Improving Communication Quality through Anonymous Communication: An Experimental Study using ANONI Application

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Quality of communication is closely related to quality education, United Nations Sustainable Goal. The performance of students can be analyzed through effective communication between students with their instructors. Multiple reasons cause poor or ineffective communication from students, for instance, shyness, fear of being criticized, and nervousness. Communication in anonymous mode is explored by various research studies. It is noticeable from the literature that students' participation is directly related to anonymous communication increase. Although anonymous communication has a positive effect on student participation, this anonymous factor also causes disruptions or unanticipated negative intrusions during class discussions. This study aims to improve the quality of anonymous communication and explore the impact of anonymous communication on students with less participation. The study's objective has been achieved about undergraduates enrolled in software engineering programs. The reward-based synchronous & asynchronous web application named "ANONI" was utilized for this purpose. The results show a positive increase in participation and constructive communication of students during the session, as only 2 off-task activities were observed.

Keywords: Quality Communication, Shyness, Anonymous Communication, Sustainability

Introduction:

Communication is a core element of learning in the era of globalization [1]. Communication is an essential part of learning. Effective Communication between students and teachers has a positive impact on the students' academic performance. In the learning process teacher is the one who passes the information to the students' minds. Communication is considered successful when students can understand the teacher‘s message [2]. There are multiple categories of communication, for instance, verbal, written, and gesture-based [3].

Although effective communication is the core learning element, however, there is a disparity between students and teachers regarding effective communication. The students hesitate to ask questions due to various types of fears, and this communication gap affects their performance. Subsequently, the students always remain confused due to ambiguities left in their minds. Students cannot inquire from their teachers due to numerous factors, such as teachers' fear, fear of being wrong, and peer laughter etc. [4].

Effective research work has been performed regarding anonymous communication; the researchers have employed an anonymous communication technique for the collaboration between teachers and students. Anonymous communication refers to the method of communication where students' identities are private. Anonymous interaction can be supported by computer computer-mediated medium for communication [5]. There is a dire need to have online communication media for instructing and evaluation purposes. The online interaction and assessment can be made more secure using blockchain technology [5].

It is evident from the literature that participation increases when we introduce an anonymous communication mechanism in classrooms, but it is not taken into account whether it stimulates the previously non-participating students or if it is just a means for her to boost the already active students of the classroom. The second objective of our research study is to find the impact of anonymous communication on the non-participating students of the classroom. We have experimented with two phases: known and anonymous. In the known phase teacher manually tracks each student's performance in the Excel sheet, which is later matched with the data of the anonymous communication to find out the impact of anonymous communication on non-participating students. We have also conducted pre-experiment survey among students to validate our idea and topic, the explanation of the survey is mentioned in the later chapter. Similarly, post post-experiment survey is also conducted to get feedback about students' experience regarding the anonymous communication in the classroom.

Research Problem:

Communication is a core element of effective learning; however, there is a gap between students and teachers concerning effective communication. Students hesitate to ask questions to remove their ambiguities. Therefore, they always remain confused due to ambiguities in their minds [3]. Researchers have discovered attitudes about learning and evolving communication skills [1]; however, there is still a gap regarding the exploration of effective communication between students and teachers.

Research Questions:

Two Research Questions (RQ) were designed for the current research study. The designed research questions are discussed as follows.

RQ1: Is anonymous communication intended to encourage students who are already engaged in class to go above and beyond, or to really assist students who need a little push to get involved?

RQ2: How can you stay on topic while using an educational social media program to increase the quality of anonymous communication in face-to-face interactions?

Background and Literature Review:

This chapter presents the history of Anonymous Communication and its use in education

and face-to-face communication between students and teachers. In this chapter, we will go through the literature and find out the importance of Anonymous Communication in learning and its impact on students' learning. Different research scientists have used different techniques to enhance student and teacher communication in the classroom. They have also used anonymous communication techniques. We have tried to go through all the techniques proposed in the literature and touch on the boundary of existing knowledge, and explore their limitations. Research scientists have used different techniques to enhance student and teacher communication in the classroom; they have also used anonymous interaction techniques. For instance, Author [5] attempted to improve student engagement in the face-to-face classroom setting. In a flipped classroom setting, they experimented with mobile applications that offered two ways to interact. Giving anonymous feedback to peers through a time sequence is one of the two interaction types; the other is giving input based on likes or dislikes. The author extracted the results by codifying the behaviours and interactions of the students. The author claim that features like rating mode increased student engagement and were particularly beneficial in reducing irrelevant messages while boosting interaction.

Similarly, Author [6] conducted a case study to determine whether applications like Speak Up help boost interactions or if they make students more distracted in class. The authors found that this application was beneficial for social interaction and active involvement. Additionally, Author [7] addressed the issue of shy students in the classroom MAQ. MAQ, according to the authors, is essential in raising student participation and positively influencing their growth as learners.

Likewise, Author [8] employed social media platforms such as Speak Up in their schools. The study aimed to integrate digital and in-person interactions. The authors offered a strategy for combining the lecture with an emphasis on how to use both digital and face-to-face communication, as well as how to switch between the two. The design concepts for creating co-located social media applications were put forth in this study. The authors' case studies served as the basis for the extraction and finalization of design recommendations aimed at improving the effectiveness, interactivity, and student preference for cooperation in these applications.

Similar efforts were made by author [9] to successfully integrate social media into the classroom alongside in-person interactions. The authors have employed the Speak Up app as a social media platform to facilitate anonymized peer-to-instructor conversations. They used 149 college students in their experiment. Their study's objective was to investigate the activity and context, and how they affect learning results. Context refers to the teacher's instructions, which they also refer to as learning activities. By action, they imply students' emotional or behavioral involvement as well as their disinterest in educational activity. They gathered information through physical observation and application logs, quiz results, and the course final grade were used to gauge learning outcomes.

A similar study conducted by author [10] aimed to improve programming instruction by integrating social media into in-person classes. They employed WhatsApp as a social media platform for student cooperation, instruction, and programming learning. Students were given a 30-day challenge in which they had to practice programming for 30 minutes each day to improve their understanding. Students were required to share their challenges and solutions in a WhatsApp group using the messaging app WhatsApp. The authors claim that it improves students' learning of programming and increases their confidence in working with teachers and classmates during the learning process.

A study of the literature demonstrates the efforts made to improve student learning and engagement in synchronous or asynchronous classroom settings [10][8]. Moreover, literature demonstrates the significance of anonymous communication in enhancing student learning and participation. Existing research does not consider the quality of participation into

account. Furthermore, there is a dearth of research on the relationship between anonymous communication and the involvement of students who choose not to participate.

Research Objectives:

The research objectives are as follows:

- To provide a strategy to enhance the participation of those students who hesitate to participate.
- To provide recommendations to Learning Management
- Systems developers in real-time live sessions, tools to incorporate the projected gamified element to enhance the involvement of students.

Research Methodology:

The study aims to enhance communication quality between the teacher and the students. It also aims to explore the influence of anonymous communication on the students who hesitate to participate in the class. Figure 1 shows the research workflow.

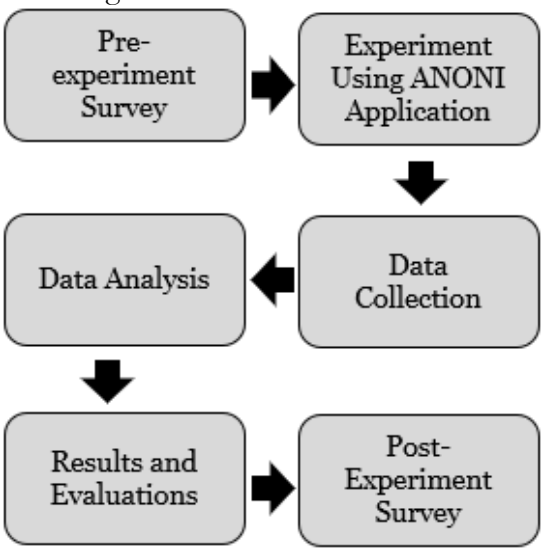

Figure 1. Research workflow

Experiment Planning:

Variables:

In this experiment, the independent variable was the mode of communication, i.e., the anonymous communication mode and the known (not anonymous) communication mode. The dependent variable was the participation level of the student.

Participants:

The students of the software engineering department of Riphah International University, Islamabad, were selected. In total, 110 students were selected to conduct the experiment, including 80 from Object-Oriented Programming (OOP) and 30 from Web Development. The OOP course was further distributed into dual sections having 40 students. Therefore, we can state that the experiment was carried out on three classrooms with an average of thirty-five students. Because they were technological, both the students and the instructors felt at ease using our program throughout the experiment.

Experiment Execution and Procedure:

The experiment execution refers to the actual conduction of the study. During this phase, students were introduced to the ANONI application, a tool specifically developed by the researcher to enhance communication quality in educational settings. Unlike *Speak Up*, which has been used as a geo-constrained tool requiring students' physical presence, ANONI was designed for online contexts, particularly during the COVID-19 pandemic, and offers functions not available in the *Speak Up* product.

The application was developed using the Laravel framework of PHP in combination with MySQL, enabling both asynchronous and synchronous interactions. ANONI provides two user modes: *Teacher Mode* and *Student Mode*. Teachers can create courses, while students can access their registered courses. Once enrolled by a teacher, each student receives unique login credentials via email. After logging in, students can access the *"Your Courses"* option on their dashboard, which displays all active enrollments. During live sessions, students may use the portal to ask questions either in person or virtually.

In the anonymous phase of the experiment, students used ANONI to submit questions anonymously to their instructors during live sessions. To discourage irrelevant use, a gamification feature was integrated: students earned 5 positive points for each relevant question submitted. However, if a question was deemed irrelevant and reported by the teacher, the student's accumulated points were reset to zero. The points earned contributed to class participation grades, serving as extrinsic motivation. In this study, class participation was weighted at 5%, which students could achieve through active use of the ANONI application. Figure 2 shows the proposed mechanism of the ANONI application:

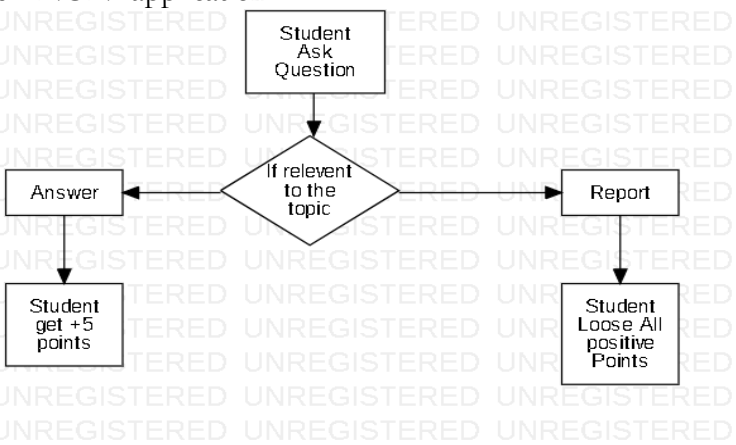

Figure 2. Proposed Flow Diagram Mechanism for Improvement of Quality Communication

There were two stages to the experiment, i.e., known (non-anonymous) and anonymous. The instructor used to manually record each student's attendance and the number of questions they answered on an Excel sheet during the known (non-anonymous) phase. Students' attendance and participation were tracked using the "ANONI" program during the anonymous phase. The experiment lasted 16 weeks, of which 8 weeks were dedicated to the known (non-anonymous) phase and the remaining 8 weeks to the anonymous phase. The attendance for each week during the experiment's anonymous and non-anonymous phases is displayed in Figure 3.

The instructor's dashboard displays all the questions asked by the students, particularly for the course. The teachers have two choices to respond to the asked question. The "Reporting" is the first option, and "Answering Questions" is the second. When answering a question, the instructor can mark the pertinent one as "Answered." If the question is off-topic, irrelevant, or contains bullying text, the teacher can mark it as "Reported."

The application also allows for giving rewards to the students. Through a question, they are given some points as a reward. As an extrinsic incentive, students were informed that they would receive participation marks based on the points earned through the ANONI portal. If a teacher reports a student's question, all of that student's earned points are reduced to zero as a punishment. In that way, the developed application has also introduced a gamified aspect. Based on the participation, students earned or lost points and thus gained or lost class participation grades.

Data Collection:

During the experiment, the data were collected through both anonymous and known (non-anonymous) modes to explore the influence and behaviors of students who hesitate to participate. To collect the data in anonymous mode, the developed ANONI application was used.

To collect the data for non-anonymous mode, the teacher was asked to observe the students' participation throughout the live sessions and document their participation using an Excel worksheet. Figure 4 shows the participation of students during anonymous and non-anonymous sessions. It shows that the participation of students increased during the anonymous sessions.

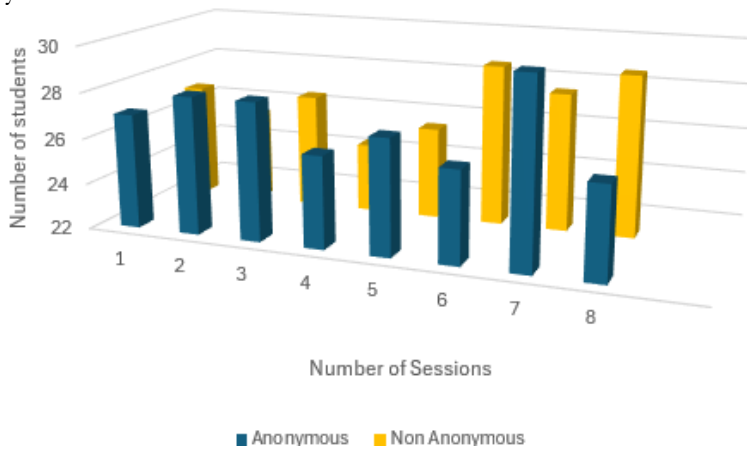

Figure 3. Student attendance during experiment execution

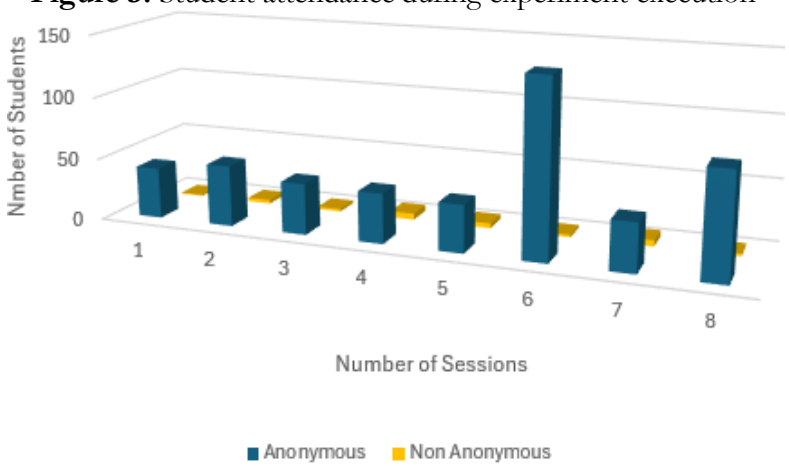

Figure 4. Participation of students during Anonymous and non-Anonymous Sessions

Results Analysis:

The information was gathered via the questionnaires that the students filled out throughout the class. Following question collection, the questions were grouped into categories. All the queries received were categorized. "Relevant Questions" were the first category; they are questions that are pertinent to the subject. The second category was 'Off-Task Questions,' which consisted of irrelevant or disruptive statements that did not qualify as genuine questions. The "Operational Questions" category came in third. These questions do not fall under the heading of "off-task questions" or are not relevant to the subject matter. Course operations, general information, assessment standards, attendance, and other interests are all covered in these inquiries. Although the authors have categorized the operational questions as pertinent, we have done so to enhance the quality of the questions.

To obtain the statistics for every question category, we processed the data. The data for each question category are displayed in Figure 5. The total number of questions asked during the individual session is displayed in the total questions bar. A relevant bar suggests

that the queries posed were pertinent to the subject. In sessions two and three, there were just two recorded off-task, one in each session. The operational questions bar indicates the number of operational questions.

This study aims to find out the impact of the anonymous communication on the students who do not participate non-participating, and we also sought to enhance the standard of anonymous correspondence.

The result analysis regarding the research question 1 "Is anonymous communication intended to encourage students who are already engaged in class to go above and beyond, or to really assist students who need a little push to get involved?" shows that each student's unique involvement in the anonymous phase. Of the 110 students who participated, 67 used anonymous communication, accounting for 61% of the overall student body. This indicates that 39% of pupils have yet to participate. Out of 61% of students, 28% asked more than five questions over the semester, while the remaining students asked fewer than five questions. Over the course of the semester, 18 out of 110 students asked more than ten questions.

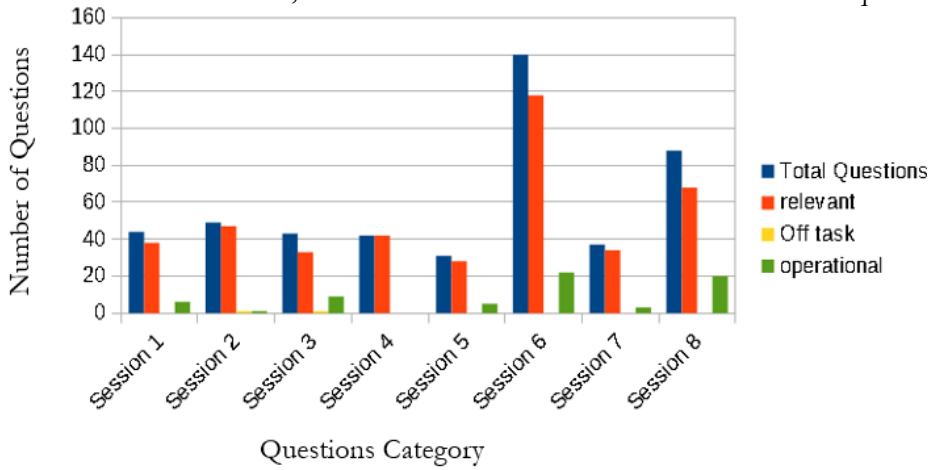

Figure 5. Stats of Questions with Category

Table 1 presents the questions along with their categories

Table 1. Questions and Categories

Question	Category
"How to create a class in Java?"	Relevant
"I like you, Sir."	Off Task
"Sir, what is he weightage of the assignment?"	Operational
"Sir, do we have class this week?"	Operational

Over the course of the semester, 18 out of 110 students asked more than ten questions. Data indicates that three students participate the most, with one asking 40 questions, the second asking 31, and the fourth asking 60. Additionally, data indicate that just 8 out of 110 students requested more than 20 questions over the course of the semester. The students who asked the most questions were also the ones who participated in the known (not anonymous) phase of the experiment, according to our comparison of the data with the manual records collected during that phase. The result analysis regarding the research question 2 "How can you stay on topic while using an educational social media programme to increase the quality of anonymous communication in face-to-face interactions?"

Students who ask questions to annoy other students or teachers are engaging in off-task activities. It affects both the classroom atmosphere and the teachers' pace of instruction. Only two off-task behaviours were reported, according to the outcome analysis, which is a far smaller number. We implemented a gamified rule in our ANONI application to reduce the quantity of off-task questions. Five points are awarded to students who ask questions. If a

student asks an off-topic question and the instructor reports it, they forfeit all of their points and receive a zero. Their class participation grades are then modified to reflect these gained points for extrinsic motivation. Students can use the ANONI program in the classroom to acquire these points, which are crucial for obtaining class participation grades in the course.

Discussion:

We conducted this study with two purposes in mind. First, to find the impact of anonymous communication on the non-participating students during live sessions with the instructors. The second purpose of the study is to improve the quality of anonymous communication, quality means that the questions asked by the student should be relevant to the topic being discussed in the classroom. As discussed in the result section that anonymous communication has a positive impact on all the students, but it is further boosting the students who were already active in the known (not anonymous) phase to ask more questions. It has stimulated the non-participating students as well to ask questions, but their participation is low, which needs to be boosted.

We used a gamified element as a rule in our ANONI application to improve the quality of communication, and it worked, and as a result quality of questions is improved. Off-task activities are very low, as compared to the study [4]. Their experiment lasted for 6 weeks, and they have reported an off-task graph. According to the graph, 7 off-task activities were reported in week 1, 1 activity in week 2, 9 off-task activities in week 3, 2 in week 4, and 1 in week 5. We have reduced the number of off-task activities to 0 in all weeks except for one activity is reported in sessions 2 and 3, by using our proposed gamified mechanism.

Conclusion:

Students' involvement is increased by anonymous communication. The purpose of the study was to determine whether it further enhances the engagement of extroverts or if it raises the participation of introverted students. Research findings show that anonymous communication stimulates the introvert students to ask questions, but their participation is not comparable to the extroverts. The conducted study presented a gamified mechanism to improve the quality of questions being asked during the live sessions and stop students from being intimidated and diverting the attention of the classroom. The gamified mechanism results are good as the study records two off-task activities.

Future Work:

In future work, we are working on the mechanism to boost the participation of non-participating students. We will come up with a mechanism to stimulate the non-participating students to increase their participation. Our next target is to lower the number of operational questions by using some ma-machine learning and NLP tools.

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