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Using Socrative to facilitate problem-based learning in large undergraduate courses

Bio data

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Abstract

This study investigates students' perspectives on a student response system (SRS), Socrative, in a sizeable university-level course. The purpose of utilizing Socrative was to enhance participation and promote collaboration among students when they interact with one another to discuss their knowledge and critical thinking of the content of the course. Participants of the study were 82 students enrolled in an American Culture and Society course at a university in Korea. Web-based questionnaires and classroom observations were employed to examine students' perceptions of Socrative use and their engagement in the related PBL activities. Overall, the students' evaluation of the effectiveness of Socrative in a large enrollment class was more positive than negative. The students believed that the use of Socrative increased their interests and engagement, improved critical thinking skills and conceptual understanding of the course contents, promoted interactivity and participation, and allowed them to get motivated. The statistical analysis results showed little gender difference for all the items except for interactivity.

Conference paper

SRS Technology-Supported PBL

Although student response systems using clickers have been around since the 1960s, they have only recently been given attention as tools to promote learning, mainly focusing on the active learning approach. Grounded in active learning, constructive pedagogy claims that students learn more successfully when they are expected to actively build their understanding of course concepts (Anderson, 1987). It is thus teachers' responsibility that creates learning environments where students can practice applying and discussing course concepts during class hours.

Moreover, SRS is viewed as mobile technology that enhances problem-based learning (PBL) in extensive courses (Hoekstra, 2008). PBL has historical origins in medical education but has been used in various discipline-related academic studies, including architecture, business, engineering, law, and science in universities (Savery, 2015). PBL is defined as an instructional approach intended to facilitate prior knowledge activation, critical analysis of arguments, and promote a deep understanding of the scientific perspective (Hmelo-Silver, 2004; Loyens et al., Kirschner, & Paas, 2012). PBL is based on learning the principles of constructivism and emphasizes the learner's active participation

in the learning process (Savery & Duffy, 1995). The PBL pedagogy shares some standard features with those highlighted by utilizing SRSs in the classroom.

Unlike traditional lecture-style classes, this approach motivates students to learn through involvement in a real problem. Research and theory in psychology suggest that by having students learn through the experience of solving problems, they can acquire content and thinking skills (Hmelo-Silver, 2004). Notably, the PBL approach stresses that social interaction is essential to knowledge construction, acquisition, and application (Evensen & Hmelo, 2000). The social negotiation of meaning lies at the core of the knowledge construction process. PBL proponents suggest that instructional designers create learning environments where the teacher provides guidance and support, and the learner's knowledge construction is facilitated (Hmelo-Silver, 2004; Tseng et al., 2012).

Thus, the effectiveness of content learning can be maximized when learners are actively engaged in social interaction, such as group activities and interpersonal communication. Hoekstra (2008) emphasizes that the PBL approach stimulates active student involvement during the learning process by placing students into small groups where they work to apply course concepts. Numerous studies have demonstrated that group discussions encourage students to explore specific topics, process material more deeply, and create meaning in the material (Kirschner et al., 2009; Prince, 2004).

At the same time, the very aspects of PBL that allow for a productive learning experience make it more challenging to be implemented in a large classroom. The common concerns that discourage instructors from implementing at the undergraduate level include the nontraditional teacher role, the atypical student role, and potentially challenging group interactions (Aarnio et al., 2014). Students may feel uncomfortable when transitioning from passive roles in the traditional-lecture classroom to the leaders of their self-directed learning experiences. Students may struggle while attempting to think critically to solve group-worthy problems. Students may also have trouble working in groups if their prior academic experiences were individual and not collaborative. These concerns over PBL may be highly alleviated by relying on SRS technology, Socrative, which has been shown to create a comfortable environment that allows all students to participate anonymously (Benson et al., 2016; Stowell et al., 2010).

Informed by previous research, this study utilized SRS technology to allow PBL to be implemented as a supplement to regular, didactic coursework. In this vein, this study contributes by investigating students' perceptions of the use of Socrative in the PBL enacted classroom environment. By doing so, this study attempts to make a significant bridge between SRS technology and the PBL approach. Very few studies attempted to explore SRS technology connected with PBL enactment in higher education contexts. The significance of the present study is that it expands on the scope of some notable work carried out previously that has focused on SRS technology.

Methods

This study is part of a larger study that investigated an alternative pedagogical approach to large classes using Socrative. Socrative-mediated PBL was implemented in the American Culture and Modern Society class offered by the Department of Language and Literature. The undergraduate content course was an elective introductory course of which the target audience was not limited to the Department of Language and Literature. Students typically did not have accounts to use online systems; when the teacher was logged into the system, they entered the teacher's online classroom with her code. When students provide answers on Socrative through their smartphones, the answers are instantly uploaded to the teacher's screen on PC. The screen is shared through the overhead projector to the whole class as the students engage in the activity so everyone can check the entire class's progress. Relying on the PBL approach, this class includes a small group discussion which is followed by a topic-related movie watching.

Socrative was used as a formative assessment tool to review content through pre-made quizzes. Students were requested to choose the preferred answers by using Socrative. Before dealing with the main topic for the day, review quizzes were given first. During the next 10 minutes, a background check of the main topic for the day was provided. Subsequently, the actual lecture for the day was presented, which was followed by the related movie watching. After the movie watching, topic-related issues were given for student discussions. Students were given five minutes to think over the issues individually and participated in group discussions for 15 minutes. Students were expected to post the common results of discussions on a Socrative platform. Each group's responses were shared in Excel on the data projector screen for a whole class discussion. The class discussion was allotted 15 minutes, and during the discussion, equal participation was encouraged by the instructor. The instructor spent the remaining time providing feedback and finished the lecture by summarizing the essential points.

Data Collection

A mixed-method design was used, combining a background information survey and end-of-semester questionnaires, with classroom observation. At the beginning of the semester, a web-based background survey was administered. The primary purpose of the background information survey was to find out the students' level of education, their major, gender, learning style preferences, and their previous experiences with any other course having an SRS component. Regarding learning style preferences, Reid (1998)'s self-reporting questionnaire was used with modifications. According to Reid's classification, the students who show a group learning style learn more easily when they study with others and complete learning tasks through group interactions. In contrast, the students who have individual learning preferences learn best when they work alone and make better progress in self-study. These two learning styles show apparent differences in the learning process— group interaction vs. self-study. The use of Socrative in this study is highly associated with group discussions, and these two learning styles were selected as crucial individual difference variables. At the end of the semester, the online survey created in Google Docs was distributed to quantitatively investigate the students' perspectives on the classroom activities conducted through Socrative and preferences in using Socrative. The survey questions were drawn and appropriately adapted from previous studies (Cardoso, 2011; Dervan, 2014; Guarascio et al., 2017).

Data Analysis

The Statistical Package for the Social Science (SPSS) 17 was used to carry out a t-test and Analysis of Variance (ANOVA). The alpha level for all statistical analyses was set at 0.05. To compare the mean scores between the female and the male group, an independent sample t-test was performed. An independent sample t-test was also used to measure differences between the group of the individual learning style and the group of group learning styles concerning the items of interests, critical thinking, engagement, conceptual understanding, interactivity, participation, and motivation. A one-way ANOVA was carried out to analyze mean differences among three disciplines regarding the use of Socrative in the large class. Finally, open-ended responses were analyzed qualitatively by the researcher.

Results

First, altering classroom dynamics by enhancing students' participation and discussions with Socrative use plays certain roles in male and female students' learning. Regarding a research question of gender difference in the use of Socrative, both male and female students felt positive about the items of interests, critical thinking, engagement, interactivity, conceptual understanding, active participation, and motivation. The p-values from the t-test provided little evidence of the gender gap associated with using SRS

technology in terms of interests, critical thinking, engagement, and conceptual understanding. Interestingly as for interactivity between peers and a teacher, there was a significant difference between female and male students. Whereas the PPT lectures systematically presented information about American culture in a neutral and impersonal manner, the short questions from Socrative situated the cultural knowledge of American society in a specific personalized context.

Second, statistical analysis showed little difference between students of individual learning styles and group learning styles in terms of interests, critical thinking, engagement, conceptual understanding, and interactivity. As for the items of participation and learner motivation, in contrast, the mean of student perception was higher in students of group learning style ($M=4.33$, $M=4.0$) and significantly different between groups ($F=1.473$, $p<.05$; $F=2.055$, $p<.05$). This implies that the use of Socrative goes better with students who show a preference for group learning to keep them motivated and increase the degree of participation. It is, therefore, reasonable to raise the instructor's awareness of the different learning styles of class members in advance.

Third, the one-way ANOVA results showed no significant differences in the mean values of three different disciplines at .05 level. Overall, the students from three different disciplines showed positive responses. When asked whether they would recommend further use of Socrative in future classes, they also responded positively.

Finally, the main strengths that the students mentioned are related to shared opinions and thoughts and thus co-constructed knowledge grounded in intersubjectivity. The findings show that the students considered the ability to share their opinion with the whole class to be the strongest aspect of using Socrative in a big classroom. For most students, using Socrative made the learning environment feel more cooperative in a lecture class. Through Socrative-mediated group discussions, students helped each other by evaluating each other's reasoning and catching each other's way of thought. As for the weaknesses, most of them were associated with technical difficulties, not classroom usage. With students being so accustomed to online applications, there were few comments in a survey related to software usage difficulties.

Implications

Based on the findings, the following suggestions are made for using Socrative in a large content-based class. First, in using Socrative, teachers should provide students opportunities to explore and internalize learning content and related issues by their views and thoughts. At the same time, it is essential to keep in mind that students are interested in sharing peer responses. Second, educators and practitioners must utilize appropriate pedagogical approaches incorporated with Socrative use. A well-designed pedagogical strategy, including a sense of one's learning goals and how to achieve these goals utilizing Socrative help, is of great importance. Third, using Socrative brings up new problems and challenges to consider—that is, how to deal with student resistance to increased learner accountability and connect Socrative activities with student grades. Accordingly, it is a crucial responsibility of the instructor to make sure that students keep on the right track of Socrative-mediated activities.

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