

Examining how Student Response Systems affect interaction between students and lecturers in higher education

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Abstract—Communication in university lectures proves to be difficult, partly because of the lecturer to audience size ratio and lack of proper interaction strategies. Through the use of an exploratory contemporary case study, including literature research, interviews and a questionnaire, this paper reveals that students in higher education could benefit from a better way to interact with lecturers, preferably anonymously. The findings of the paper sheds light on factors makes large lectures problematic as learning environments for students, and how SRS's might improve them, through facilitating improved student-lecture interactions.

Index Terms—Student Response System, lectures, interaction, learning environment

I. INTRODUCTION

In higher education, the lecturing of theoretical topics is dominated by traditional methods, which involves lecturers presenting slides to students. Although this is efficient for small classes, it does not scale well to larger classes [1]. According to a survey conducted with 5162 NTNU respondents, "Læringsmiljøundersøkelsen 2015", lectures was the learning method students felt they learned the least from [2].

Within this environment, it is difficult to avoid that the learning becomes unidirectional: the students becomes passive observers instead of engaging in the learning. The average attention span of humans are around 20 minutes [2], and a way to "reset" humans' attention span are to somehow include them in the learning process. A recent approach to increasing student participation is the use of Student Response Systems (SRSs), which are wireless communication between students and lecturers, such as Kahoot and Sibly [3], that allow students to anonymously engage with lecturers and the classroom during lectures through a common communication channel. Studies show that SRSs can positively effect the

environment of the classroom as well as the results of students [4].

The main purpose and underlying motivation of this research project is to examine how SRSs affect lecture interactions, and to what extent this affects the learning environment. The insights gained from this work may be valuable for lecturers and students involved in higher education, together with organizations working to improve higher education. Taking the purpose into account, the following research questions were developed:

- **RQ1:** How does the use of Student Response Systems affect the interaction between lecturers and students in lectures?
- **RQ2:** To what extent does the use of Student Response Systems in lectures affect the learning environment?

II. BACKGROUND

A. Similar studies

In order to get a better and broader understanding and perspective on the topic of this research study, it was important to find similar research on SRSs. The similar research was found using Google Scholar, as well as by asking professors and lecturers at NTNU that was performing research on the same topic or had interest of it.

The first similar study considers gamified approaches for teaching ICT theory [1], using SRSs such as Sibly and Kahoot. This study is relevant due to its focus on the use of SRS in lectures, increasing the students motivation and enabling a good learning environment. Another study considered evaluation of SRSs from the viewpoint of lecturers and students [5]. The study focuses on lecturer-student interaction and student engagement,

which makes it very relevant. The last study examined whether the use of SRS in lectures changes student engagement and learning [6]. It is relevant due to its focus on students motivation and learning environment. These similar studies are relevant for both research questions of this paper.

B. Limitations

The studies examined in subsection II-A considers the same topic as this research paper. However, two of the studies' participants was from the same classroom or field of study [1], [5], and the last study had a limited amount of participants [6]. This paper aims to include a larger amounts of students in large lectures within various fields of study.

III. METHODS

A. Research strategy

The course literature was used in order to find strengths and weaknesses within different research strategies [7].

Various strategies were analyzed and the group decided to opt for a case study. Case studies were the most suitable as its possible to use multiple data sources, which can produce data that is close to people's experiences. This is very relevant as it is useful to examine both students and lecturers experiences during lectures. However, case studies doesn't have a set of rules to follow and the presence of the research team may affect how people behave. Therefore it is important make the participants as comfortable as possible when being interviewed.

Case studies makes it possible to collect both quantitative and qualitative data, which is needed to answer the research questions. Quantitative data from questionnaires can be used to answer research question 1 (I) as the question requires many different perspectives, while the more in-depth qualitative data from interviews can be used to answer research question 2 (I). This can be combined in a exploratory contemporary case study [7]. This means that interviews were conducted to understand the subject before conducting a quantitative survey through the use of a questionnaire.

The use of this sequential approach enabled the researchers to understand how lecturers experience the learning environment of lectures, and how it may be improved. The strategy was chosen as the group wanted to understand the situation from the lecturers point of view, before asking students if they can relate to these viewpoints.

B. Data generation methods

1) *Interviews*: The interviews were designed using a semi structured approach [7], enabling the group to change the order of the questions asked during the interview, while also making it possible to ask additional questions if beneficial. While this made the interview process a bit more challenging for the interviewer, the decision made it easier to adapt the interview for different lecturers with different backgrounds and motivations to contribute to the project. As the course literature anticipated, the semi-structured interviews made it easy for the interviewees to also introduce issues of their own that they thought was relevant for the research [7].

2) *Questionnaires*: Subsequent to the interviews conducted on lecturers, a questionnaire were designed and distributed to 41 students enrolled in various fields of study with various amount of experience being a student.

3) *Literature*: Alongside the research process, various literature articles have been examined to support the research, including articles written by professors at the Department of Computer Science at NTNU.

C. Data analysis methods

Results from interviews of professors was used to analyze and answer both research questions. Questionnaires were used to collect adequate data for the analysis to draw a proper conclusion to how SRSs affect the learning environment.

1) *Qualitative*: As the study is an exploratory case study, the analysis of the qualitative research was designed to provide input to the quantitative research conducted afterwards. The interviews were recorded and later transcribed.

2) *Quantitative*: The quantitative research was based around a questionnaire that was answered by 41 students. Utilizing visual aids proposed by the course material [7], the data was aggregated into a table because the table provides a structured overview of such data.

IV. FINDINGS

A. Literature

Literature were used to understand the subjects and prepare the interviews and questionnaires. One of the most insightful documents that was examined was "Læringsmiljøundersøkelsen" [2], stating that students prefer other learning methods than lecturing.

B. Interviews

The main focus of the interviews was to examine how lecturers experience the current learning environment in

lectures. Four lecturers with different backgrounds were interviewed.

For example, one of the lecturers mentioned that from their experience, even if they used the same setup and format, the participation varied from year to year, and that the students involvement was depending on the students themselves. Also, the lecturer mentioned that the traditional form of interaction in lectures, i.e. students raising their hands and asking questions might disappear with the use of SRS.

In addition, a professor with technological background had used a SRS called Sembly and was pleased by the feature that kept track of how the amount students that didn't follow the lecture. Another lecturer supported this by proposing that the threshold for admitting to not have understood things was very high, and that nobody really wanted to admit this, and that even if they wanted, the lecturer still hadn't found a good way for the students to do so.

On the other hand, the lecturer further mentioned that some implementations of SRS might increase workload on lecturers to an extent where some of them would prefer not using it. Also, Sembly makes it possible for students to upvote questions, which allows the lecturer to answer the most relevant question for the class.

C. Questionnaire

The main focus of the questionnaire was to examine how students experience the lectures.

Statement	Disagree	Neutral	Agree
I am comfortable asking questions during lectures.	70.7%	14.6%	14.7%
I prefer asking questions during the break or after the lecture, rather than during the lecture.	9.8%	2.4%	87.8%
The size of the lecture audience affect whether or not I am comfortable asking questions.	4.8%	4.9%	90.2%
I am comfortable asking the lecturer to re-explain topics I find unclear.	87.8%	2.4%	9.8%
I often have the same question as others during lectures.	9.7%	24.4%	65.9%
I feel that the students are responsible to interact with the lecturer.	7.3%	24.4%	68.3%
I prefer when the lecturer uses SRS	12.5%	22.5%	75%
A service that makes me anonymous would make it easier to ask questions during lectures.	12.2%	9.8%	78%

1) *Uncomfortable asking questions:* One of the main focuses was to analyze if the students was comfortable asking questions during the lectures, but 87.8% preferred asking questions during the break or after the lecture. Also, 90.2% said that the size of the lecture matters. This indicates that the students do have questions, but aren't comfortable asking them in classes with a large audience.

2) *Anonymous service as a support tool:* From the findings, 75% of students prefer that the lecturer is using a SRS during the lecture. Since most SRSs has the ability to make the users anonymous, it was important to follow up with a question asking whether or not a service that makes the student anonymous would make it easier to ask questions. A total of 78% agreed with this statement, which means that most students are in favor of using SRS during lectures.

3) *Other thoughts:* In addition to the statements, there was also comments saying that if the lecturer would start using a SRS, it would be preferable that the system do not require much time to setup or install. A web service, for instance, that require neither would be the most preferable choice.

V. DISCUSSION

Based on the findings presented in the previous section, the research team decided to discuss the impact of the findings. The data in the table in subsection IV-C confirms that the majority of students are not comfortable when asking questions during lectures with a big audience.

There are many reasons to be uncomfortable. For instance, thinking that the question is irrelevant or wrong because the time spent to answer this question is taken from everyone participating the lecture. Another reason as to why students are uncomfortable is that they don't want to admit that they don't understand something or lack knowledge as discovered in the interviews.

This is not necessarily a problem, but may become one if students are missing out on valuable knowledge because they are afraid of asking questions. Connected with the findings from "Læringsmiljøundersøkelsen", which shows that students doesn't view lectures as a good form of learning [2], this may be a part of the reason for this.

To improve the situation, SRS can be used during lectures. Based on the findings, majority of students prefer the lecturer using a SRS. The reasoning behind the interest may be that most SRSs provides a way for users

to be anonymous, which many of the students thought could make it easier to ask questions during lectures.

It is important to state that SRS must be fairly easy to implement, use and little time consuming when setup and installing. Also, as it was discovered from one of the lecturers during the interviews, using SRS might result in losing the traditionally form of interaction, which might not be desirable for some lecturers. Even if the system is properly implemented and eases the interaction between student and lecturer, it will increase the workload on lecturers. A lecturer mentioned a possible way to deal with this, by delegating SRS management to an assistant.

When using SRS, students become more comfortable to ask questions and furthermore ask more questions compared to when SRS is not used. It can therefore be seen, in regards to RQ1, that SRS systems increases the amount of communication between students and lecturers. In regards to RQ2, if the students are more active in the lecture, and the communication improves, the use of a SRS stimulates the learning environment. Making the students learn more, reduce the amount of students losing track, reduce the threshold for asking questions, and finally, provides a way to reset the human attention span. This may result in increased motivation, participation and interaction with the lecturer, positively affecting the learning environment.

The results from the similar studies described in sub-section II-A, found that using SRSs increases student engagement [1], aids learning [6], are enjoyable, and improves interaction and learning [5]. The main contribution of this paper is that students are uncomfortable asking questions in lectures with a big audience and that SRS could improve this and result in better interaction with the lecturer and a better learning environment.

VI. CONCLUSION

Many students doesn't view lectures as a good form of learning, due to being uncomfortable to interact with the lecturer. This research paper describes why SRSs can be a helpful tool to improve the interaction between lecturers and students in lectures, while also improving the learning environment. Specifically, the use of SRSs enables students to be anonymous asking questions, which mitigates the problem that students won't admit that they do not understand what is being taught. Furthermore, the use of SRS makes asking questions in lectures more comfortable and lowers the threshold for participating in the lectures. However, this comes at a cost, moving us further from the traditional form of

interaction in lectures. It also moves the lecturer further away from the original tasks while lecturing, but this issue may be mitigated by delegating SRS management to an assistant.

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B. Limitations of the research

It is important to know that the survey and interviews are geographically scoped to a set of students at a Norwegian University in Trondheim. A conclusion made from this research alone is not adequate to represent students from different countries or from different universities. The conclusion will be based on the students that participated in the study and the interviewed persons and further research will be necessary to broaden the scope of the conclusion.

C. Future ideas

In cooperation with this study, it would be interesting to extend this research study with another study that research the students' inner motivation and how they could stimulate their own learning environment.

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