

Effectiveness of Topic Specific Poll at the Start and End of online Class during COVID-19

Chuadhry Mujeeb Ahmed
mujeeb.ahmed@newcastle.ac.uk
Newcastle University
UK

Abstract

As with many other aspects of life, COVID-19 disrupted teaching and learning at all levels. Computer Science at the higher education level tends to be a practical and mathematical subject, therefore, it becomes difficult to keep students engaged and motivated through online teaching platforms. Moreover, it even becomes harder to get any feedback from the students due to a lack of physical interaction, and the hesitation of students in participating in online forums. In this paper, I would like to share the experience, results, and effectiveness of instant feedback through the topic-specific poll at the start and end of the class with the same type of questions. This practice gauged the effectiveness of the lesson plan, statistics on student understanding, and an opportunity to update future lessons. Furthermore, different levels of question design, student engagement, and poll design parameters are discussed.

Keywords: Teaching, Computer Science, COVID-19 academia, Teaching and Learning in Pandemic

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1 Introduction

The coronavirus (COVID-19) pandemic had impacted our lives in many ways. It is still a reality with strict rules on social interactions in several countries. One major disruption due to COVID was the one faced by the education sector[6], first in the form of complete lockdowns and then forcing

teachers and learners to engage online. It affected the primary, secondary, tertiary, and higher education alike as well as all the disciplines[4]. For the last couple of years teaching online has been the norm. Teaching online would have worked for certain disciplines but a common concern shared by the educators was the lack of engagement and interaction with students and hence missing that instant feedback one could get by gauging the overall atmosphere in an in-person class [1].

In this manuscript, I am sharing a technique that I used and gave me some insights into how much students are getting out of the lecture. The problem was that it was difficult to gauge how students were feeling, and how effective was the lecture, especially when students were not comfortable turning the videos ON and interacting with the lecturer. The idea that I used was, to use the topic-specific questions with Yes/No or True/False type questions before and after the class and see how much the response changed at the end of the lecture. The idea is to use the same questions at the start and the end of the lecture so we can see how much the students think they have improved in that specific topic. I will show some examples and what insights were obtained and used in future lectures.

2 Methodology

It was a large second-year class in a computer science program. Polling questions were chosen as a reasonable method to check the understanding of the class at the start and the end of a specific topic. On average 100 students participated in the poll questions. The design of the questions focused on the concepts-focused approach. One type of question was designed to see how the understanding of students on a specific topic has improved due to the lecture and the second type of question was designed to be discussed in a smaller group-based discussion. The video conferencing application's poll option is used to create and conduct the poll.

The classroom questions with the immediate response using clickers have been studied [8] and it is found that the clickers improve the learning of the students. Another recent study has shown the use of audience response systems and their impact on the engagement of the learners [3]. However, these previous studies were conducted in in-person teaching scenarios and pre-COVID times. In this article, I am sharing my experience while teaching online and running these polls

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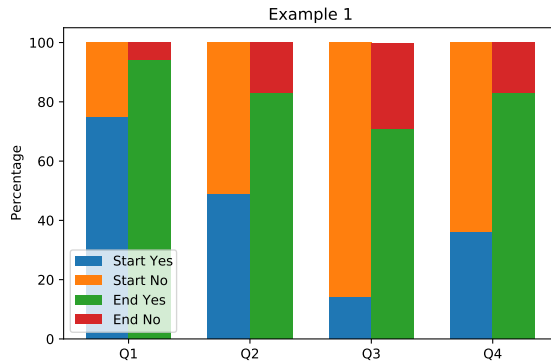


Figure 1. An example of the Type 1 of question asked at the start and end of the class and student responses on percentages. Q1: Do you know what is the idea of an interrupt? Q2: Do you know the difference between a software interrupt and a hardware interrupt? Q3: Do you know the difference between an interrupt and a trap? Q4: Do you know how interrupts are handled?

at the start and end of class to gauge student engagement and the effectiveness of lecture delivery. The following two examples are shared based on two types of settings, one in a classroom setup and the second break out room discussions at one-third of the course.

2.1 Type 1 Classroom Session

The first example will describe a poll conducted at the beginning of the class and the end of the class using the same questions. Note that these are yes/no questions specific to the topic being discussed in the lecture. These types of questions were used each time a new topic was to be delivered to understand where did students rank their knowledge before the lecture and where they rate their knowledge at the end of the lecture. Remember that the students are in their second year so sometimes they might have seen the topic elsewhere in their courses. As we will see in example 2, the questions asked there have different tones and settings. In the following, we state the four questions being asked in this example.

- Q1: Do you know what is the idea of an interrupt?
- Q2: Do you know the difference between a software interrupt and a hardware interrupt?
- Q3: Do you know the difference between an interrupt and a trap?
- Q4: Do you know how interrupts are handled?

The intention behind these questions was that they not only capture the knowledge of the students but also capture the depth of the knowledge. For example, I had expected that quite a number of people would say yes to the Q1 and I have designed the later question to see how much they know about this topic. I had anticipated that for RQ 2–4,

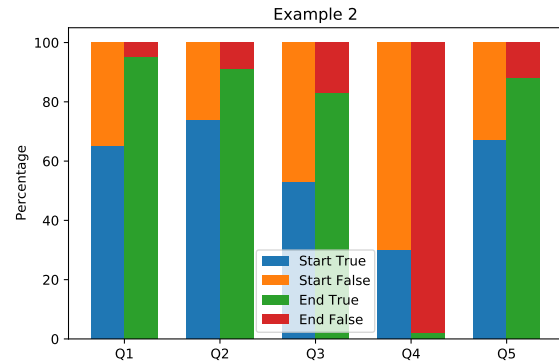


Figure 2. An example of Type 2 of questions. These were intended to assess students understanding when one-third of the course have been covered. Q1: Maskable interrupts can be disabled by the CPU? Q2: Process Control Block (PCB) lives in Kernel's address space? Q3: Threads in a multi-threaded process, share same address space with the process? Q4: Applications are OS specific because of the trade secrets of OS vendors? Q5: Monolithic OS model means that the entire kernel lives in a single address space?

the knowledge of students will go down and I had prepared the content accordingly. Once the poll had been taken at the start of the class, my anticipation proved to be true as shown in Figure 1. From Figure 1 it is clear that the student assessment of their knowledge has increased if we look at the increase in the percentage saying they understood the concepts being discussed. This gave me an indication that the content of the lecture was relevant and also was delivered well. Another advantage of taking this poll at the start of the class was knowing which aspects need emphasis in the same lecture and at the end of the lecture, it shows there are still some students who need to revisit this topic. However, if the number of students at the end of the class reported they did not understand the topic, it meant bringing new examples and rethink on the content of the lecture.

2.2 Type 2 Peer Discussion Session

The second example is the type of questions that were more focused and would test the knowledge that has been acquired over the weeks. This type of poll is conducted when around one-third of the course contents have been covered. Moreover, these were made part of peer discussions in small groups and followed by the whole class discussion. A similar pattern has been followed, i.e., one run of the poll at the start of the session and one run towards the end. A key difference between these types of questions as compared to the example1 type of questions is that these are designed to assess the knowledge as compared to prior experience and see how well the lecture makes the point. Examples of questions from one such session are stated in the following:

- Q1: Maskable interrupts can be disabled by the CPU?
- Q2: Process Control Block (PCB) lives in Kernel's address space?
- Q3: Threads in a multi-threaded process, share the same address space with the process?
- Q4: Applications are OS-specific because of the trade secrets of OS vendors?
- Q5: Monolithic OS model means that the entire kernel lives in a single address space?

Figure 2 shows the data for such a poll. We can see the answers to the above questions in True/False form. We see that the percentage of right answers increases toward the end of the session.

3 Implications

There are two examples shown on the proposed idea of using the short polls at the start and end of the class using the same set of questions.

3.1 Type 1 Poll

Example 1 type poll helps the instructor to understand the prior knowledge of the students and based on the result two actions are taken.

1. Adapt the lecture based on the answers submitted at the start of the session. This includes spending more time on the topics where needed and emphasizing the sections which need help as indicated by a lower score.
2. Towards the end of the session it helps in understanding how effective the teaching is and how much the student benefit. At the same time, if there is still confusion about certain topics, it provides information on what to spend time on next time while a recap of the current lecture.

3.2 Type 2 Poll

Example 2 type poll helps the lecturer to understand how effective the teaching has been. This is more focused on the fact and information, mostly focusing on remembering and analyzing categories of Bloom's taxonomy [7]. This is carried out at an important stage of the class when several topics have been concluded and new topics are about to begin. At this point, it informs an instructor where are the confusions. For example, in Figure 2 for Q3, at the start of the session, the division is almost 50% which is as good as the random guessing. This kind of result indicates that these topics are tricky and need revisiting either with new content or new examples, to help the students.

4 Conclusions and Future Work

Using polls during the class and discussion sessions we conclude that these proved to be very helpful to provide quick feedback and engagement with the large class. The examples show the questions and intentions to design those as such.

The outcome of these polls has serious implications in terms of adapting the content and style of the class to the needs of the students. Since these polls do not take a lot of time to run, we hope to continue these while we are returning to campuses for in-person teaching. In the future, I hope to explore this approach further while teaching in in-person sessions and compare the effectiveness in online vs in-person scenarios. I would like to update the design of the questions to be asked using some higher cognitive categories from Bloom's taxonomy and see how well these polls perform with that updated questions [2, 5].

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