

Level of Social Presence, Social Interaction, Collaborative Learning, and Satisfaction in a BAMS Course Discord Server

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Abstract

The integration of Discord as a communication and collaboration platform in online learning has gained attention due to its interactive features that support real-time engagement. This study examines students' perceptions of social presence, social interaction, collaborative learning, and overall satisfaction in a Bachelor of Arts in Multimedia Studies (BAMS) course Discord server. Using survey data, activity logs, open-ended responses, and the Student Evaluation of Teaching (SET) data for the BAMS course, the study evaluates how Discord fosters a sense of community, facilitates peer interaction, and enhances the learning experience. Findings indicate a high level of social presence, with 84% of students agreeing that Discord helped them feel connected with peers and faculty-in-charge (FIC). Real-time chat, voice discussions, and multimedia sharing contributed to a stronger sense of community compared to traditional Learning Management Systems (LMSs). In terms of social interaction, 71% of students reported frequent engagement with classmates, with text chat (95%), voice discussions (60%), and direct messaging (50%) being the most utilized features. Additionally, collaborative learning was supported, with 65% of students acknowledging that Discord facilitated knowledge sharing, teamwork, and problem-solving. Students appreciated its structured organization, which helped them locate discussions and announcements efficiently.

Overall, 64% of students expressed satisfaction with Discord as a learning platform, citing benefits, such as enhanced faculty communication (86%), improved peer interaction (69%), and a relaxed yet productive learning environment (62%). However, challenges included unfamiliarity with the platform, underutilization of certain channels, and reliance on peer engagement for meaningful discussions. The study concludes that Discord serves as an effective supplementary learning tool, enhancing online learning experiences through real-time interaction and collaboration. Recommendations include onboarding tutorials, structured engagement activities, and periodic check-ins to improve student participation further and maximize the platform's potential.

Keywords: *Discord, digital platform, online community, online learning environment*

Introduction

In online education, fostering a sense of community and interaction among students is essential for enhancing engagement, learning outcomes, and overall satisfaction. Asynchronous discussion forums have traditionally served this purpose, but recent advancements in communication technologies have introduced more dynamic platforms that enable real-time interaction. One such platform is Discord, which has gained popularity in educational settings due to its versatility in supporting text, voice, and video communication.

The Bachelor of Arts in Multimedia Studies (BAMS) program at the University of the Philippines Open University (UPOU) is delivered entirely online, requiring innovative approaches to facilitate student engagement and collaboration. To address this need, a dedicated Discord server was introduced to serve as a space for students to interact, collaborate on coursework, and build a sense of community. However, the effectiveness of such platforms in fostering social presence, social interaction, and collaborative learning remains an area of interest. Understanding how students perceive these elements in an online learning environment can provide valuable insights for improving digital learning communities.

This study explores students' perceptions of social presence, social interaction, collaborative learning, and overall satisfaction in the BAMS course Discord server. Specifically, it seeks to determine whether Discord effectively facilitates meaningful interactions and collaboration among students, ultimately enhancing their learning experience. By examining these perceptions, this research aims to contribute to the broader discussion on optimizing online learning environments to promote engagement and academic success.

Objectives

This study aims to examine students' perceptions of social presence, social interaction, collaborative learning, and satisfaction in a Bachelor of Arts in Multimedia Studies (BAMS) course Discord server. Specifically, it seeks to:

1. **Assess Social Presence** – Evaluate the extent to which students feel a sense of community, connection, and real-time engagement with peers and instructors through the Discord server.
2. **Analyze Social Interaction** – Investigate the frequency, depth, and nature of student interactions within the platform.
3. **Examine Collaborative Learning** – Determine the extent to which the Discord server supports collaborative learning by facilitating teamwork, knowledge sharing, and academic discussions.
4. **Measure Student Satisfaction** – Assess students' overall satisfaction with Discord as a communication and collaboration platform in the course.
5. **Identify Challenges and Opportunities** – Explore potential barriers and advantages of using Discord in an online learning environment to inform future improvements in digital learning communities.

By addressing these objectives, this study aims to provide insights into the

effectiveness of Discord as a tool for fostering engagement, collaboration, and a sense of belonging in online education.

Conceptual/Theoretical Framework

This study is grounded in theories related to online learning, social presence, and collaborative learning. The framework integrates the Community of Inquiry (CoI) model (Garrison et al., 2000), Social Presence Theory (Short et al., 1976), and Collaborative Learning Theory (Bruffee, 1999; Vygotsky, 1978) to examine how Discord supports social interaction, collaborative learning, and student satisfaction in the Bachelor of Arts in Multimedia Studies (BAMS) course.

Community of Inquiry (CoI) Model

The Community of Inquiry (CoI) model offers a structured framework for understanding online learning experiences through three interrelated elements: social presence, cognitive presence, and teaching presence. Social presence refers to the ability of students to project themselves socially and emotionally in an online environment, fostering a sense of community. Cognitive presence involves the extent to which learners engage in meaningful reflection and critical thinking. Teaching presence encompasses the design, facilitation, and direction of learning to ensure an engaging and effective educational experience. Together, these elements create a comprehensive learning environment that promotes deep engagement, collaboration, and knowledge construction. Social presence enables students to feel connected, reducing feelings of isolation in online settings and encouraging active participation in discussions. Cognitive presence supports the development of higher-order thinking skills by fostering inquiry, problem-solving, and meaningful dialogue among learners. Teaching presence plays a crucial role in structuring learning experiences, guiding discussions, and providing timely feedback to ensure that students remain engaged and achieve learning objectives.

This study focuses primarily on social presence and its impact on social interaction, collaborative learning, and satisfaction within the Discord platform. By assessing students' perceived social presence, the study aims to understand how it influences their interactions and learning outcomes.

Social Presence Theory

Originally proposed by Short et al. (1976) in the context of communication media, Social Presence Theory suggests that different communication technologies vary in their ability to convey a sense of human presence. The theory emphasizes that higher social presence leads to more effective communication and engagement. In this study, Discord's real-time chat, voice channels, and multimedia-sharing features are analyzed to determine their role in enhancing social presence.

Collaborative Learning Theory

Drawing from Vygotsky's (1978) Social Constructivist Theory, Collaborative

Learning Theory (Bruffee, 1999) underscores learning as a social process in which knowledge is constructed through interaction with peers and instructors. It emphasizes that learning is most effective when students work together, share knowledge, and engage in discussions.

The study applies collaborative learning principles to examine whether the Discord server facilitates collaborative learning by enabling students to engage in academic discussions, group projects, and peer-to-peer support.

Conceptual Framework Overview

Building on these theoretical foundations, the study explores the relationships among four key constructs: social presence, social interaction, collaborative learning, and satisfaction. Social presence refers to how students perceive their connection with peers and instructors within the Discord server. Social interaction examines the level and nature of student engagement and communication on the platform. Collaborative learning focuses on the extent to which students use Discord to share knowledge and work together. Finally, satisfaction reflects students' overall experience and perceived benefits of using Discord for learning. By analyzing these relationships, the study aims to provide insights into the effectiveness of Discord as a learning tool.

The study hypothesizes that higher levels of social presence lead to increased social interaction, which in turn enhances collaborative learning and ultimately contributes to higher student satisfaction.

By applying these interrelated theories, this research provides a structured approach to analyze the role of Discord in online education, offering insights that may inform future improvements in digital learning communities.

Review of Related Studies

The increasing adoption of digital communication platforms in online education has prompted numerous studies examining their impact on student engagement, social presence, collaborative learning, and satisfaction. This section reviews relevant literature on social presence, social interaction, collaborative learning, and student satisfaction in online learning environments, with a specific focus on Discord and similar platforms.

Social Presence in Online Learning

Social presence, defined as the ability of students to perceive themselves as real and connected in an online environment (Garrison et al., 2000), is a key factor in fostering meaningful learning experiences. Studies have shown that higher social presence in online learning platforms leads to greater engagement and improved learning outcomes (Richardson et al., 2017).

Lowenthal and Dunlap (2014) highlighted the role of synchronous communication tools in enhancing social presence by allowing real-time interactions. Similarly, Sung and Mayer (2012) found that multimedia-enhanced discussions, such

as those facilitated by Discord, promote stronger social connections among students compared to traditional text-based discussion forums. These findings suggest that platforms with real-time interaction capabilities, such as Discord, can significantly improve students' sense of social presence in online courses.

Social Interaction in Online Learning Environments

Effective social interaction is critical for student engagement and learning in online education. Hrastinski (2008) identified two key types of online interaction: asynchronous interactions (e.g., discussion forums and emails) that allow time for reflection and synchronous interactions (e.g., live chats and video calls) that promote real-time engagement.

Building on this distinction, Asterhan and Schwarz (2016) found that synchronous platforms foster more active participation and immediate feedback, making them effective for collaborative discussions. Additionally, Ayob et al. (2022) investigated the potential, effectiveness, and satisfaction of using Discord as a digital learning tool among higher education students during the COVID-19 pandemic. They found that Discord facilitated active social and learning engagement, providing a flexible platform for discussions and interactions between students and instructors. These findings suggest that Discord, as a synchronous and interactive platform, may facilitate higher levels of student engagement and interaction.

Collaborative Learning in Online Platforms

Collaborative learning theory emphasizes that knowledge is constructed through interaction and shared experiences (Vygotsky, 1978). Studies have shown that digital platforms that encourage teamwork and peer collaboration can enhance students' problem-solving abilities and knowledge retention (Dillenbourg, 1999).

For instance, a study by Lacher and Biehl (2018) investigated how Discord could be utilized to moderate student collaboration and teamwork. They suggested that the platform's features, such as voice channels and text chats, enable students to discuss assignments, share resources, and provide peer feedback effectively. Similarly, the study of Ari-adco et al. (2024) examined the effectiveness of Discord as an educational tool for promoting teamwork among sixth-grade students using a pre-experimental design with 35 participants. Results from the Wilcoxon test indicated significant improvements in leadership, communication, and empathy, confirming that Discord enhances student interaction and collaboration.

These studies indicate that Discord's interactive features may facilitate a more engaging collaborative learning environment compared to traditional LMSs.

Student Satisfaction in Online Learning Platforms

Student satisfaction is a key indicator of the effectiveness of an online learning platform. According to Moore and Kearsley (2012), students are more satisfied with online courses that offer interactive and socially engaging environments.

Gray and DiLoreto (2016) found that higher levels of social presence and collaborative learning correlate with increased student satisfaction in online courses. Similarly, a recent study by Obionwu et al. (2024) found that using Discord in online Computer Science classes significantly improved student satisfaction, with 87% of participants reporting an enhanced sense of belonging. These findings suggest that Discord has the potential to enhance student satisfaction by providing an interactive and socially engaging learning environment.

Summary of Related Studies

The reviewed literature collectively underscores the significance of social presence, interaction, and collaboration in online learning, emphasizing that synchronous platforms like Discord can enhance these aspects. Research suggests that higher social presence is associated with increased engagement and improved learning outcomes (Richardson et al., 2017; Sung & Mayer, 2012). Synchronous communication tools facilitate real-time interactions and encourage active participation, making them valuable for online learning environments (Asterhan & Schwarz, 2016; Hrastinski, 2008). Additionally, Discord's interactive features have been found to support collaborative learning and peer engagement (Ari-adco et al., 2024; Lacher & Biehl, 2018;). Furthermore, student satisfaction tends to improve on platforms that foster social engagement and real-time collaboration, creating a more dynamic and engaging learning experience (Gray & DiLoreto, 2016; Obionwu et al., 2024).

These studies provide a strong foundation for examining how BAMS students perceive social presence, social interaction, collaborative learning, and satisfaction in a Discord server. By building on these insights, this research aims to contribute to the growing body of knowledge on the effectiveness of Discord as a learning tool in online education.

Methodology

This study examines students' perceptions of social presence, social interaction, collaborative learning, and satisfaction in a Bachelor of Arts in Multimedia Studies (BAMS) course Discord server. The methodology outlines the research design, participants, data collection methods, and data analysis procedures used in the study. By employing this methodology, the study aims to provide a comprehensive understanding of how Discord facilitates social presence, interaction, and collaborative learning, ultimately shaping students' satisfaction in an online learning environment.

Research Design

A descriptive research design employing a mixed-methods approach is used to provide a comprehensive understanding of student experiences. The study combines both quantitative and qualitative data. Quantitative data are collected through structured survey instruments while qualitative insights are drawn from open-ended responses, activity logs, and SET data of a BAMS course. This

approach allows for triangulation, enhancing the validity and depth of findings.

Participants

The participants of this study are 238 BAMS students who have actively used the Discord server for course-related discussions, collaboration, and interaction. A purposive sampling technique is used to select students enrolled in the course during a specific term. Participation is voluntary, and informed consent is obtained before data collection.

Data Collection Methods

This study employs multiple data collection methods to gather insights into students' experiences with Discord as a learning platform. A structured survey questionnaire is designed to assess key aspects such as social presence (feeling connected with peers and instructors), social interaction (frequency and quality of engagement), collaborative learning (teamwork and knowledge sharing), and overall satisfaction with Discord for learning. The survey consists of Likert-scale questions, ranging from 1 (Strongly Disagree) to 5 (Strongly Agree), along with open-ended questions to capture qualitative insights. With participants' consent, anonymized Discord server activity data, such as message frequency and types of interactions, are analyzed to support the survey findings. This data provides additional insights into engagement patterns, communication dynamics, and the overall level of interaction within the server while ensuring participant privacy and confidentiality. Additionally, the study also incorporates Student Evaluation of Teaching (SET) data, which provides descriptive feedback on faculty teaching performance within the course.

Data Analysis

Quantitative data from the Likert-scale survey responses are analyzed using descriptive statistics, such as mean, standard deviation, and frequency distributions. For the qualitative data, thematic analysis is conducted on open-ended survey responses and SET data to identify recurring themes related to students' experiences with social presence, interaction, and collaboration. To enhance the validity of the study, triangulation is employed by comparing findings from the survey, server activity logs, and SET results ensuring a comprehensive understanding of the data.

Ethical Considerations

Participation is voluntary, and all responses are kept confidential and anonymous. Data collection is conducted only after obtaining informed consent from participants. Students are assured that their participation (or non-participation) will have no impact on their academic standing or course grades.

Limitations

The study is limited to students enrolled in a specific BAMS course using a Discord server, and findings may not be generalizable to all courses, disciplines,

or online learning platforms. Additionally, the reliance on self-reported data introduces the potential for response bias, as students' perceptions may be influenced by individual experiences, motivations, or expectations.

Results and Discussion

This section presents and interprets the findings on students' perceptions of social presence, social interaction, collaborative learning, and satisfaction in the Bachelor of Arts in Multimedia Studies (BAMS) course Discord server. The results are based on survey responses, server activity data, and SET data. The discussion interprets these findings about existing literature and the study's theoretical framework, primarily the Col model and Social Presence Theory.

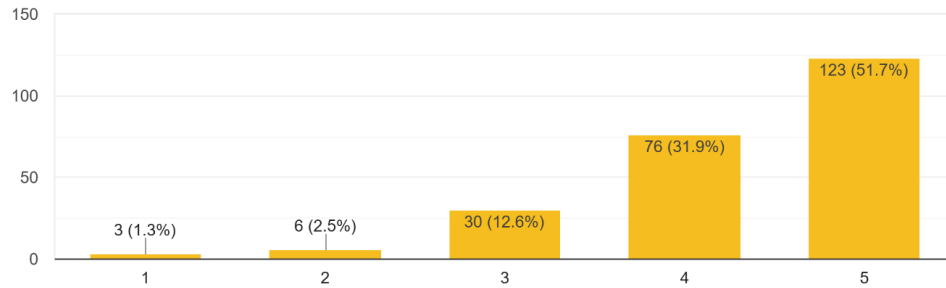
Social Presence in the Discord Server

Based on Figure 1, survey responses indicate a high level of social presence among students, with 84% agreeing that they felt a sense of community with their peers and instructors in the Discord server. Many students reported that real-time chat, voice, and multimedia sharing enhanced their sense of community compared to traditional learning management systems (LMSs).

Responses to the open-ended survey questions further expressed students' appreciation for Discord as a learning and communication platform in the course. They found it engaging, interactive, and effective in fostering communication between students and the FIC. Several students highlighted that the weekly Q&A sessions were beneficial in addressing concerns and providing real-time feedback, which they found lacking in other courses. Additionally, many students acknowledged the efforts of the FIC, particularly in actively communicating, encouraging participation, and fostering a welcoming learning environment. They found the FIC to be approachable, patient, and responsive, which contributed to a positive learning experience. Some students also mentioned that using Discord helped them make new friends, stay updated on course matters, and feel more connected despite the online learning setup.

Figure 1*Faculty-In-Charge's Role in Community Building and Discussion Facilitation on Discord*

The Faculty-In-Charge (FIC) created a community in the course's Discord Server.
238 responses



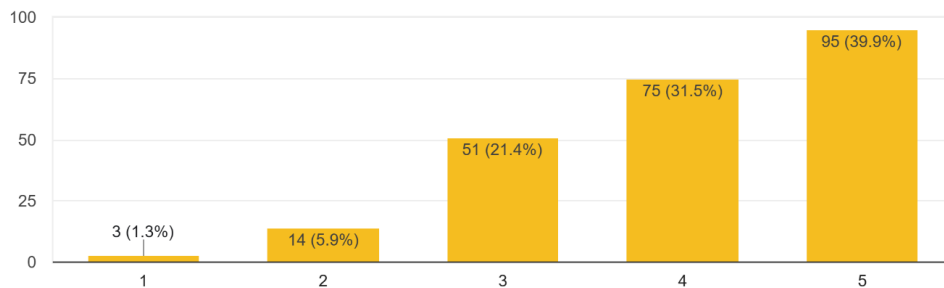
These findings align with the Social Presence Theory (Short et al., 1976), which suggests that communication platforms with richer interaction features enhance perceived presence. The Community of Inquiry (Col) model (Garrison et al., 2000) also emphasizes the importance of social presence in fostering engagement. The results support previous studies (e.g., Richardson et al., 2017) showing that synchronous communication tools contribute to stronger social connections in online learning.

Social Interaction Among Students

As shown in Figure 2, the majority of participants (71%) reported that they engaged in frequent interactions with classmates through text chat (95%), voice discussions (60%), and direct messaging (50%). Activity logs support these responses with a high volume of student-led discussions, particularly in channels dedicated to general discussions, questions, concerns, and group assignments.

Figure 2*Student Perceptions of the Course's Discord Server as a Tool for Social Interaction*

The course's Discord Server was an excellent means for social interaction.
238 responses



The findings are consistent with Hrastinski's (2008) model of online interaction, which differentiates between asynchronous (e.g., forum-based) and synchronous (e.g., chat-based) interactions. Discord's synchronous nature appears to promote immediate feedback and dynamic conversations, enhancing student engagement (Asterhan & Schwarz, 2016). The ability to communicate in real-time may explain why students perceive Discord as a more interactive learning environment compared to traditional LMS discussion boards.

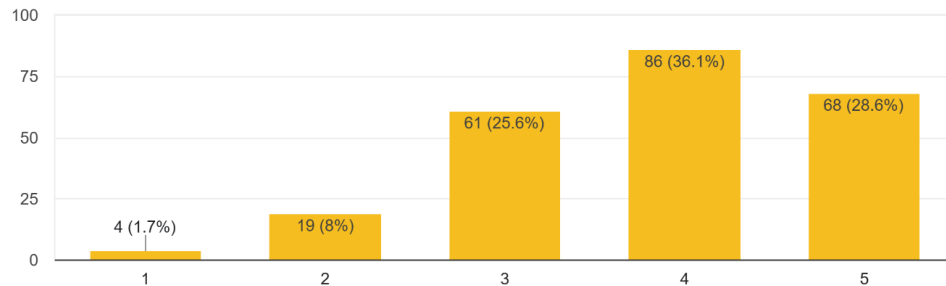
Collaborative Learning in the Discord Server

About 65% of students agreed that Discord supported collaborative learning, as can be seen in Figure 3. Specific collaborative activities reported by students included skills and knowledge acquisition (50%) and the development of problem-solving skills (47%). These activities highlight the role of the Discord server in facilitating peer learning, knowledge sharing, and critical thinking through collaborative discussions and interactions.

Students also appreciated the organized structure of Discord, which helped them easily locate discussions and announcements. Some noted that it provided an alternative to traditional forums and social media platforms, making it a valuable tool for collaborative learning and interaction. Others recognized Discord's potential for enhancing online education, suggesting that more courses should adopt its features to improve student engagement.

Figure 3*Student Satisfaction with Collaborative Learning in the Course's Discord Server*

Overall, I am satisfied with my collaborative learning experience in the course's Discord Server.
238 responses



These findings align with Collaborative Learning Theory (Dillenbourg, 1999; Vygotsky, 1978), which emphasizes that social interaction plays a crucial role in knowledge construction. Studies such as Lacher and Biehl (2018) and Ari-adco et al. (2024) have shown that Discord's interactive features facilitate teamwork and resource-sharing, leading to a more engaging learning experience. However, challenges such as lack of participation from students made the server feel inactive or underutilized. Some students pointed out that the effectiveness of the platform depended heavily on peer engagement, and since many students were unfamiliar with Discord or chose not to participate, meaningful discussions were limited.

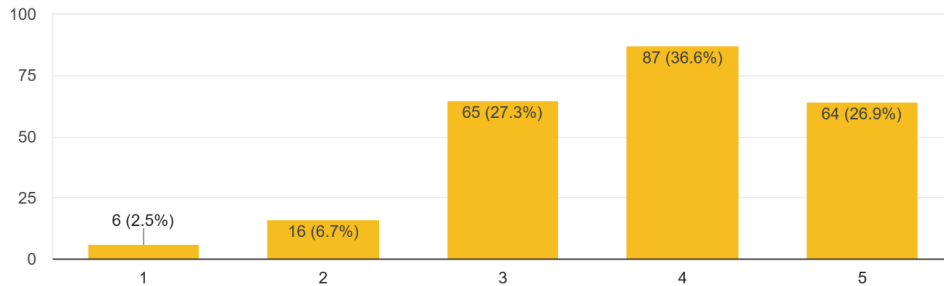
Student Satisfaction with Discord as a Learning Platform

A significant 64% of the students reported being satisfied with using Discord for course-related communication and collaboration, as shown in Figure 4. The most frequently cited benefits of using Discord in the course were its enhanced communication with the FIC (86%), with weekly Q&A sessions and prompt responses from the FIC helping address student concerns efficiently, fostering a more interactive learning experience. Additionally, 69% of the students highlighted that Discord provided improved peer interaction and support, with students appreciating having a space to engage with classmates outside the LMS, allowing for better collaboration and discussion. Furthermore, 62% of the respondents found that the platform created a relaxed yet productive space for learning, making the experience more immersive and interactive.

However, from the course SET results, the issues that were experienced by some students were they either did not use Discord often or preferred other communication methods. Also, some students mentioned that certain channels, like the "off-topic" and "study lounge" channels, were underutilized and could have helped create a more engaging environment.

Figure 4*Student Perceptions on Whether the Course's Discord Server Met Their Learning Expectations*

Overall, the course's Discord Server met my learning expectations.
238 responses



These results support previous studies from Gray and DiLoreto (2016) and Obionwu et al. (2024) indicating that student satisfaction increases when online platforms provide opportunities for interaction and community building. The findings also reinforce Moore and Kearsley's (2012) theory that student satisfaction is influenced by the level of engagement and interaction in an online course. However, the identified challenges suggest a possible limitation of Discord, as its effectiveness largely relied on active peer participation. Since many students were either unfamiliar with the platform or opted not to engage, the depth and frequency of meaningful discussions were restricted.

Challenges and Areas for Improvement

While most students expressed positive perceptions of Discord, some challenges were identified based on open-ended responses and the course SET results. Several students were unfamiliar with Discord and preferred using other platforms, such as MyPortal or Facebook Messenger for course-related discussions. Additionally, while Discord was recognized as a useful tool for academic interactions, some students felt that it did not fully provide a social experience or foster a sense of camaraderie among classmates. The off-topic and study lounge channels, which could have contributed to a more engaging and interactive learning community, were also underutilized.

These issues can be addressed by offering onboarding support such as short tutorial or guide on how to navigate Discord for students unfamiliar with it, encouraging the use of off-topic and study lounge channels for casual interaction, and implementing periodic "kamustahan" (wellness check-ins) to foster community engagement could enhance Discord's effectiveness as a learning tool.

Table 1*Summary of Key Findings*

Key Area	Findings	Challenges
Social Presence	<ul style="list-style-type: none"> 84% of the students felt a sense of community in the Discord server. Real-time chat, voice, and multi-media sharing enhanced social presence. 	<ul style="list-style-type: none"> Some students were unfamiliar with Discord and preferred other platforms (e.g., MyPortal and Facebook Messenger).
Social Interaction	<ul style="list-style-type: none"> 71% of students engaged frequently with classmates. 95% used text chat, 60% participated in voice discussions, and 50% used direct messaging. 	<ul style="list-style-type: none"> Some students felt Discord did not fully foster camaraderie. The effectiveness of interactions depended on peer participation.
Collaborative Learning	<ul style="list-style-type: none"> 65% agreed that Discord supported collaborative learning. Students engaged in knowledge-sharing and problem-solving activities. 	<ul style="list-style-type: none"> Some channels (e.g., "off-topic" and "study lounge") were underutilized. Lack of participation from some students affected engagement.
Student Satisfaction	<ul style="list-style-type: none"> 64% were satisfied with Discord as a learning platform. 86% cited enhanced communication with faculty. 69% valued peer interaction and support. 	<ul style="list-style-type: none"> Some students rarely used Discord or preferred other platforms. The platform's effectiveness depended on student engagement.

Conclusion

The study assessed the effectiveness of Discord as a learning and communication platform, aligning with the five key objectives. The findings indicate that Discord contributed positively to social presence, social interaction, collaborative learning, and student satisfaction.

Key conclusions include:

1. The high level of social presence (84%) suggests that Discord effectively fostered a sense of community. Features such as real-time chat, voice, and multimedia sharing enhanced interaction, allowing students to feel more connected to their peers and instructors. Faculty engagement played a crucial role in maintaining a welcoming and interactive learning environment.
2. Social interaction was robust, with the majority of students (71%) actively engaging via text (95%), voice (60%), and direct messaging (50%). The findings indicate that Discord promoted real-time communication, which enhanced engagement compared to traditional LMS discussion boards. However, some students felt that the platform did not fully foster camaraderie, and its effectiveness depended on peer participation.
3. Collaborative learning was supported, with about 65% of students recognizing Discord's role in knowledge sharing (50%) and problem-solving (47%). Structured discussions, organized channels, and real-time interactions facilitated teamwork and critical thinking. However, the underutilization of certain channels and limited participation from some students hindered its full potential.
4. Student satisfaction with Discord was notable, with 64% expressing satisfaction and 86% valuing enhanced communication with the faculty. Many students appreciated the interactive and engaging nature of the platform. However, some students either preferred alternative communication tools or did not actively participate, affecting their overall experience.
5. Some students were unfamiliar with Discord and found it less intuitive than other platforms. The lack of participation in non-academic channels (e.g., "off-topic" and "study lounge") limited opportunities for informal interactions. Future improvements could include offering an orientation for new users, encouraging casual discussions, and integrating periodic wellness check-ins to foster a stronger sense of community.

Overall, the study highlights the potential of Discord as an effective tool for online learning. While it successfully enhanced communication and engagement, its effectiveness depended on active student participation. Addressing identified challenges could further optimize Discord's role in fostering a collaborative and socially connected learning environment.

Recommendations

Based on the findings, the following recommendations aim to enhance the effectiveness of Discord as a learning and communication platform, addressing social presence, interaction, collaboration, satisfaction, and challenges.

1. Implement student-led discussion sessions, allowing learners to moderate or initiate topic discussions and foster a stronger sense of community.
2. Encourage students to use voice channels more frequently by hosting informal study sessions, discussion groups, or co-working sessions to

increase engagement and foster real-time collaboration.

3. Offer a brief tutorial or onboarding session at the start of the course, especially for students unfamiliar with Discord.
4. Actively promote the off-topic and study lounge channels to encourage casual interaction and strengthen peer relationships.
5. Schedule "Kamustahan" (wellness check-ins) or informal discussions to help foster a more engaging community.

By implementing these recommendations, Discord can become a more engaging, collaborative, and supportive learning environment, addressing both its strengths and areas for improvement.

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