have been defined as psychological safety. After watching the video, students responded to three reflection prompts.

This activity aimed to involve students in a reflection-action process to critically examine how they acted in practice, think about individual experiences, and encourage them to constructively reflect on the action [10]. Reflection on the action involves an active process of making sense of past experiences to orient them for future action [10].

3.0 Methods

3.1 Context and Participants

This study was conducted at a large mid-western university in a sophomore-level Systems Analysis and Design course. This course guides students in applying methods and models to the process of designing computer information systems. Students use techniques from Unified Modeling Language in particular, along with object-oriented modeling tools for describing functions, actors, structures, behaviors, hierarchies, dependencies, and workflow transitions [16]. In addition, the course places a strong emphasis on the development of teamwork skills using an agile methodology and scrum techniques. Other skills included in the course curriculum are cost-benefit analysis, project documentation, and fact-finding. The course design has been subject to multiple revisions iteratively to incorporate teamwork with a class size of 110 to 150 students. For this, the course has combined scrum practices with cooperative learning [2], [5], [16]–[19]. Thus, the documentation of the course orchestration and the effectiveness of this approach have been detailed elsewhere.

For this study, in particular, we report on the integration of transformative pedagogy that aimed to improve teamwork interaction during the Covid-19 pandemic. The course was adapted to respond to social distancing restrictions during the Covid-19 pandemic and thus was offered following a HyFlex format [17]. The course already followed a cooperative project-based learning approach where students work towards a team-based semi-capstone project [18]. Briefly, the project is divided into four key milestones, and their final deliverable is an information system design with a basic online prototype element. Students met virtually in mandatory teamwork sessions using Microsoft Teams. The instructor created breakout rooms for each team to meet. TAs and instructors visited each team during the teamwork sessions to provide feedback or address any questions. As a team, they explored the assigned case study, gathered information, implemented their disciplinary knowledge to solve the design problem in the case, and created the final project

prototype. Students also participated in team-building activities during the semester, reflected on their team performance, and identified ways to improve their teamwork skills [2]. This allows students to improve their teamwork skills, problem-solving, communication, leadership, and professional skills throughout the semester in a scenario representative of the industry [5][17].

Participants of this study were 127 students enrolled in this system analysis and design course in Spring 2021. According to institutional data, 16% of students were female, and 84% were male. As for ethnicity and race, there were 9% Asian, 6% Black or African American, 7% Hispanic or Latino/a/x, 54% White, 8% two or more races, 13% International, and less than 1% American Indian or Alaska Native.

3.2 Procedures and Data Collection Method

The first four weeks of the semester delivered a reflection on action approach to help students build teamwork skills. The activities followed a similar format. During class time, students watched a video that introduced them to aspects relevant to teamwork, such as cultural self-awareness, communication between team members, and teamwork values. This study reports on students' reflections regarding the role of communication in teamwork, which took place in the third week of the semester. During those first four weeks, students had an opportunity to learn about elements of teamwork and reflect on their previous teamwork experiences and also what teamwork skills they would apply for the rest of the semester.

In Week 3 of the course, students were asked to watch a video on teamwork from Google [15]. The video is titled: Secrets of successful teamwork: Insights from Google. The video is four minutes long and summarizes the findings of the project Aristotle [20]. The video summarizes the findings of a study conducted by Google with more than 180 separate software development teams for the duration of several years. Their goal was to identify what makes teams successful. The video was played at the beginning of the class. After watching the video, students were required to reflect on the following three questions: (1) What do you think are the benefits of good communication within a team? (2) What challenges did you experience concerning communication while working in your project teams? (3) What strategies do you plan to implement to overcome team communication challenges? The course instructor gave students the time to complete the three questions. Specifically, she asked students to raise their hands if they still needed time to complete the reflection. The responses to the three questions served as the data collection method for the study. The responses were de-identified to protect students' privacy and confidentiality before sharing with the research team.

3.3 Data Analysis

The data were analyzed qualitatively using inductive thematic analysis [21]. Two researchers first independently coded 30% of the data for conducting the thematic analysis. Each researcher read the responses carefully and identified the common theme. After completing the first coding round, researchers met, discussed their findings, and developed the codebook. The researchers again recoded the data using the codebook, and interrater reliability was calculated. The percentage agreement between the raters was 87%, which is acceptable for qualitative coding [22], [23].

The researchers conducted the qualitative coding in three steps; in step 1, they identified the top codes for each reflection question. In step 2, the researchers developed three categories for the codes identified, and in step 3, researchers combined all the codes and developed themes for each category. Further, raters divided the data among themselves and coded the rest of the data.

4.0 Results

4.1 Developing Codes and Categories

To answer the following overarching research question: What are student reflections about the role of communication while working in teams in a cooperative project-based learning environment? The thematic analysis was conducted for the three reflection questions, and codes for each question were combined to form categories and themes. The analysis revealed the following three categories: benefits of good team communication, challenges faced due to inadequate team communication, and strategies to improve team communication. Refer to Table 1 describing the codes, their definition, and how the codes formed specific categories.

Table 1. Codes, definitions, and their corresponding category

Category	**Codes**	**Definition**
Benefits of good team communication	Work accomplishment	Students mentioned how good communication led to task accomplishment.
	Share information	Students shared their ideas of specific tasks related to the project and provided information like meeting times, discussion objects, etc.
	Improve work efficiency	Students refer to how communication helped to improve productivity or work efficiency
	Improve collaboration	Students mentioned how communication helped them establish team norms, help each other deal with problems, and split work.
Challenges due to virtual team communication	Lack of equal participation/contribution	Students mentioned that due to the virtual nature of team meetings, few group members did not intend to participate/contribute in team meetings, or some did not attend the team meetings.

	Lack of social sensitivity	Students mentioned due to the virtual setting, students, turned off their cameras and were not being able to watch each other's facial expressions and body language
Strategies to improve team communication	Equal Contribution	Students mention how effective team communication will help everyone share their opinions and contribute ideas, opinions, etc., in a virtual setting.
	Social Sensitivity	Students mentioned how turning on the camera during a virtual meeting will help them watch team members' facial expressions and body language. It will help them understand each other without verbal communication
	Empathy	Students mentioned the importance of understanding team members emotions, like whether they are upset about any tasks or decisions. Or they are experiencing some challenges and barriers with the project.

4.2 Developing Themes for each category

Based on each category, we came up with related themes. The themes represent the top codes that were identified during the analysis.

4.2.1 Theme for benefits of good team communication: *Good teamwork communication can help accomplish the decided work, improve work efficiency, collaborate, and promote better information sharing.*

The theme for benefits focuses on how good communication among the team members helped the team to accomplish work, share information, improve work efficiency and improve collaboration. The codes and categories were combined to form the themes. Figure 2 below represents the percentage of students who agreed to each code. It is important to note that more than 50% of students identified good communication helped them to accomplish their assigned tasks.

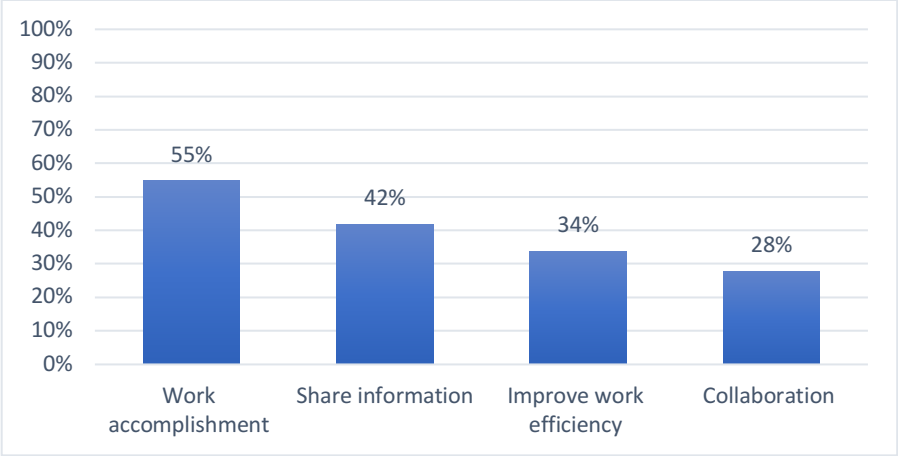

Figure 2: Benefits codes bar chart

Here is an example of a student quote for the above theme. The student quote highlights the importance of team communication in a team setting. Also, it describes how good communication among the team members helps them divide the task and accomplish it, whereas lack of communication hampers the achievement of the desired goal. Further, students have described how students communicated and were connected during the project.

> *"Communication is the only way to unite the team around a common purpose and work consistently to achieve that purpose. It also allows teams to divide up and specialize tasks without working against each other. Fair and balanced communication allows people to blend their own ideas with the ideas of their teammates, while unbalanced communication leads to a lack of unity and the improper specialization of tasks. I think our team has performed well as a whole. We created our group chat and have shared documents. We share a lot of thoughts through our chat and communicated well as a group."*

4.2.2.Theme for Challenges faced due to virtual team communication: *Students experienced a lack of social sensitivity and equal participation in the team goals due to virtual team communication.*

The theme above represents the challenges students faced as they had to communicate virtually to accomplish their final projects and assignments. Figure 3 below represents the two challenges faced by the students. It is important to note that the percentage of challenges experienced by students is less than the benefits they experienced as a group. The top two challenges students faced were lack of equal participation/contribution, reported by 18% of students, and lack of social sensitivity, reported by 12% of students.

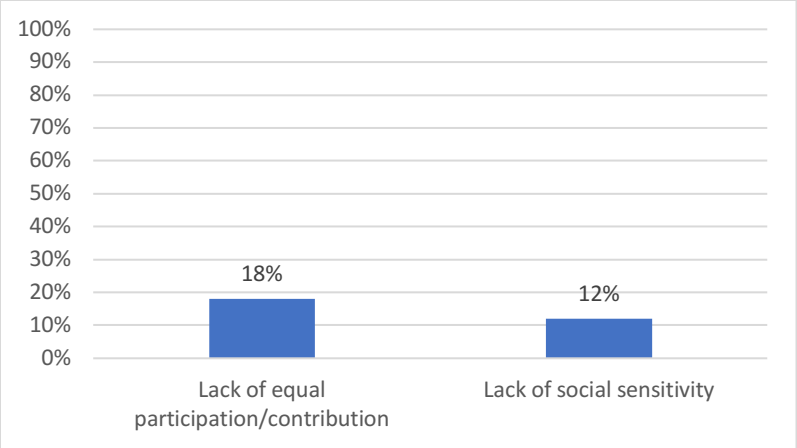

Figure 3: Challenges codes bar chart

Here is an example of a student quote for the above theme. The student quote highlights the challenges students faced due to virtual team communication. The primary issue was that the team members skipped the team meeting, and two members did most of the work related to the project.

" My team is having issues with some members showing up, so we are not really getting a chance to allow that member to contribute. The two of us on the team that are actively showing up do a good job of letting the other talk and share ideas."

4.2.3. Theme for Strategies to improve team communication*: To improve team communication, in the future, students want to develop strategies to provide team members opportunities for equal participation and improve social sensitivity and empathy.*

Based on the thematic analysis, we found that students identified the following strategies to improve team communication in the future. The opportunities for equal participation/contribution were identified as a strategy by 50% of students, improving social sensitivity was identified by 48% of students, and developing empathy was identified by 20% of students. Figure 4 represents the codes and respective student percentages. Since the semester followed a HyFlex model due to the Covid-19 pandemic, students found it challenging to interact virtually. Therefore students want to implement strategies to improve team communication in a virtual setting as well.

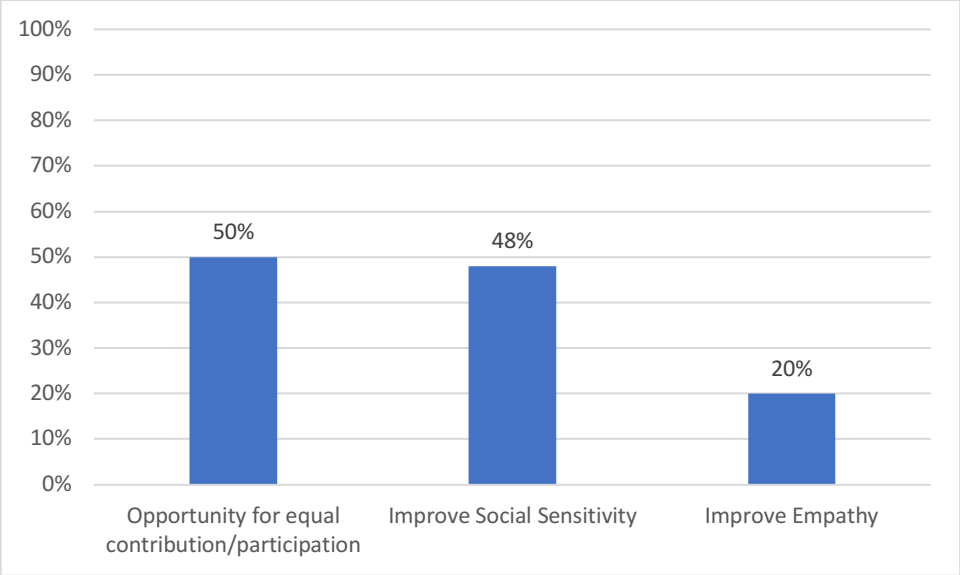

Figure 4: Improvement Strategies codes bar chart

Here is an example of a student quote for the above theme. The student quote highlights the strategies they plan to implement to improve their teamwork communication. Their primary suggestion is to follow a participative approach so that every team member can contribute and learn from one another. They also feel that having cameras turned on can drastically improve team interaction and make the virtual experience more effective.

> *"I think if our team really focuses on making sure one person doesn't become the leader the whole time, then the project will go smoothly. We really need to make sure that one single person doesn't talk the whole time or do a lot of the work. If we split the communication and work, then we will function better as a team. Also, Google mentions to read mind by the eyes test to improve the social and emotional sensitivity, I think during our meeting, we most of time can only feel others by their voice, if we can try to turn on camera for each meeting will be better."*

5.0 Discussion and Implications

In this study, we intended to answer an overarching research question: What are student reflections about the role of communication while working in teams in a cooperative project-based learning environment? Our analysis revealed that students' reflections on the role of communication while working in teams can be categorized into three themes: 1) ***benefits of good team communication, 2) challenges faced due to virtual team communication, and 3) strategies to improve team communication.*** The students worked in a cooperative project-based learning environment to develop a rapport with their team members through interaction and communication. Based on the theoretical framework [11] used in this study, we found that the student's perceived communication is crucial for achieving the desired goals. The Dickinson and McIntyre [11] model emphasizes that communication is the key to teamwork. Studies [2], [4], [5], [18] also revealed that good teamwork

communication helps them effectively set their goals, assign roles, and work together to achieve them. The student quoted below shows how much students valued good teamwork communication.

> *"My team as a whole is performing well for now. Each member of my team has decided on which leadership role they will take for each milestone, and we all have taken turns to speak to one another about the project. We have also divided our tasks among our team and have set dates to check in with the whole group to check on our progress."*

A smaller percentage of students (less than 20%) reported some challenges they faced during their project concerning communication. One of the critical reasons for the challenges was the virtual meeting of student teams due to the Covid-19 pandemic. Students reported that they sometimes felt a lack of social sensitivity and unequal contribution on the part of team members as some students did not turn on their cameras during the team meeting. Students also reported that their team members were hesitant to share their thoughts or ideas during the group meeting.

> *"It's difficult to gauge how well my team is doing since most of the communication occurs online, but so far, we're all on the same page, so I'd like to think that it's going well enough. I think if we turn on our cameras maybe we can realize if someone is upset or if someone wants to say something but couldn't."*

While working in a virtual team setting, it is expected of participants to turn on cameras, but it is essential to acknowledge that every student work under different circumstances, and they might not feel comfortable turning on cameras [24]. Some of the key reasons could be the appearance of students, weak internet connection, physical location not suitable, etc. [24]. Therefore to overcome this challenge, instructors need to implement strategies for social collaboration, such as asking the students to use the chat feature or encouraging participation by allocating specific tasks to each member [24].

Students also reported strategies to improve team communication, as communication is key to teamwork success. Improving team communication requires team members to interact with one another and develop a conducive judgment-free environment where students can express their ideas. Working in a virtual setting can be challenging; therefore, students identified strategies to improve team communication. The first strategy is to provide equal opportunity to all members to express their ideas. Allowing each member to express their ideas helps members develop confidence and feel like an integral part of the team [2], [17], [18]. The second strategy was to improve social sensitivity. Social sensitivity helps students become accountable, responsible, and understand team members' problems [25]. Empathy has always been considered essential, especially in the context of teamwork. The third strategy was to improve empathy. Developing empathy helps overcome the barrier of cultural difference and helps the team members understand the challenges and frustration faced by other team members [26]. A recent study by Nuria et al. [27] has revealed that developing an understanding of team members' emotions in virtual teams

helps them promote their team members' well-being. Therefore it is good to note that students identified improving empathy as one of the improvement strategies.

The intervention discussed in this study allowed the students to reflect on benefits, challenges, and strategies to improve team communication. Reflecting on their experiences had the goal of encouraging them to understand the team's functioning better and make effective decisions [28]. Since the course follows cooperative project-based learning and students have been working and delivering all their assignments in a group, we wanted them to develop rapport by making them aware of the role of communicating effectively through their teamwork interactions and potentially develop an interpersonal relationship with their team members [2]. One crucial point here is to note that students were inclined more towards the benefits of team communication; the possibility for that could be the pedagogical framework of the course.

6.0 Conclusion, Limitations, and Future Work

The study revealed that most students believe that communication plays a crucial role in teamwork. This awareness can significantly impact team projects and establish collaborations within teams. Some students had problems with social sensitivity and individual contribution to the team and demonstrated a positive attitude to improve them in future teamwork sessions. The study has limitations; one of the limitations is that the study was conducted early in the semester; doing a pre-post study would help us better understand the benefits and challenges of teamwork communication. For future study, we intend to do a pre and post-study to understand the trajectory of benefits and challenges of teamwork communication. We also plan to use a control group to understand the impact of the intervention. Future qualitative studies will also focus on conducting interviews to understand the challenges and benefits of working with a project-based team in higher education.

Acknowledgment

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