Investigating a peer-learning model that encourages student communication and interaction in an online learning environment: a qualitative approach

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ABSTRACT
Modern Learning Management Systems (LMSs) have their roots in the Programmed Logic for Automatic Teaching Operations (PLATO) learning system created in the 1960s. Since then, they have evolved to encapsulate a plethora of new features. Despite this, research shows that many students use only the basic features of LMSs while neglecting their capabilities for communication. Literature indicates that primary reasons for this include teaching authorities dictating the usage of a given LMS, student fears of stating an unpopular opinion, and students not finding LMS communication systems satisfying to use. This research aimed to develop a peer communication system (Quizzle) based on a conceptual peer-learning model. The system was intended to make the students the primary authority of the system and was designed such that it would be interactive and fun to use. To evaluate the system, Year 3 and 4 students of the University of Guyana were invited to interact with the system over two weeks. Interviews with the students were then conducted to determine their perspective of the system. Thematic analysis was performed on the data collected. The data revealed that the participants responded positively to the implemented system. Many found that it facilitated peer interaction, was an anxiety-free experience, helped to build social skills, and helped to promote independent learning.

Keywords: Learning Management Systems, Communication, Peer-Learning, Education.
INTRODUCTION

Learning Management Systems (LMSs) play a critical role in modern education. As said by Watson and Watson (2007), a LMS is a framework that handles all aspects of the learning process. They provide a way for lecturers and students to communicate and exchange resources as well as provide other tools to emulate and innovate the traditional learning process. Among these tools are features to facilitate communication (Gasaymeh, 2017). The utilization of open lines of communication among students and lecturers is paramount to the learning process and in students taking a more active role in their education. This is primarily because it allows for insights and clarity that a student would not glean from provided lectures and notes alone.

Many students use only the basic features of LMSs while neglecting their capabilities for communication (Dahlstrom et al., 2014). This trend has also been observed with the open-source LMS Moodle. The University of Maribor in Slovenia adopted Moodle as their official LMS, and, though perceptions of the LMS were mostly positive from the perspectives of students, it was noted that they made little use of the communicative features of the platform such as forums to interact with their peers (Hölbl; Welzer, 2010). Further, Sakulwichitsintu et al. (2018) accentuated the importance of peer communication concerning its effect on a student's learning experience in any given peer-learning environment.

The current state of peer-communication systems in LMSs was investigated by Dahlstrom et al. (2014) who called for better communication systems between students. Previous implementations of platforms to facilitate communication between students have been created, but the research shows that they are always underutilized (Dahlstrom et al., 2014). Students being active in the learning process via interaction with their peers offers an excellent avenue for the acquisition of new information, experiences, and perspectives.

This research aims to develop, implement and evaluate a peer communication system based on a peer-learning model that encourages student communication and interaction. This system and model can then be utilized by the relevant stakeholders such as lecturers, students and LMS developers to improve communication and interaction.
2 THEORETICAL FRAMEWORK

2.1 COMPUTER-MEDIATED COMMUNICATION

It is important to consider the societal and cognitive effects of computer-mediated communication. This allows for an informed approach when crafting or examining an environment to facilitate online communication. Tajfel’s (1979) social identification theory posits that people tend to categorize themselves as belonging to an in-group or an out-group, with the out-group people possessing opinions that are viewed as extremist. This leads to people more likely to directly categorize the person as being a part of their in-group or an out-group (Ho; Hung; Kwan, 2022). Therefore, online environments may become prime environments to foster deliberation because they leave the argumentations of a person to stand entirely on their merit. Further, those who perceive themselves as inadequate in a given physical modality would be more likely to engage in discussions online.

In an online environment, the personal characteristics of the interlocutors can be so far removed that one often forgets they are indeed interacting with a real person (Kiesler; Siegel; McGuire, 1984). This can be to the detriment of facilitating an organic conversation, but it can be to the benefit of facilitating engagement for deliberation. Ho (2008) suggests that anonymity in online environments aids in reducing the need for public support which also fuels a less-restricted expression of opinion. The degree of anonymity in computer-mediated communication is not fixed. Riva (2002) references the use of avatars and backgrounds to add characteristics of face-to-face interaction into an online environment. This shows that elements of face-to-face conversations can be emulated to some degree in an online environment. With this, it is worth considering the concept of anonymity as a feature that can be implemented and controlled to maximize the benefits of same.

2.2 COMMUNICATION IN LEARNING MANAGEMENT SYSTEMS

Learning Management Systems (LMSs) have become a prominent part of modern tertiary education. A core part of any modern LMS is the ability to facilitate communication among students (Gasaymeh, 2017). Despite this, many students use only the basic features of LMSs while neglecting their capabilities for communication (Dahlstrom et al., 2014).
2.2.1 Teaching authority’s role in prioritised uses of LMSs

Dahlstrom et al. (2014) observe that 85% of faculty across thousands of universities use LMSs as part of their teaching. The usage is primarily for sharing content with students with very little priority going toward fostering student communication. It is also observed that students regard the interaction-related functionalities as being the least satisfying components with which to engage (Dahlstrom et al., 2014). This particular prioritization of the use of LMS functionalities by faculty may play a role in students’ perceptions of the purposes of an LMS (Livingstone, 2015).

The most popular features of an LMS that faculty found to be the most satisfying to use were posting content and course assignments, while for students, it was accessing content and submitting course assignments (Dahlstrom et al., 2014). In cases where students made some use of the communicative features of a given LMS, the underlying motivator was to track course activities (Hölbl & Welzer, 2010). This lends credence to the idea that those in positions of teaching authority dictate the usage of a given system, in this case an LMS system. This will directly impact what features the users of that system deem as the most relevant to use regardless of whether that is the best way to use the system (Mayhew & Murphy, 2014). Taşlı Pektaş and Demirkan (2011) noted the extensive literature focused on course management systems being used as repositories of course information while research about the communicative aspects of these systems was scant. Communication functionalities, therefore, should be prioritized to encourage their usage beyond just the handling of a course’s logistics.

2.2.2 Moodle: a case study on high-prioritization

Taşlı Pektaş and Demirkan (2011) investigated the viability of Moodle as a communication platform by using it as the main communication system for multiple student teams working on a common task. The majority of students perceive Moodle to be an effective platform to facilitate communication among teams, describing the communication system as flexible. Some criticism was directed at the platform’s lack of expression compared to face-to-face communication. Some students also criticized its underwhelming visual support (Taşlı Pektaş; Demirkan, 2011).

Any given communication system would ideally be customized to best facilitate deliberation in its respective environment. When these factors are being considered, it is worth considering the contexts of what the system can be made to do and how the users would most intuitively make use of it (Stav; Bergh, 2008). Users would be less likely to engage with an overcomplicated or cumbersome system even if it does what they desire (Granic, 2008). Lack of expression may serve to lessen the intimacy of the user experience. However,
the tradeoff of higher levels of engagement in deliberation by a larger number of students is worth considering (Ho; Hung; Kwan, 2022). For a deliberation platform, the latter should be prioritized.

2.3 PEER-LEARNING: THE CHAMPION OF PEER-DELIBERATION

Online peer-learning environments are prime centers to foster deliberation and encourage general interaction among students (Abdullah; Chan, 2018). Hamad et al. (2020) regard the idea of student learning to naturally comprise student teaching, thereby reinforcing every taught concept many times over. This idea was observed when peer learning was applied to a pharmacotherapy course as well where over 90% of the student participants claimed to have learned new knowledge from their peers (Alexander et al., 2008). In a traditional lecturer-student context, this would not be plausible as the student would not hold the default power to instruct. One implementation of a peer-learning program facilitated discussions which improved the knowledge and leadership skills of all participants (Burton et al., 2013). The permuting nature of peer learning means that all in attendance of its program can learn from all others; all must also dictate to all others. Creating an effective peer-learning environment with which to foster this deliberation therefore entails the consideration of many factors.

The application of gamification to foster deliberation in an educational environment is ripe with potential (Ho; Hung; Kwan, 2022; Miller, 2013) There are several components of gamification that are viable in this regard namely badges (Huang; Hew, 2015), ranks (Roosta; Taghiyareh; Mosharraf, 2016), leaderboards (Kiryakova et al., 2014) and feedback (Nah et al., 2014). The idea of using gamification to motivate students was investigated by Roosta, Taghiyareh & Mosharraf (2016) who examined the relationship between the various motivations of students and the gamification elements that would best engage them. The gamification elements they would ultimately implement were a leaderboard, feedback system, badges, and progress bar (Roosta; Taghiyareh; Mosharraf, 2016).

2.4 RESEARCH DIRECTION

Online environments are prime environments to foster deliberation. Ultimately, the impetus of student communication in modern learning environments is on the authorities that oversee a given programme. Redistributing this power to dictate among the students via a peer-learning programme lends to said students being more interested in communicating. Designing an effective peer-learning system necessitates that the environment naturally encourages deliberation. As such, the ideal system would need to be designed such that it incentivizes students to communicate. One way to achieve this incentivization
is through gamification. The following sub-section presents a conceptual peer-learning model that incorporates gamification elements to foster online student communication and interaction.

2.5 CONCEPTUAL FRAMEWORK

The model in this study was developed based on a critical review of the literature on LMS communication systems, the social and cognitive considerations of computer-mediated technology, and perspectives of peer learning. The model is also based on gamification elements that were found to encourage online communication and interaction and aid in the revision of the course material in LMSs. Figure 1 illustrates the conceptual model that was developed. Below is the description of the elements of the model. The following sub-section presents an implemented peer communication system that was designed based on the key tenets of the model.

![Figure 1. Conceptual Model of Study](source: Prepared by the authors)

2.5.1 Users

Users are the players (students) that will create pseudonym profiles for anonymity while utilizing the system either by investing new entries of quizzes into the system or playing those quizzes invested by their peers while providing feedback and viewing their ranks. Additionally, they can utilize the flagging system if need be.
2.5.2 Quiz

This form of summative pedagogy practice was chosen due to its familiarity, easy-to-comprehend instructions, and frequent application for assessment of retention and comprehension purposes, universally thus, mitigating the learning curve and possible anxiety of students to partake in an activity. Other pedagogy practices such as diagnostic and formative assessments were not incorporated since we are not trying to replace students’ existing teachers. Rather, we are supplementing taught lectures through revision and peer learning (Hanna et al., 2004). According to this model, users create or undertake a quiz.

2.5.3 Feedback

A comment feature will also be applied to our model thus allowing students to provide feedback on a specific quiz which creates social interaction and boosts student-student collaboration. This way, the students can maintain focus on a particular quiz’s discussion, rather than allowing them to create separate threads of topic interests which can lead to risks. In the model, users interact with feedback and feedback is tied to one quiz.

2.5.4 Gamified Elements

Four primary gamification elements were incorporated to build upon the intrinsic motivational nature of the conceptual model while maintaining acceptable development cost by adopting the necessary features for a multiple-choice quiz-based system. Those features are users, challenges/tasks, points, and ranking of users (Kiryakova et al., 2014).

- **challenges/tasks**: refers to the multiple-choice quiz placed in the information system for users to perform and progress upon. This element is necessary in assessing the students' capabilities as it is a key factor in our prototype;
- **points**: these are incentives to motivate students upon completion of a quiz. This element will aid the student’s self-assessment and by extension their behavior, which has a major influence on their motivation after receiving the score. In the model, Points are attached to the quiz and are used to score users;
- **ranking of users**: users are ranked according to their accumulated scores from partaking in activities. This element correlates with the Points element as it places users further up the list depending on their total points. This level of hierarchy is acceptable as it is a natural consequence of the student’s performance;
- **flagging system**: users have the ability to flag a quiz or feedback in case of unanimous disapproval of content. This way, users can maintain a healthy environment among themselves.

2.6 QUIZZLE: IMPLEMENTED SYSTEM BASED ON CONCEPTUAL MODEL

The quiz system named Quizzle is a web application providing convenient access to students which will be built upon the following W3C technologies HTML, CSS, and JavaScript by ECMA which is the standard client-side scripting language to develop the front-end artifact due to its highly portable nature. These building block technologies are used over others since they provide great support for most modern browsers.

Quizzle encourages students to participate in the revision of course material through gamification elements that make participation worthwhile. All the while improving their retention and comprehension capability. Students contribute resources in the form of multiple-choice quizzes to the quiz bank. Their investments towards the quiz bank then serve as the content for gamified activities. Through performing these activities, students can gain new learning and directly interact with other students via a comment system that will be visible for each activity. Furthermore, students will be up-to-date with their performance, and that of their peers, thus providing intrinsic motivation for participating in Quizzle as a whole. The system requires a participant to register their account with a username and password.

After logging in, the participants were greeted with both third and fourth-year courses. We chose to provide only the joint Computer Science (CS) and Information Technology (IT) courses to maximize course usage across the board. Also, with this decision, parties can revise previous courses (fourth-year students), or learn and gain insight into upcoming courses (third-year students). While on the homepage, participants can view the dynamic leaderboard which displays the quiz points, investment points, and comment points of the top students. Their personal metrics are displayed just below.

![Quizzle Homepage](image)
Selecting a course grants the participant two options: investing a quiz into the quiz bank, or playing the quiz game. Investing provides the user with a multiple-choice quiz form. Here, the user enters a question, three potential answers, a blitz lecture (optional), and selects which of the three answers is the correct one.

![Figure 3. Course Selection on Quizzle](image)

Source: Prepared by the authors

Playing the quiz game provides a randomly selected quiz card pertaining to the selected course to begin the quizzing. Their score (tied to that course) is located under the course title and updates as they continue playing. Results and the “Blitz lecture” are shown after taking the quiz along with feedback from fellow peers. Their score is also dynamically updated.

![Figure 4. Investing Quiz on Quizzle](image)

Source: Prepared by the authors

3 METHODOLOGY

Tang *et al.* (2022) and Vrieling-Teunter *et al.* (2022) provided appropriate means for testing peer learning and peer interaction in online settings based on student’s perspective and perceived relatedness,
respectively. On one hand, Tang et al. (2022) identified four main perspectives addressed from their results. First, “enhancement of learning ability”; This shows that peer learning can boost a student’s self-regulated learning ability which can directly impact the student’s retention and comprehension of learned information. Secondly, “attitude of learning” shows that students performed better and with much more positive attitudes utilizing the peer-learning environment versus students who were in face-to-face lectures. Third, “motivation for learning” fosters motivation in students involved in peer-learning environments and promotes self-regulated learning more so than students involved in traditional teaching. Finally, in “interpersonal relationships”; students' social skills improved by interacting with peers on a similar level, thus increasing their communication skills which leads to effective functioning in a peer-learning environment.

On the other hand, researchers Vrieling-Teunter et al. (2022) provided a triad of constructs that target social interactions in an online peer-learning space. First, “social presence” focuses on the perception of other persons as being real. Secondly, “social space” focuses on the interpersonal and emotional connections between group members. Lastly, “sociability” is the degree to which the virtual learning environment supports social presence and social space.

3.1 DATA COLLECTION

To evaluate the system, data was collected via interviews utilizing convenience sampling which included students of the University of Guyana from the faculty of Natural Sciences and those belonging to the majors of Computer Science (CS) and Information Technology (IT). These students transitioned from traditional face-to-face to online learning over the past four years which resulted in their student needs all being provided, assessed, and facilitated by Moodle (Gonzales-Zamora et al., 2020).

A moderate sample of thirty students in total were targeted from years three to four. Year 3 was included due to the evaluation being conducted during the recess period. This allowed us a chance to get more people for the evaluation. Respondents were given a link and invited to experience and interact with Quizze. The participants experienced Quizze for two weeks. We then conducted one-on-one online interviews during their preferred contact periods stated in the Survey Design. This was facilitated using both Zoom and Google Meet video conference platforms (Singh; Awasthi, 2020).

Following exposure to the tool, questions were asked that targeted relevant information for evaluation purposes. Seven questions were designed based on the relevant literature (Tang et al., 2022; Vrieling-Teunter et al., 2022). and targeted the areas of participant’s perspective on the use of Quizze; (1) enhancement of learning ability, (2) attitude of learning, (3) motivation for learning, and (4) interpersonal relationships, and perceived relatedness; (5) social presence, (6) social space, and (7) sociability. The first
question targeted the student’s source of learning and their perspective on peer learning. The second question was developed to measure student’s motivation and attitude toward wanting to learn on either platform. The third question targeted their current social skills and checked whether they can see significant improvement over time while using Quizzle compared to Moodle. The fourth question was developed to help us understand their awareness level of others during their experience. The fifth question supplements the fourth question by testing the participant’s level of perceived relatedness to being a part of a community of peers. The sixth question was structured to help us understand the cause of an inhibiting emotion towards self-regulated learning and peer communication, which is anxiety, by questioning their experience between Moodle and Quizzle. Lastly, a five-point Likert scale was adopted in this questionnaire with values ranging from very weak to very strong. 1 to 5 points respectively. This targeted the level of intimacy of their social bond and interpersonal relationships between the two platforms.

3.2 DATA ANALYSIS

After collecting feedback from the participants, responses were transcribed according to clean verbatim for easy readability. Following the guidelines of Braun and Clarke (2006), qualitative analysis was then conducted using thematic analysis. The analysis led to the development of seven interpretive themes based on the students’ use of Quizzle. These seven themes emerged from a total of 138 codes.

4 RESULTS AND DISCUSSIONS

This research aimed to develop and implement a gamified conceptual model that encourages and facilitates peer learning and peer communication. Accumulated responses indicate that the conceptual model promotes both peer learning and peer communication, as well as providing an adequate environment for self-regulated learning:

4.1 THEME 1: QUIZZLE PROMOTES PEER-INTERACTION

Most participants agree that Quizzle provides support for peer interaction. Communication is key in peer learning, and Quizzle provides this by allowing students to share feedback on quizzes and interact with peers. Participant 8 reported:

Yes, I can see myself improving my social skills using Quizzle because Quizzle provides a platform for interaction with other students. (P08)
4.2 THEME 2: QUIZZLE CAN BUILD PEER RELATIONS

Building relationships among peers is important for one's social development and will allow them to collaborate more effectively versus being isolated. We asked the participants to rate their perceived interpersonal relationships between Quizzle and Moodle. Most participants share similar sentiments on building bonds through peer interaction. Participant 6 mentioned:

Comparing this experience to Moodle, I like that this experience gives me more of a sense of community. It feels like a classroom. (P06)

4.3 THEME 3: QUIZZLE CAN IMPROVE SOCIAL SKILLS

As discussed earlier, social skills play a major role in retrieving information and communication which can lead to a better experience in a peer-learning environment. Most participants see the potential for significant improvement of their social skills as they spend more time using Quizzle over Moodle. Participant 2 reported:

Because comments are the only way to directly communicate with other people but I would be in the comments a lot [laughs], so I’m sure it would help my social skills. (P02)

4.4 THEME 4: QUIZZLE REDUCED ANXIETY

Anxiety is a major inhibitor in academic performance as it directly affects peer learning, peer communication, and self-regulated learning in our study. The first part of the question asked about their anxiety with Moodle, and the second part asked if they experienced it with Quizzle. Positively. Most students agreed to have experienced or seen the potential for a significant reduction of anxiety using Quizzle compared to using Moodle. Participant 9 said:

Yes, I think the more I use it, the less anxious I would be long-term, but I don’t really feel too anxious to start, to be honest... because I found that I do over some of the questions here, and your score can just go back up. With Moodle, it’s one-and-done [chuckles] given Moodle’s nature for retrieving assessments and being assessed. (P09)

4.5 THEME 5: RECOGNISES POTENTIAL IN DISCIPLINE IMPROVEMENT

Stemming from the importance of self-regulated learning, discipline is essential to one’s motivation for learning. Participants in this study showed eagerness to play due to Quizzle’s simplicity in
design and gamification features along with incentives. We also asked the participants to compare their experience with Quizzle versus Moodle. Another positive indication that our conceptual model addressed key components in individuals’ attitudes that boost motivation. Participant 1 reported:

How y’all got this thing setup, it’s like a game, so it’s not really like you have to put in a bunch of work to come and use the app. You just come and play because it’s like a game. (P01)

4.6 THEME 6: QUIZZLE PROVIDES SOCIAL PRESENCE

Any given system must provide its users with an intuitive interface for easy navigability and means of accomplishing their objectives efficiently. Having awareness of your peers being active alongside your learning journey is important in an online peer-learning space. Data indicated that most participants indeed felt the company of their peers while learning with the Quizzle prototype. Participant 8 reported:

I feel like I have a social presence on Quizzle compared to Moodle. The layout is already pleasing enough to use. (P08)

4.7 THEME 7: QUIZZLE PROVIDES FRIENDLY USER-INTERFACE

As mentioned earlier about the importance of having a friendly user interface, participants shared the same sentiment in questions that targeted bonds among peer interaction, anxiety during peer interaction, and system usage across Quizzle and Moodle. Participant 11 mentioned:

Peer interaction on Moodle is like sending emails. Your expectancy of a response is equivalent to using an email platform, whereas with this platform [Quizzle], even if it takes them maybe the same amount of time to respond to your comment, you do not feel the same way when coming back to the platform. There is social activity. (P11)

5 CONCLUSION

The literature indicates several reasons for the underutilization of communication systems in modern learning management systems. Prominent factors influencing communication among students on online platforms include the system being interactive and fun to use, the ability to remain anonymous and the desire to conform. This study developed a gamified approach toward online peer communication to make communication, interaction and deliberation fun within a system.

The gamified approach manifested in the forms of a conceptual peer learning model and an implemented peer communication system, Quizzle. Participants in the study responded positively to the
implementation of the conceptual peer-learning model, Quizzle. Many participants found that the system facilitated peer interaction, was an anxiety-free experience, helped to build social skills, and helped to promote independent learning. These findings contribute to conversations governing increasing interaction in a given peer-learning environment. There is a need for further research into the benefits of personalized in a peer-learning environment since it can potentially bolster communication when many students are learning together.
REFERENCES


