Improving Student Learning through Classroom Engagement

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Abstract

Criminal Justice Database Operations is offered each semester during the year as part of the BS in Criminal Justice and Law Enforcement Technology curriculum in the Security Systems and Law Enforcement Technology Department. The course introduces students to Database Operations which is often taught in Computer Science curriculums. Due to the technical nature of the course material, some students can be overwhelmed. Based on the results from Student Evaluations of the course in the Fall Semester 2017, 81% of students who responded strongly agreed that the Instructor encouraged student participation. In the Fall Semester of 2016, 78% of students in one section strongly agreed and, in another section, 84% strongly agreed. While these results are favorable, it was evident that some students were reluctant to respond to questions asked in class and it is hard to tell whether it was due to fear of failure or some other force.

Key Words:

Classroom Response Technology, Top Hat, measuring effectiveness, assessment, and evaluation of learning.

1. Background

There has been research related to integrating technology into the pedagogy of difficult subjects like Integral Calculus [1]. Other research gathered student's opinions about the implementation of Classroom Response Systems in university lectures [2]. The findings of the Procedia research showed that students gave an overall positive evaluation of the Classroom Response System (CRS). It also identified CRS's as enhancers of attention, participation, classroom dynamics, and learning. In 2016, clickers were determined to be a moderate indicator of course performance [3].

Prior studies have compared assessment methods as predictors of student learning. Cumulative assessments assess student learning on the material from the first day of class. Students who take cumulative assessments would outperform roughly 67% of the students who do not take the assessments. [6] Other studies have examined the impact of effective communication, achievement sharing and positive classroom environments on learning performance. The 2014 study found that when teachers create a sense of community, respond to students and foster positive relationships, students are more engaged and enthusiastic about learning and tend to perform better academically. [7]

Other research showed that traditional paper and pencil tests are the most common method used to assess learning in higher education. The results indicated that teachers in colleges of science and engineering use different methods to assess learning. Teachers use these assessment methods despite the grading systems used at their

institutions. For the purposes of this study, the existing grading system is the system used as it is accepted generally within the institution and by the regulating bodies [8].

The impact of different student response systems is explored in a human biology course using different student response systems in three successive spring semesters. Analysis of student assessment data in the lecture portion of the course indicated a statistically significant impact of the use of student response systems by students on their grades [9]. For the purposes of this study, the success of the Classroom Response Technology (CRT) implementation is assessed by both Qualitative and Quantitative methods.

Multiple measures of teaching effectiveness including student surveys as predictors of student learning were studied in relationship to different elements of a teacher evaluation model and its usefulness in predicting student learning. It was determined that student perception surveys provide a reliable indicator of the learning environment and give voice to the intended beneficiaries of instruction. Identifying predictors from teacher observations and student surveys that lead to student growth will help in designing professional development to improve the quality of teaching. [10]

2. Assessment Instruments for this study

The class studied for this research is an undergraduate Criminal Justice Database Operations class which introduces students to technical concepts often taught in Computer Science curriculums. Due to the technical nature of the course material, some students can be overwhelmed. There are both lecture and lab components to the course and classroom response technology was introduced into the lecture component towards

the goal of improving student learning through classroom engagement in the Fall semester of 2018. Top Hat was made available to all 24 students in the class via school computers in a Lab setting. Students accessed Top Hat by logging on via web browser to the Top Hat website. The Qualitative method for this study used data from Student Surveys that are taken at the end of each semester. The existing survey has a question that asks about whether or not the Instructor encouraged student participation. Prior to the implementation, the results from the surveys taken indicated that on average, about 80% of students strongly agreed. The expectation is that this metric should increase after the CRT implementation. Additional questions could also be added to the existing survey to gather additional qualitative data. Quantitative analysis was conducted based on the average student grade results before and after the implementation. If the CRT has the expected impact, the average results should improve over time.

3. Learning objectives and student grades

The goal of the course studied is to provide students with the practical skills needed to develop, manage, and operate a criminal justice database. The lab portion of the class provides hands-on training using Microsoft Access, Excel, Word and PowerPoint. 10% of student's final grade is based on classroom participation. Since every student in the classes studied answered every question asked in class through Top Hat, every student received the full 10% for classroom participation.

4. Analysis of current Classroom Response applications used in education

There are currently three predominant Classroom Response System applications used in education. Kahoot is primarily used in elementary and intermediate schools and

is not ideal for higher education applications due to its lack of short response answer integration. Socrative allows for multiple choice and true/false questions but it does not allow for short response answers nor does it provide anonymous analytic metrics. When results are displayed, the users name is displayed along with whether they answered correctly. The Top Hat CRS has been available since 2009 and is established as a leader in the CRS space. It has a robust User Interface and its anonymous analytical breakdown of each question makes it a prime candidate for our application.

In addition to the analysis done on Kahoot, Socrative and the Top Hat application, an inquiry was made to determine whether there is any CRS functionality available in Blackboard which is used widely throughout the State University System. It was determined there is a survey function in Blackboard that allows students to answer questions in an anonymous mode. It was decided to use the survey function to try a proof of concept in the Fall Semester 2018 to determine if the element of anonymity enhanced students learning. When asked verbally about their perception of the utilization of the survey functions during lectures in CRJ307, the students responded positively. There were some distinct challenges associated with the using the Survey function in Blackboard including: 1) In order to share results of the surveys with the class, the professor has to hide other columns to avoid divulging other grades. 2) All questions in a given survey have to be presented at once and 3) Survey results can only be presented in numeric format. The ability to show results graphically is easier for most students to process.

5. Deployment Challenges

There were several deployment challenges faced leading up to the Phase I pilot. Those challenges included obtaining Legal, IT and Institutional Review Board (IRB) approval. It took several iterations between the college's Legal liaison and representatives from the software company to address all the legal concerns. The IT approval was not as time consuming since the Top Hat application can be accessed from their website and does not require software to be installed on school computers. Since this research involved human subjects and anonymous student survey results, the research was deemed to be exempt from continuing IRB review.

Since the research related to the pilot was not going to be conducted until after the end of the semester, IRB approval was not a primary concern. As a result of delays in getting the licensing finalized, the initial pilot did not begin until October of 2018. This was less than ideal but the focus was placed on getting as much usage as possible for the remainder of the semester. Some of the other delays were due to the cost of the software being covered by a grant. Top Hat seemed to be more accustomed to having students pay for the software so the registration process took a couple of iterations.

6. Qualitative Measures

Qualitative measures of the impact of Classroom Response Technology (CRT) is primarily determined based on the results of Student Class Surveys. As mentioned previously, based on the results from Student Evaluations of the course in the Fall Semester 2017, 81% of students who responded strongly agreed that the Instructor encouraged student participation. In the Fall Semester of 2016, 78% of students in one

section strongly agreed and in another section, 84% strongly agreed. This was prior to any CRS deployment.

In the Spring semester of 2018 with the introduction of the survey function in Blackboard during the lecture of Criminal Justice Database Operations, 88% of students responded that they strongly agreed that the instructor encouraged student participation. 4% of students responded that they agree and 8% responded that they neither agree nor disagree **(Fig 1).** In their comments on the learning process, one student stated that "I liked doing the in class quizzes/surveys. I think if there were more of those, it would help the class be more interesting and make people want to participate more".

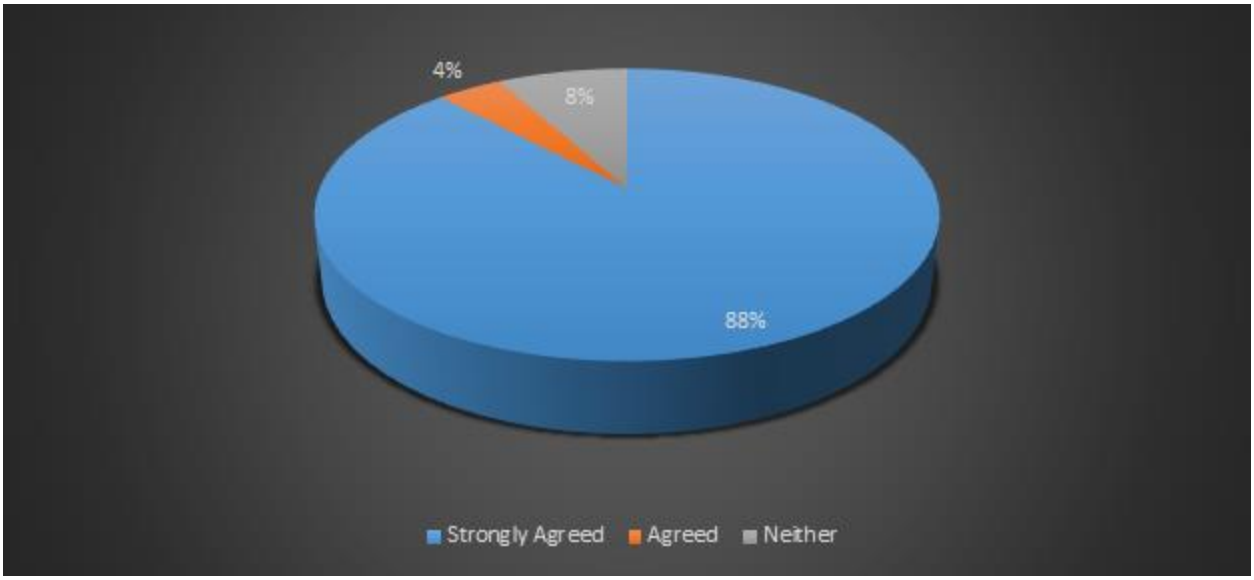

Fig 1: Instructor Encouraged Student Participation (Spring 2018 with Black Board surveys)

The Phase I Pilot of the Top Hat application began in the Fall Semester of 2018. The primary goal of introducing Classroom Response Technology into the Criminal Justice Database Operations course is to improve student learning through increased

participation. The enhanced course will impact student engagement and learning by requiring all students to answer all of the questions asked. By providing students with the opportunity to answer questions very similar to those that they will have to answer on exams in an anonymous mode, they will be able to focus on their personal mastery of the material without the distraction of looking bad to the professor or their peers. Overtime, the expectation is that with the elimination of this distraction, their ability to focus on their personal mastery of the material will flourish.

There was one section taught online and another taught in the classroom where Top Hat was made available to all of the students. The lecture was delivered in a classroom where all students had access to a computer and they all accessed Top Hat by logging on through a website on the Top Hat Website. 81% of the students who responded strongly agreed that the instructor encouraged student participation. 12% agreed and 6% neither agreed or disagreed that the instructor encouraged student participation. **(Fig 2)** In their comments on the learning process, one student stated that "Top Hat was a great tool to use. Perhaps more time in class devoted to it may be more beneficial." 81% of students who took the online section of the course where Top Hat was not implemented strongly agreed that the instructor encouraged student participation and 19% agreed. **(Fig 3)**

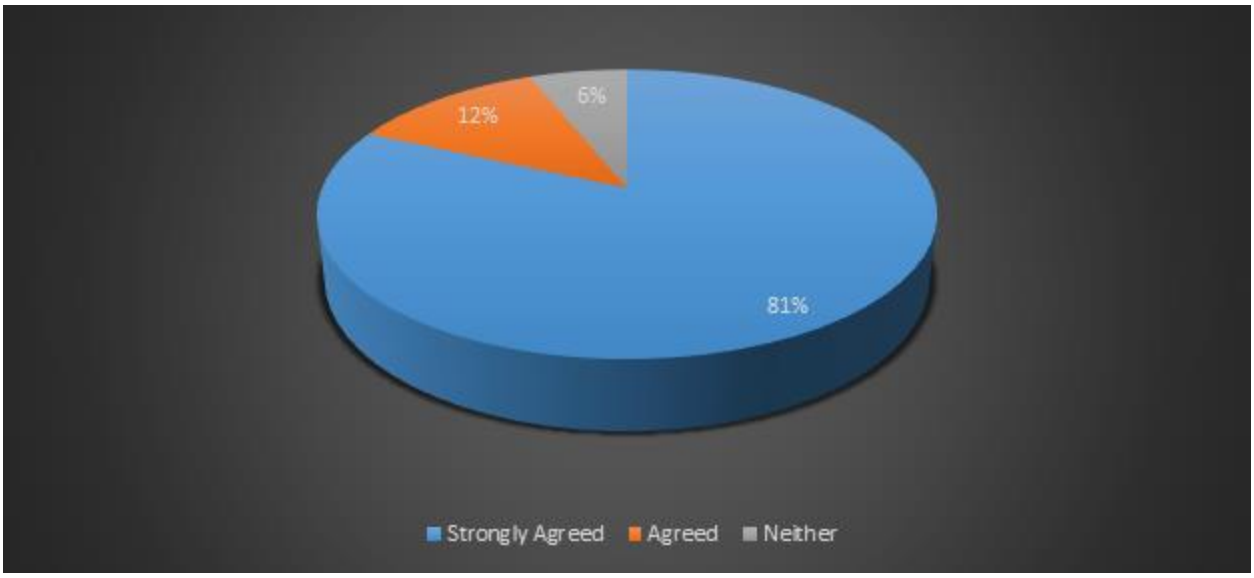

Fig 2: Instructor Encouraged Student Participation (Fall 2018 with Top Hat)

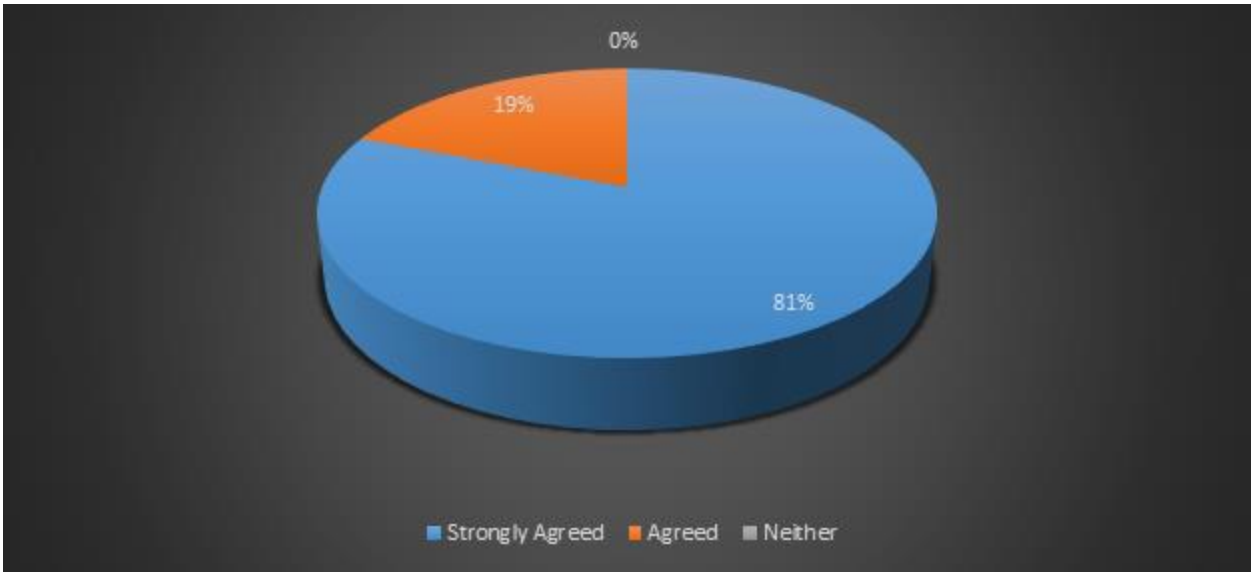

Fig 3: Instructor Encouraged Student Participation (Fall 2018 without Top Hat)

One of the primary expectations of this research was that if students participated in class more, their learning would increase and this would be reflected in their final grades. An analysis of the class average grades before and during the Phase I pilot did not reflect an increase in student's average grades. **(Fig 4)**

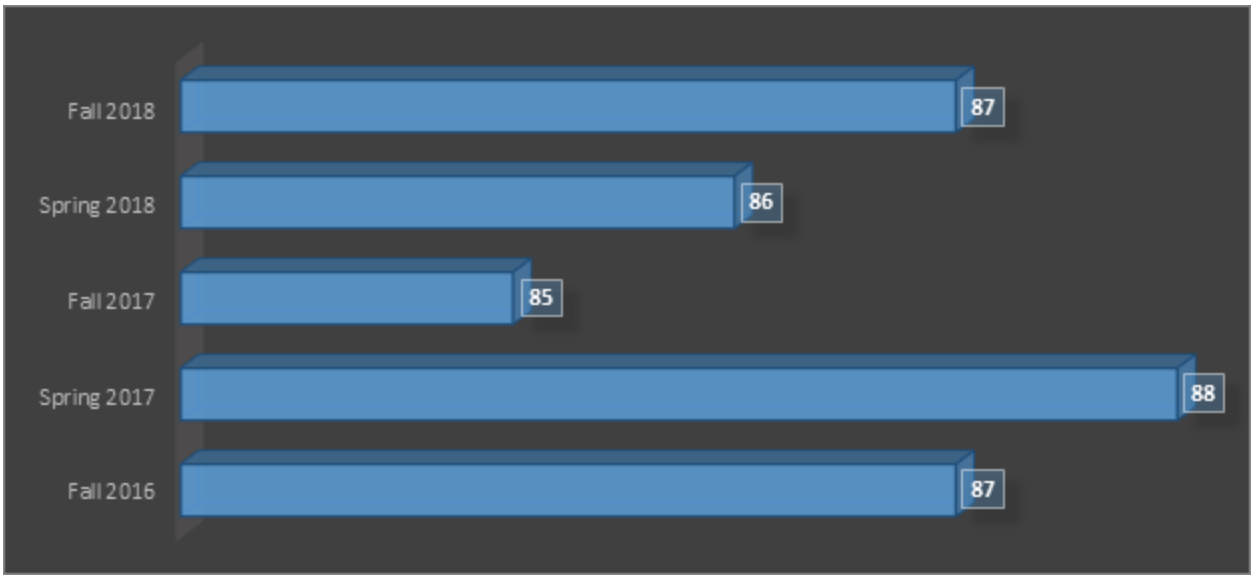

Fig 4: Average Grades (In Percent)

7. Summary of Key Findings and Future Research

Since the deployment, there have not been any significant quantitative impact achieved by using Top Hat. Student participation in the end of semester surveys is not mandatory. Even though students were strongly encouraged to participate. The participation during the Phase I Pilot ranged from 55% to 70% and only 2 of the students who participated made comments specifically related to Top and the Blackboard Surveys. Both of them spoke favorably about the tools being used. While the average grades did not improve during the Phase I Pilot, students did respond favorably when asked if they felt that Top Hat added value at the end of the semester. While the quantitative results did not improve, it can be concluded that the overall student participation did improve.

The question becomes: is student perception in a classroom with the introduction of a Classroom Response System a reliable enough indicator of learning even if a quantitative impact is not achieved? From the perspective of the researcher, the

qualitative improvement associated with the elimination of the awkward silence waiting for someone to volunteer is significant.

From the beginning Top Hat was intended to be used as a supplement to Black Board rather than a replacement. The Phase II Pilot was completed during the Spring Semester of 2019. In Phase II, there was a continued emphasis on using Top Hat to allow all students to respond to every preplanned question. The lecture classroom was much larger and there were no computers, so students had the option of using their own laptops or their smartphones. An additional piece of functionality that was also tested was taking attendance. In Phase II, the accuracy of the Top Hat Attendance feature is analyzed with comparisons of manual attendance taking methods.

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