Flipped Classroom Research Article Analysis

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Introduction

The research article analyzed for this paper, “Analysis of Learning Achievement and Teacher-Student Interactions in Flipped and Conventional Classrooms” by Jerry Chih-Yuan Sun and Yu-Ting Wu, provided several research components to review and consider. The study was quasi-experimental since the participant groups were not randomly allocated by the researchers, but rather students were allowed to select which class (flipped or traditional) they wanted to take. Quantitative methods include a pre- and post-course achievement test, as well as bi-weekly tests, and scores were compared between the experimental and control groups. The study was qualitative in that the instructor, TAs and learners participated in several surveys and interviews before and after the course regarding teacher-student interactions.

Per Sun and Wu, the study addresses two important needs: 1) use of technology in the flipped classroom model to enhance interaction and achievement and 2) lack of research on teacher-student interactions in the flipped classroom environment. (2016, pg 81) This study aimed to investigate the possible differences in learning achievement and teacher-student interactions between a flipped classroom model and a conventional classroom model. Both classrooms integrated the use of Open Courseware (OCW) to view lectures at home as part of the weekly assignments. Flipped classroom strategies demonstrate a constructivist learning theory and allow students to “gain a measure of control over [the lectures]” as a resource to “access and use, rather than an imposed experience [to]...sit through…” (Reiser and Dempsey, 2018, pg 65) The prediction was that the students in the flipped classroom would show a higher learning achievement, and that their qualitative reviews would find a higher degree of satisfaction with teacher-student interactions.
The objectives of this study were clearly stated; “because the flipped classroom incorporates teaching strategies based on peer–peer and teacher–student interactions, the inclusion of course activities can elevate students’ metacognition mechanisms” (Sun and Wu, 2016, P. 81). Moreover they “hypothesized that the flipped classroom model would substantially enhance the learning achievement and teacher–student interactions” (Sun & Wu, 2016, P. 81).

“In sum, the teaching model used in the experimental group was the integration of OCW and a flipped classroom while that in the control group was using OCW integrated with a conventional classroom (the learning progress was self-paced)” (Sun & Wu, 2016, P. 86). Also, the researchers expressed a positive bias toward the flipped classroom model. They believed that their study would show that this method provides students with a better foundation for testing well in a general physics course. The researchers made a convincing case that a research hypothesis was important to the study.

**Research Procedures (Methods)**

As mentioned in the introduction, the study used a quasi-experimental design, in addition to qualitative surveys. The participants completed the same course materials (including the OCW) and met biweekly for reviews and tests. The flipped classroom group participated in weekly collaborative learning activities, while the conventional classroom predominantly used self-study at their own pace. (Sun and Wu, pg 85-86) The students selected their preferred teaching method (e.g. flipped or conventional) and registration occurred based on the order sign-ups were received. Males in computer science, engineering or science represented the majority of participants and the sample population does not include a large number of females. The flipped classroom was organized into groups based on their prior knowledge (i.e. prior test results) to support the “collaborative learning” activity plans for this group. In addition, the
flipped classroom groups and members received awards based on the performance of their groups. The methods used in the conventional classroom groups included the OCW weekly reviews and completion of assignments at home. Both classroom groups participated in the biweekly review and supplementary sessions. (Sun and Wu, 2016, pg 89)

However, since 1) selection of participants was not truly random; 2) significantly fewer females participated in the program than males (41 to 140 respectively), and 3) the participant sample encompasses science related majors, the study results may only apply within similar demographic groups.

Research Results

The study employed various appropriate statistical techniques. To compare quantitative differences between the groups on pre and post tests, they used SPSS for data entry and analysis, and conducted a t-test and a one-way ANCOVA. To measure teacher-student interaction, the study adapted a known survey instrument and used a 6-point Likert scale. Several other statistical techniques were used as well to determine the appropriateness of the applied analytics to the data set.

For the quantitative portion of the study, the researchers determined that the mean in learning achievement between the learners in each classroom were significantly different and higher in the flipped classroom. For the qualitative portion of the study, no significant difference in teacher-student interactions existed, but both teaching models were higher than average.

Discussion of Results

As the researchers had hypothesized, their quantitative analysis performed through pre-course and post-course testing showed that the flipped classroom students scored
“significantly higher” compared to the standard classroom students. The mean for the flipped classroom was 69.09 and the mean for the standard classroom was 62.58. To the authors of this paper, this does not sound like a very large difference in means. It may be worth pointing out that “significant” in reference to statistical analyses is different than the common definition of significant, meaning important or worthy of attention. “Significant” in statistics means that a relationship between two or more variables is caused by something other than random chance. We do not know what mean scores would have meant that there was no significant statistical difference.

The researchers provided reasonable explanations of their findings. The expected difference in learning achievement was statistically significant and the results proved this part of their hypothesis to be correct. However, their study did not find a significant difference between groups where it came to teacher-student interaction. The researchers suggested that this may be due to the fact that both study groups tended to rely heavily on their peers and the TA’s to answer any questions or misconceptions they had, rather than relying on the professor. Also, both groups found the teacher-student interactions to be very favorable, which the researchers concluded was likely due to the course design where both groups had equal access to speak to the instructor and the TA.

The researchers recommend using the flipped classroom model with the following attributes:

1. sufficient teaching resources
2. integration of flipped classroom and OCW
3. progressive design of distance learning courses
4. in-class group activities with clear instruction
The researchers also suggest using portfolios, multimedia learning management systems and other game-based learning activities to enhance teacher-student interactions. (Sun and Wu, 2016, pg 95)

**Summary**

This study provides a detailed review of conducting research using two teaching models and how to organize the experimental and control groups. The study also addresses specific challenges that occur within the flipped classroom environment, such as effective collaborative learning activities. Finally, the study utilizes both quantitative and qualitative methods to gather data to support the results.

Some recommendations for further research include a more balanced study on the usefulness of the flipped design with groups taking other types of courses, and with a better balance of female/male participants. Also, random selection of the participants for the course better supports the research rather than two selection methods (allowing participants to self-select and then, placing students in a course). Although the groups were balanced in number (90 and 91, respectively), 51 students in the conventional class originally signed up for the flipped classroom. This change in enrollment may influence motivation in the conventional classroom.

This study actually measures the effectiveness of the collaborative group learning activities, and the role of the teacher in group learning activities. The researchers attempted to level the playing field by providing students equal opportunities to access the course materials (e.g. OCW) in order to isolate the effect of the collaborative learning and teacher-student interactions. However, the awards component of the flipped classroom is not addressed in the conventional classroom. For future research, motivational elements using positive reinforcement should be applied equally to both groups.
References
