

The Flipped Classroom: Factors of Self-regulated Learning Affecting Students' Learning Effects

Kuo-Yu LIU*

*Department of Computer Science and Communication Engineering
Providence University, Taichung, Taiwan ROC*

*kyliu@pu.edu.tw

Abstract: This study investigates how students' self-regulated learning affect their learning satisfaction and performance within flipped classroom courses. Eighty-eight undergraduate computer science students taking a flipped classroom course from a private university in the Central Taiwan participated in the study. A Web-based questionnaire was used to collect data on students' demographics, self-regulated learning as well as learning satisfaction and performance. According to the examination of Pearson's correlation coefficients, findings show that the effects of flipped classroom are positive correlated with self-regulated learning of students. In addition, self-regulated learning between students' gender is significant difference in this flipped classroom course as well as learning satisfaction and performance. The effects of flipped classroom are also significant difference between retaking students and other students.

Keywords: flipped classroom, self-regulated learning, learning satisfaction, learning performance, learning effects

1. Introduction

Recent advances in technology and in social network concept bring the evolution of instruction model. Massive Open Online Courses (MOOCs) are a recent development in distance education which began to emerge in 2012. The arrival of MOOCs, which allow hundreds of thousands of students to participate simultaneously in a course, and are free and open to any interested participant, constitute a phenomenon that extends pre-existing initiatives to provide free, educational resources online (Hollands & Tirthali, 2014). Although it is an attractive prospect and rewarding for the teachers to see their work under the sunlight and widely broadcasting all over the world, the potential challenges are that it has much higher dropout rates and lower grades than the conventional kind. A MOOC-like online courses study has been done at Columbia University found that nearly twice as many students dropped out than their counterparts who took the same courses in conventional classrooms. The online students also got lower grades and were less likely to ultimately graduate (Jaggars, Edgecombe & Stacey, 2013). A recent study by researchers investigating the impact of MOOCs also found that few of those who sign up for a course complete it (Ho, et al., 2014). Thus, without a specific class time, students enrolled in MOOCs require enormous focus and self-discipline, and above all, a strong desire to watch lectures and review class materials in a timely manner.

If MOOCs are used as a supplement to classroom teaching rather than being viewed a replacement for it, they can increase instructor leverage, student throughput, student mastery, and student engagement (Fox, 2013). The innovative model is called Small Private Open Online Courses (SPOCs) which supports a current trend in education also known as blended learning or flipped classroom. The flipped classroom is an educational model that consists of two parts: interactive group learning activities inside the classroom, and direct computer-based individual instruction outside the classroom. According to a survey of the literature related to the flipped classroom through June 2012, Bishop and Verleger concluded that despite differences among 24 studies, general reports of student perceptions were relatively consistent. Opinions tended to be positive and students did tend to watch the videos when assigned (Bishop & Verleger, 2013). Another case study focused on the STEM (science, technology, engineering, and mathematics) courses which instructors teach in a flipped classroom also indicated that the impact on student learning is positive (Herreid & Schiller, 2013).

In this study, the instruction model of flipped classroom was deployed on a computer science curriculum, “Operating systems”. This paper focuses on whether students’ self-regulated learning affects their learning satisfaction and performance within flipped classroom after participating in this learning experience. The study population was comprised of students in a private university in the Central Taiwan. The self-regulated learning scale including four factors: self-monitoring and planning (22 items), self-reinforcement and persistence (8 items), self-evaluation and confidence (11 items), and seeking assistance (7 items), is derived from Jen’s research that is more appropriate for Taiwanese students (Jen, 2011). Each item is answered using a four-point scale (strongly agree=4, agree=3, disagree=2, strongly disagree=1). Another 5-point Likert scale used to evaluate the effects of flipped classroom consists of two factors: learning satisfaction (6 items) and learning performance (6 items).

2. Method

2.1 Participants

Students in College of Computing and Informatics must take the course. The participants included 88 students from the following majors: Computer Science and Information Engineering, Computer Science and Communication Engineering, and Computer Science and Information Management. 53% ($N = 47$) of participants were male, and 47% ($N = 41$) were female. 28% ($N = 25$) of participants retake the course, and 72% ($N = 63$) take the course first time. This combination provides a good mix of students to investigate the correlation between different objects and learning effects, in particular to students who retake the course experienced both traditional instruction and flipped classroom.

2.2 Research Methodology

In order to exert the characteristics of flipped classroom, we employed a MOOCs platform as a learning management system. The video lectures and exercises prepared by the instructor were used as out-of-class activities. In the class, small group activities were adopted to complete the discussion of homework assignments and oral presentation. After 10 weeks of the course, a Web-based questionnaire was used to collect data on students’ demographics, self-regulated learning as well as learning satisfaction and performance.

2.3 Research Questions

Here are some interested questions that will be examined in this study:

Q1: Is there any correlation between self-regulated learning and flipped classroom effects?

Q2: Is there significant difference on self-regulated learning and flipped classroom effects between different genders?

Q3: Is there significant difference on self-regulated learning and flipped classroom effects between retaking students and other students?

3. Results and Discussion

Table 1. Intercorrelations of the Factors of self-regulated learning and flipped classroom effects

	Self-regulated learning			
	self-monitoring and planning	self-reinforcement and persistence	self-evaluation and confidence	seeking assistance
Learning satisfaction	.238*	.395**	.149	.183
Learning performance	.312**	.448**	.156	.414**
Flipped classroom effects			.382**	

* $p < .05$; ** $p < .01$

Q1: as Table 1 shows, the effects of flipped classroom indeed correlated with self-regulated learning, and the correlation is significant. The factor, self-evaluation and confidence, has positive correlation but

is not significant indicated that Taiwanese students usually diffident and lack of self-confidence (the result is consistent with Jen's research (Jen, 2011)). The reason may be correlated with the quality of home education in Taiwan.

Table 2. Independent samples *t*-test of different genders

	Gender	N	Mean	Std. Deviation	<i>t</i>	<i>p</i>
Self-regulated learning	Male	47	149.74	14.73	3.783	.000**
	Female	41	138.39	13.21		
Flipped classroom effects	Male	47	45.38	6.71	2.584	.011*
	Female	41	41.61	6.97		

Q2: as shown in Table 2, after examination of independent samples *t*-test, there was a significant difference between male and female students on self-regulated learning ($p = .000 < .05$) as well as effects of flipped classroom ($p = .011 < .05$). The result contradicts Jen's research (Jen, 2011), and the reason may be the course we used in this study was computer science oriented. According to the research results published by Saad et al., there was a significant difference between male and female students who studied science, and female students rated markedly higher than that of male students (Saad, Tek & Baharom, 2009). However, the result in our study is opposite. Therefore, flipped classroom model may play a critical role to enhance students' learning motivation, in particular to male students.

Table 3. Independent samples *t*-test of retaking students

	Retaking Course	N	Mean	Std. Deviation	<i>t</i>	<i>p</i>
Self-regulated learning	Yes	25	147.40	12.94	1.156	.251
	No	63	143.29	15.79		
Flipped classroom effects	Yes	25	46.24	6.96	2.241	.028*
	No	63	42.59	6.87		

Q3: retaking students who experienced both traditional instruction and flipped classroom models could be a typical pointer in this study. The results, as shown in Table 3, indicated that there was a significant difference on effects of flipped classroom. When the dataset was analyzed by retaking students and other students within factors of flipped classroom effects (i.e., learning satisfaction and learning performance), the significance appeared in learning performance ($t = 2.241$, $p = .028 < .05$). From this finding, we can draw inferences that the flipped classroom will improve students' learning performance to some degree.

References

- Hollands, F. M., & Tirthali, D. (2014). MOOCs: expectations and reality. Full report. Center for Benefit-Cost Studies of Education, Teachers College, Columbia University, NY. Retrieved from: http://cbcse.org/wordpress/wp-content/uploads/2014/05/MOOCs_Expectations_and_Reality.pdf
- Jaggars, S. S., Edgecombe, N., & Stacey, G. W. (2013). What We Know about Online Course Outcomes. Research Overview. Community College Research Center, Columbia University. Retrieved from: <http://files.eric.ed.gov/fulltext/ED542143.pdf>
- Ho, A. D., Reich, J., Nesterko, S., Seaton, D. T., Mullaney, T., Waldo, J., & Chuang, I. (2014). HarvardX and MITx: The first year of open online courses (HarvardX and MITx Working Paper No. 1). Retrieved from: <http://ssrn.com/abstract=2381263>
- Fox, A. (2013). From MOOCs to SPOCs. *Communications of the ACM*, 56(12), 38-40.
- Bishop, J. L., & Verleger, M. A. (2013). The flipped classroom: A survey of the research. In *ASEE National Conference Proceedings*, Atlanta, GA.
- Herreid, C. F., & Schiller, N. A. (2013). Case studies and the flipped classroom. *Journal of College Science Teaching*, 42(5), 62-66.
- Jen, Y. Y. (2011). The Effects between the Personality and the Self-Regulated Learning of E-learning. Master thesis.
- Saad, M. I. M., Tek, O. E., & Baharom, S. (2009). Self-regulated learning: gender differences in motivation and learning strategies amongst Malaysian science students. In *1st International Conference on Educational Research*.