LiveClassroom

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Abstract. Despite technological developments in education, in-class student participation and engagement have yet to see substantial improvements. Indeed, many students still have a hard time in actively participating and asking questions that can sometimes disrupt the flow of the class. LiveClassroom provides Students with means to improve their in-class interaction with Instructors, eg. asking questions, submitting course or lecture feedback and answering online instructor questions for assessment purposes. Additionally, it increases student learning and interactions compared to students who did not use LiveClassroom.

Keywords: blended learning, backchannel, participation, engagement, feedback, attendance.

1 Introduction

Recent years have witnessed substantial technological advances in e-learning tools and educational multimedia content dissemination through the Internet. However, many problems still remain in technology enhanced learning. While richer content is being provided, student participation and engagement have not seen similar development. Since students can review class topics at a later date they might feel a disconnect towards the class, because the prospect of asking a question in front of others or be mistaken is daunting for some, so they stay quiet and tell themselves they will look at it later. However, this is not ideal, as instructor-student dialogue during a lecture can greatly improve learning outcomes [Roc10] and it needs to be improved with technology. Because, although technology is already part of the classroom, it is mostly used by students for distraction purposes.

E-learning and blended learning focus on aspects that are outside of the classroom. While technology provides ways to improve learning during off-time, it is during a lecture that students develop critical thinking, become motivated and stay engaged by asking questions and interacting with others [Roc10]. Students worry about displaying a positive image of themselves to their class mates. This can prevent their participating in class due to evaluation anxiety. Many fear being judged by others because they made a mistake or just do not want to be the focus of attention [Roc10].
1.1 Objectives

I developed a tool-set to support bidirectional communication and evaluation to promote student engagement in lectures, improve teaching in blended learning settings while increasing student participation in simple and unobtrusive ways.

This approach, which I call LiveClassroom, draws inspiration from recent related work and is available to a multitude of devices and operating systems, allowing students to interact with the class towards improving their engagement and participation. Among other functionalities, students are able to pose questions and ask the lecturer to repeat subject matter that was not clearly understood. Anonymity allows shy or socially challenged students to participate and improve their learning, while maintaining a log of whoever interacts with LiveClassroom, with the intent of minimizing "anti-social behaviour" or attention-hogging by overly active students. The instructor has immediate access to these questions and can weave them into the current explanation or answer them when that would have the least impact on class flow. LiveClassroom is simple, unobtrusive and easy to use to minimize distractions and keeps track of student attendance. Lastly, the instructor is able to quiz students on topics previously discussed at any time during class, not only for grading purposes but to keep the class on their toes and engaged during each lecture.

LiveClassroom’s user tests have shown an increase in student interactions of 20% and a higher test score of 13%. Though it needs more testing and analysis in a realistic environment to determine if this projection can be maintained.

1.2 Related Works Discussion

By reviewing and analyzing previous research on backchannels, it can be noted that they increase student participation and interaction significantly.[Yar06] The introduction of anonymity into these systems allow for even more students to participate but also make anti-social and negative behaviour apparent. [BK10] Degrees of expression also have an influence, higher degrees allow more communication capabilities but require more attention, while lower degrees limit communication but are easily interpreted. [DRCG09,DRC12]

Microblogging systems, like Twitter, have the possibility of being important in a classroom context, the fact that it is real-time, available to a wide array of devices and has limited text characters makes for a more dynamic class by making communication easier to interpret by both students and instructors. [GH08] Since twitter is a social network and a widely used platform by all kinds of companies, it can introduce another avenue for distractions, as the students have easy access to various news and information that is no way relevant to the topic of the lecture.[MCB+15]

Multitasking for distractions are a problem in class and will only get bigger as computers become evermore ubiquitous in the classroom, not only for those that are using the device but for others who have a clear view of others devices.[FSSB11] Students who are uninterested in the class or find the lecture too difficult will want to find escapism. To combat this, the class needs
to be more engaging, providing easier and safer means to interact with the
instructor.[TFF15] A more creative and engaging class will make more attentive
students.

Blended learning and gamification increases student performance of students
who are enrolled in classes with this teaching pedagogy, and they are also widely
preferred by students.[YPW14] These pedagogies create better motivated and
invested students in the course, but the MCP course has only implemented an off-
class solution with Moodle, which is independent of each lecture’s environment
or students. The addition of a real-time solution during class will certainly not
only improve student performance and engagement but also the fluidity of the
class.[BGJG13][Kiv14]

These are the most important traits that LiveClassroom will approach.

– Promote engagement, a vital component of learning, by keeping students
actively participating and paying attention.
– Promote participation, which develops critical thinking and makes students
interested, actively thinking about what they are learning.
– Provide anonymity, this extra layer of security will help student who are not
comfortable with public interactions.
– Allow in-class quizzing in a fair way, where each student can earn credits by
answering correctly.
– Easy interpretation of interactions, for quick and clear understanding of what
is written.
– Low multitasking impact by not occupying too many cognitive faculties and
minimizing distractions.
– Promote blended learning by providing an accessible, intuitive solution for
in-class student instructor interactions.

Looking at all these approaches, it seems that a chat room approach is not
ideal, especially if the instructor has no visual control over it. Limiting a students
actions to only a small portion of text will allow for easier interpretation and
focused writing, rather than allowing video or images that are more heavy on
cognitive functions. Anonymity, if used correctly, provides an extra layer of se-
curity that most students will take advantage of to suppress their social phobias
and better their learning. This however, will also bring about the probability
of off-topic discussions, but with the implementation of Public Anonymity Pri-
vate Accountability Policy these discussions can me mitigated, with the added
feature that the instructor will be able to know who said what at any time.
Microblogging has the advantage of small and concise text, which would help
the instructor with interpretation. But if a social network, like Twitter, is used
it would only provide more avenues of distractions due to all the other non class
related content available.

In short, there is no solution that approaches all the LiveClassroom’s pro-
posed traits successfully, so, in the following section I will propose my own ap-
proach.
2 My Approach

2.1 Student Side

First I will explain the student side, starting with the token acquisition process. When the class starts, the instructor will enable a private ad-hoc network, that the students will need to connect to. Then they must input the instructors IP address into an Internet browser, this will redirect them to a token acquisition site. Alternatively, a QR code can also be shown to the students to accelerate the process if they have a smartphone that can read them. Here, after logging-in with their Fénix ID they will receive an access token. With this access token, they will then leave the instructors network and rejoin Eduroam to access LiveClassroom. This token is only viable for the duration of the lesson. The process to obtain a token guarantees that only students who are in the classroom or in its immediate vicinity can get it, adding to LiveClassroom’s reliability. With a valid token they are redirected to an active lesson, where they will have their attendance counted and be allowed access to instructor-student bidirectional interactions.

Figure 1 shows the main student functions of the application, it has the most important interactions at the top. The "I Do Not Understand" button sends
the same text to the instructors, advising them to repeat the last section of the lesson. "Submit question" button allows the students to specify what they want to know more and is limited to 140 characters, the size of a twitter message. This restriction is necessary as it forces the student to be direct plus it allows for twitter integration on the instructor side. Each time these buttons are pressed they send a tweet to an account that the instructor owns. This integration will be explained further in the following subsection. Bellow this are all student interactions in the current lesson, so that everyone can follow along with all interactions made. All interactions are completely anonymous for the students, only the instructor can verify who made them. When the instructor sends a question, the students are forcefully redirected when one to it. Students are then presented with a question and have exactly 1 minute to submit their answer or it will not be counted. After answering, or time expires, they are redirected back to the previous page. The answer options are shown in a randomized order to difficult copying from other students.

2.2 Instructor Side

The instructors require no tokens, and so are redirected to their appropriate page upon logging-in with their Fénix ID. This area, is restricted to students. It is hard coded to only accept specific Fénix ID numbers, in this case the instructor’s. Here, figure 2 the instructors can change between the two campi, Taguspark and Alameda. Create a new lesson or enter an existing one. There can only be one active lesson per campus at a time, so the page indicates if there are any open lessons. Furthermore, upon choosing a lesson to enter, more information is shown about it. It shows how many questions were created and how many were sent, start and end time, students who attended and their answers to each question sent. This allows for instructors to quickly do a summary of the lesson, or do their end of class duties.

Upon entering a lesson, figure 3, they are presented with a real time number of the number of students registered in this lesson followed by 3 main areas, the question queue, the Lesson option and the student interactions. The question queue shows, by order of creation, the next question available to be sent and the previous question sent. It is this way so that the instructors can create questions based on their slides. If they want to create questions for slides 10, 14, and 25, they should create it in this sequence so that it will align with the lesson and facilitate sending them. The first row of buttons are related to the question queue, they allow to send the next question, review the statistics of the previously sent question, sending a quick question, and skipping backward or forward in the queue. Quick questions are standardized to allow for a quick survey of the classroom, their tittle is quick question and the answers are option 1 to option 4. If the instructor desires to know something about the class then he can indicate in the white board what the options 1 through 4 mean and quickly send it out to review the results. The skip buttons are there in case something goes wrong. If the instructor forgets to send a question or does not want to send it for some reason, he can skip that question entirely or revisit it
later. First in the lesson options is the create a question button, which allows for multiple question, true/false or open answer which are then inserted at the end of the queue. List questions will show all the questions in order of creation, and allows for them to be sent out again, to review their results or to edit or delete them. Show QR code will open a QR code in a new window that the instructor can show to the students to ease the token acquisition process. The final button deactivates the lesson, so that students can no longer enter it, and creates 2 files. The attendance file, which lists the students, their entry and
exit times. The Question answers file which lists the students and their answers to each question sent. This is the same information that is shown in the lesson selection but it is in file format for posterity. At the bottom are the same student interactions as the student side adding the student ID, but the instructor has another way to keep track of this. By having a smartwatch connected to the PCM twitter account via their smartphones, the instructors can receive these interactions via their smartwatch by allowing notifications from twitter. This notifies the instructors in a non-disruptive way and is quickly available for them to read when appropriate. It also allows the instructor more freedom, as there is no need to be in front of the application at all times. Also, due to my proximity with TagusPark campus, this solution has only been tested there. LiveClassroom is able to function correctly in Alameda, but the token acquisition process needs to be tested and refined for those specific classroom conditions.

3 Result Discussion

LiveClassroom functions were incrementally tested throughout the second 2015/2016 semester, during PCM lessons, in the environment on which LiveClassroom
would be used. I was present during the Tagus Park class lectures to ensure that everything worked according to plan, and empirically analyze how LiveClassroom performs and make on-site observations. At the end of the semester, students filled a short questionnaire related to their overall experience with LiveClassroom. After all this, an additional user test was made to completely test all of LiveClassroom’s features at the same time, during a simulated lecture with 8 users. Where users were divided into 2 groups, one with and the other without LiveClassroom. Every action performed was being monitored for number of clicks, time and mistakes, with a final written test for evaluation.

Regarding the functionalities of LiveClassroom that were tested with the students, a post semester student questionnaire revealed that:

– The interface was simple.
– Information could be more clearly displayed.
– Students feel that LiveClassroom would benefit their learning.
– The token process was acceptable but could receive some improvements.
– Students are unsure if student-instructor questions would be helpful.

As observed during the semester, the number of student interactions steadily declines through time, meaning that students become less engaged and interested. Given that students in the questionnaire felt that LiveClassroom could help improve their learning, I think that would directly relate to an increase in communication and engagement. Also, the fact that paying attention in class could visibly impact their credit score, by answering instructor questions, would not only motivate the student but also keep them interested and yield better results overall. Additionally, the spark of using new technology and new applications could fuel student interactions, by experimenting with it and realizing that interactions are completely anonymous. This is corroborated by the user test, the Users who used LiveClassroom had 20% more interactions than the ones without and scored 13% higher in the final test. Instructor-Student interactions would definitely support evaluation of students, but also, instructors can clearly see when a part of the lecture is problematic. By reviewing the number of "I do not understand" messages and student questions they can see where students falter, where the lesson could stand to become clearer or where the slides could use some improvement.

The number of users in the user test is low, and cannot accurately reflect the environment nor the conditions of a real lesson, but I think it shows promising results that have the potential to be even better because in a real lesson students actual have a stake and want their results to be the best they can be. The fact that students can see that they have equal opportunity to earn credits, don’t have to be the quickest and can take some time to think up their answer will be a motivating factor. And, as they see their lesson scores keep up with other students, it might increase their self-esteem enough that they could ask more questions and keep feeding this cycle. These points, I think, fulfil "bidirectional communication and evaluation to promote student engagement in lectures, improve teaching in blended learning settings while increasing student participation".
Since distractions are ever more prevalent, LiveClassroom does not need to add to that, so, the student side of the application is as simple as possible. They have 2 options to interact, one is a simple button that performs the action it displays, "I do not understand" and the submit question which is limited to the size of a tweeter message. Instructor questions appear on their screen automatically, requiring no action from the student. In the questionnaire, 70% of students considered the interface simple. The instructor already has a very demanding task during a lesson, that takes massive amounts of multi-tasking, again, LiveClassroom does not need to add to that. Questions should be created before a lesson, in the order that they should be sent to the students. During the lesson the instructor should only be pressing 2 buttons, the one to send the next question, when appropriate, and the one to display results, if they deem necessary. Questions can be skipped forward or back in the case that one is forgotten. Furthermore student questions can be read easily, by newest first order, on the application or on their smartwatch, by integrating it with the PCM associated twitter account. These complete the objective of a tool-set that is simple and unobtrusive.

4 Conclusion

Lack of student interaction and engagement are a real problem in the current classroom pedagogy, some students are afraid of being wrong in front of their classmates, others have questions but hold off on asking them hoping they will be answered in the coming slides, and when they are not, the student might feel like the conversation has moved on and their question would no longer be relevant and seen as disruptive. While others have no such problems and dominate the entire discussion, being the sole communicators with the instructor. Is there a way to increase student interaction and engagement in an unobtrusive and simple way?

The final prototype fulfills all the objectives initially proposed, it features anonymous student-instructor communication with the help of twitter to allow an easier read for the instructors. Allows for instructor-student questioning during class with limited class flow interference. It keeps all attendance records and student answers to ease the instructor’s out of class work flow.

Throughout the semester only a handful of students would regularly interact with the instructor and answer his questions. This confirms previous research and validates LiveClassroom as an alternative as all students should be able to earn credits by answering correctly to instructor questions, instead of only the quickest or most vocal.

Even though some features where not extensively tested throughout the semester, the ones that were tested turned out a positive result by their final build. Attendance recording was accurate as only people present in the class were recorded. The login process was functional but was overly extensive. And students were able to receive and answer instructor questions when one was sent. Obviously some new features have been added and perfected that also require
more testing and use, but overall I believe that LiveClassroom is beneficial to the classroom, at least from an instructor-student perspective. Since student-instructor questions were not tested, and students seem doubtful of it’s use, it is hard to predict if it will have much use, but steps have been taken to ensure that if it is used it has the least amount of impact on class flow and instructor time and attention. In the end, I am hesitant to call LiveClassroom ready for deployment or ready to be used consistently throughout a semester. More testing is needed to guarantee that everything works as intended, but initial results are promising and enhance the blended learning aspect of the MCP course.

References


