GIFTS: An example implementation of web-based, in-class polling as an active learning and formative assessment tool

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As an active learning technique, delivering questions directly to the internet-enabled devices of students during class is an established and effective practice [1]-[4]. This type of low-stakes testing promotes long-term retention of concepts and can help students and instructors identify gaps in understanding in advance of summative assessments [5]. Over the span of eight years, the authors of this GIFTS paper have used web-based polling in lecture courses ranging from 100-level through graduate-level, both online and in-person (~30-60 students). Implementations have ranged from ungraded occasional use in service of specific activities to full integration with day-to-day instruction and graded participation. Platforms used include PointSolutions, LearningCatalytics, Kahoot! and MentiMeter. We draw on these varied experiences to offer broader lessons learned and outline an example implementation for engineering courses.

The authors have used web-based polling to reinforce concepts, rather than problem solving methods. By providing options that represent common misunderstandings, multiple choice, true/false, and matching questions are effective tools for probing conceptual knowledge. Such questions can be quickly administered as part of class, creating minimal disruption to the flow of lecture or other instruction. These conceptual questions can also play a complementary role in courses whose homework sets are predominantly problem-solving oriented.

The authors have found success when polling is administered with a predictable rhythm, such as starting class each day with a question related to a recently learned concept. This practice incentivizes on-time attendance, and our students have reported that it serves as both a reminder of recent topics and as a familiar entry point into the day's lecture. At least once during class, we disrupt the normal flow of class by delivering a question on a new concept or as a challenge to extend a previously learned one. These are well-suited to active learning techniques, such as think-pair-share [6]. The change-of-pace this provides is by far the most appreciated aspect of web-based polling in our students' course evaluations. Ending class with a question assessing a concept introduced that day is most useful in online courses where it encourages students to stay to the end of class, while also fostering group cohesion.

If graded, students' answers are evaluated by response rate, not correctness. Being best suited for in-class active learning and formative assessments, questions are often designed for a significant portion of students to give wrong answers - this should not be punished. In our experience, a good system is to give four participation grades per semester, each covering a quarter of the term, with one unexcused absence permitted per quarter. In courses where we have tracked the data, classes where participation was graded based on question response rate averaged 91% attendance. Data for courses in which there was no grade attached were not as well tracked, but we can say with certainty that attendance was substantially below 91%.

References

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