



Research Paper

The Way to Improve Sustainable Education- The Application of Small Private Online Courses

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ABSTRACT

When the time is limited and the class is large, how to keep up with the progress while providing adaptive instructions to allow all students to achieve higher level learning is always an important theme to sustainable education. Flipped teaching may be a feasible option for sustainable education. In the present, Massive Open Online Courses (MOOCs) is the flipped teaching platform that is more commonly used in colleges and universities. However, the numerous problems that have been identified with MOOCs include: (1) low course completion rates; (2) lack of learning portfolios of students; (3) lack of funds and resources. As there are widely divergent views about these problems, many educators have gradually shifted their attention from MOOCs to SPOCs (Small Private Online Courses). To improve the numerous drawbacks of MOOCs application in teaching, this study attempts to replace MOOCs with SPOCs for application in accounting education. The effects of the way to improve sustainable education would be examined in this study.

Kai-Wen Cheng

National Kaohsiung University of Hospitality and Tourism, No.1, Songhe Rd., Xiaogang Dist., Kaohsiung City, Taiwan (R.O.C.).

*Corresponding author. E-mail: kevin1188@mail.nkuht.edu.tw. Tel: +886 7806-0505.

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INTRODUCTION

Flipped teaching is to revolutionize teaching and learning in the aspects of “concept” and “technology” to make instructions more flexible and to provide students opportunities to solve problems that require higher-level thinking (Huang, 2014). Since the introduction of the flipped teaching concept, numerous studies have been conducted, and most of them have empirically confirmed the significant effects of flipped teaching on students’ learning attitude, learning interest, and learning achievements (Teng et al., 2014; Huang, 2015; Chen and Han, 2015; Chang and Yang, 2016; Chen, 2016; Hsu and Hsiang, 2016). Flipped teaching may be a feasible option for sustainable education (Liu, 2013). However, a number of studies have obtained the opposite result, that is, flipped teaching does not contribute to better learning effectiveness (Bishop and Verleger, 2013; Tseng and Tsai, 2015; Holdhusen, 2015). The field of application, educators, and subjects vary greatly among these studies, and most of them focus on the applications of flipped teaching in mathematics, science and engineering areas. The applications in business and management areas are seldom

discussed (Cheng, 2019). Therefore, this study focuses on the application of flipped teaching in “accounting education” to improve sustainable education.

MOOCs are a new e-learning model developed on the basis of flipped teaching (Cheng, 2019). It allows all learners, no matter school students or general citizens, to learn online and have control over their learning. In this model, teachers offer instructions completely online (Ho, 2014; Huang, 2015; Cheng, 2019). Due to the enormous convenience, MOOCs has established popularity and commercial value in a short time. Because MOOCs is characterized by being “massive” and “open”, with the increasing applications of MOOCs, two major problems have been identified (Cheng, 2019): low completion rates (Alcorn et al., 2014) and the lack of learning portfolios (Kim et al., 2008). To address issues arising from applications of MOOCs, many scholars have begun to create a better teaching model by tackling the “size” and “openness” of online courses first to improve sustainable education. SPOCs is an alternative model developed based on MOOCs (Bernard, 2013; Cheng, 2019). SPOCs, which stands for Small Private Online Courses, was

first introduced by Armando Fox, a professor in University of California, Berkley (Fox, 2013). While MOOCs is intended to make online courses accessible to off-campus learners, SPOCs is to provide flipped teaching among on-campus students (Cheng, 2019). The first two letters of SPOCs have the opposite meanings to the first two letters of MOOCs. SPOCs is to offer lessons in small classes rather than large ones and is accessible to only specific users instead of to all (Liu, 2014; Dawson, 2017). In fact, SPOCs is to incorporate the concepts of MOOCs in the physical classroom (Cheng, 2019). It is a hybrid learning model that combines MOOCs resources and flipped teaching (Fox, 2013; Oremus, 2013; Liu, 2014; Cheng, 2019).

METHODS

Quasi-experimental method

The goal of this study is to apply SPOC teaching model in the classroom instruction of “accounting”. In the practical teaching environment, random classification of students into the experimental or control group was not viable. Therefore, the quasi-experimental method was adopted. Two classes taking “Accounting” course were directly selected for the experiment. These two classes consisted of 2nd-year students in a university.

In the experiment, “teaching model” was the independent variable. The “SPOC teaching model”, which involved both online flipped teaching and classroom instruction, was conducted in the experimental group to improve sustainable education. The “traditional didactic teaching model”, where the teacher delivered knowledge to students through lectures in the classroom, and the online materials were accessible to them as reference materials, was adopted in the control group. The lessons for the two groups proceeded following the almost same schedule. The major difference was that before the experimental instruction, the experimental group was given an additional introduction to “SPOC teaching method”. There are two dependent variables in this experiment, including “learning achievement” and “learning feedback”. “Learning achievement” refers to the score on the Accounting Learning Achievement Posttest Scale, while the “learning feedback” is the result based on the “SPOC Quality Survey” created on the Virtual University Platform. Control variables are variables that may affect the experimental results and need to be controlled throughout the experiment. The control variables in this experiment include lessons, teachers, test time, teaching time, and the testing and scoring teacher.

Research instruments

Virtual university platform

To establish the SPOC teaching model, the e-learning

materials were designed and deployed in an Internet-based application system. Considering the easier accessibility to the related resources, the “Virtual University Platform” of the researcher’s university (URL: <http://cu2.nkuht.edu.tw/>) was adopted to be the teaching platform for this experiment. By entering an exclusive set of account name And password, “Teacher’s Office” and “Classroom Environment” could be browsed and edited after logging into the system.

Accounting learning achievement scales

The scales used to measure students’ learning achievement include “Accounting Learning Achievement Pretest Scale” and “Accounting Learning Achievement Posttest Scale”. The pretest scale was used to measure if the differences in learning achievement between the two groups were already significant before the experiment; the posttest scale was used to evaluate if such differences became significant after the experimental instruction.

A. Compilation procedure: Based on the questions in the last 10 years’ tests for Level C Technician for Accounting in Taiwan, “Accounting Learning Achievement Pretest Scale” and “Accounting Learning Achievement Posttest Scale” were developed with content validity according to the learning objectives in each unit of the course and the opinions of four accounting experts.

B. Test administration and question selection: After completing the design of pilot test questions, the 109 students who had completed the accounting course were invited for pilot test questions. The questions based on item difficulty and item discrimination were then selected. According to Yeh (2004), questions with a difficulty index closer to 0.5 are more favorable in item selection, and extreme group t-test can be applied to evaluate the discrimination index of each question. Based on the pilot test results, items that were too hard or too simple (≤ 3 or ≥ 7) were deleted and kept items with a significant discrimination index. Finally, a pretest scale consisting of 60 items and a posttest scale consisting of 50 items were obtained.

C. Reliability analysis: The internal consistencies of the “Accounting Learning Achievement Pretest Scale” and the “Accounting Learning Achievement Posttest Scale” were evaluated using Kuder-Richardson reliability test (KR-20). The KR-20 reliability statistics for the pretest and the posttest scales were 0.720 and 0.910 respectively, indicating high reliability. Through test compilation, test administration, item selection, and reliability analysis, the final “Accounting Learning Achievement Pretest Scale” and “Accounting Learning Achievement Posttest Scale” were completed.

Table 1: Allocation of students into groups.

Level	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7
High	1	2	3	4	5	6	7
			12	11	10	9	8
Mid	14	13					
	15	16	17	18	19	20	21
	28	27	26	25	24	23	22
	29	30	31	32	33	34	35
Low	42	41	40	39	38	37	36
	43	44	45	46			

Experimental instruction procedure

The experimental instruction was implemented during the period from February to June, 2018. The procedure was as follows:

Preparation and adaptation

To familiarize students in the experimental group with the online learning model, the e-learning course on the "Virtual University Platform" was created and tried to give lessons to the experimental group from September to December, 2017. This allowed students in the experimental group to get used to the online learning model. The online learning environment was also improved based on their opinions.

Pretest

At the start of the experimental instruction, both groups were provided a 40-minute introduction to the online teaching system. Thereafter, the implementation and scoring method of "SPOC teaching model" were explained only to the experimental group. Finally, the Accounting Learning Achievement Pretest was administered to both groups.

Flipped teaching

Before the experimental instruction, all the necessary materials for this experiment, including online videos, animations, issues for discussion, online tests, evaluative activities, and group assignments on the Virtual University Platform, were uploaded and set up. Therefore, students in the experiment group were allowed to view instructional videos and discuss with each other before class. Besides, when they came into the virtual classroom, they would also do online tests, evaluative activities, group assignments, and peer discussion based on the "SPOC teaching model". As for students in the control group, the same online materials were also available for them to practice and evaluate their achievements, but they would receive

classroom lessons based on the "traditional didactic teaching method".

Whole-class physical instruction

In the whole-class physical instruction, the teacher assisted the experimental group in reviewing the main concepts. Moreover, students were allowed to raise questions to clarify confusion. Later, the teacher used online tests, unit activities, and group assignments to help students organize and summarize what they had learned in this class.

Online group assignments

To increase students' learning effectiveness through collaborative learning, students were grouped in the experimental group by academic achievement in order to do the group assignments online. The grouping procedure is as follows. Students in the control group were asked to form groups on their own, with each group consisting of 7 students.

A. Sorting: The students were sorted by overall performance in "Management Science" based on the previous academic year of 2017.

B. Deciding group size: The experimental group consisted of 46 persons. 7 groups were formed, with 4 groups consisting 7 students and 3 groups consisting of 6.

C. Grouping method: According to each student's overall performance in "Management Science", the whole class was divided into high-level, mid-level, and low-level groups, respectively taking 25, 50, and 25%. Based on the sorting result, the students were assigned to the groups as shown in Table 1.

RESULTS

Sample analysis

The participants were 95 students from two second-year

Table 2: Survey results for items selected.

Item	Content	Options	No	Percent
1	Teaching activities, such as assignments, tests, and discussions, can be applied in more than 2/3 of the units in this course to allow learners to evaluate their learning achievement.	Very agree	22	48.89
		Agree	19	42.22
		Neutral	4	8.89
		Disagree	0	0.0
		Very disagree	0	0.0
2	There are sufficient exercises and extra-curricular activities (such as online tests and assignments) for all the units in this course.	Very agree	26	56.52
		Agree	16	34.78
		Neutral	4	8.70
		Disagree	0	0.00
		Very disagree	0	0.00
3	The teacher can use various collaborative learning strategies, such as group discussion, collaborative project or peer review, in teaching this course.	Very agree	28	60.87
		Agree	17	36.96
		Neutral	1	2.17
		Disagree	0	0.00
		Very disagree	0	0.00
4	The questions in the individual and group assignments help you identify the key points in the lessons and motivate you to have higher-level thinking and apply what you have acquired.	Very agree	26	56.52
		Agree	17	36.96
		Neutral	3	6.52
		Disagree	0	0.00
		Very disagree	0	0.00
5	In the synchronous teaching activities of this course, the teacher and learners have positive interactions when discussing the course-related subjects.	Very agree	26	56.52
		Agree	18	39.13
		Neutral	2	4.35
		Disagree	0	0.00
		Very disagree	0	0.00
6	In all the asynchronous teaching activities of this course, you and your classmates will express opinions and be active in the discussion.	Very agree	27	58.70
		Agree	15	32.61
		Neutral	4	8.70
		Disagree	0	0.00
		Very disagree	0	0.00
7	The synchronous discussion method used in this course is appropriate and allows you to have more intensive discussion with other classmates.	Very agree	27	58.70
		Agree	15	32.61
		Neutral	4	8.70
		Disagree	0	0.00
		Very disagree	0	0.00
8	It is appropriate for the teacher to use the students' learning portfolios on the teaching platform as one of the bases for evaluating students' achievements.	Very agree	29	64.44
		Agree	14	31.11
		Neutral	2	4.44
		Disagree	0	0.00
		Very disagree	0	0.00

Table 2:

9	You, your classmates, and the teacher are all active in the issue discussion forum.	Very agree	26	56.52
		Agree	17	36.96
		Neutral	3	6.52
		Disagree	0	0.00
		Very disagree	0	0.00
10	You are satisfied with the online teaching of this course.	Very agree	26	56.52
		Agree	18	39.13
		Neutral	2	4.35
		Disagree	0	0.00
		Very disagree	0	0.00

classes of the four-year technical college in a university. The experimental group comprised 46 students, including 11 boys and 35 girls. These students were given lessons adopting the "SPOC teaching model". The control group comprised 49 students, including 7 boys and 42 girls. These students learned the lessons based on the "traditional didactic teaching model".

The effects of different teaching models on learning achievement in both groups

To examine if there were significant differences in basic accounting knowledge and skills between the two groups before the experimental instruction, the "Accounting Learning Achievement Pretest Scale" was administered to both groups. Thereafter, the normality of the pretest results was tested. It showed that the Kolmogorov-Smirnov statistic was not significant for both groups, suggesting that the pretest results were normally distributed for both groups. In the Levene's test, a statistic of 1.324 ($p > .05$) suggesting that there was homogeneity of variances in the pretest results of the two group, was good for further t-test. The t-test results showed that although the control group outperformed the experimental group, the score difference was not significant ($t = 1.953$, $p > .05$).

To evaluate if the SPOC teaching model created a significant difference between the two groups, the Accounting Learning Achievement Posttest was administered to both groups. In the normality test of the posttest results, the Kolmogorov-Smirnov statistic was not significant for both groups, suggesting that the posttest results for both groups followed normal distribution. In addition, in the Levene's test result, the assumption of homogeneity of variances in the posttest results of both groups was supported ($F = .085$, $p > .05$), and an analysis of covariance (ANCOVA) could be proceeded. Using "Accounting Learning Achievement Pretest" as the covariance in the ANCOVA of "Accounting Learning Achievement Posttest", it is found that the effects of the two teaching models were not significantly different ($F = .008$, $p > .05$). This implies that although the control

group had a higher average score in the posttest ($M = 46.33$) than the experimental group ($M = 43.15$), once their pretest scores were considered as the covariance, the difference of posttest scores between the two groups became insignificant.

The effects of SPOC teaching model on learning achievement in the experimental group

To examine if students in the experimental group had improved "learning achievement" after the experimental instrument, a paired sample t-test of their Accounting Learning Achievement Pretest scores and Accounting Learning Achievement Posttest scores was carried out. The results showed that the average posttest score ($M = 43.15$) was significantly higher than the average pretest score ($M = 34.37$) ($t = 4.084$, $p < 0.001$). In other words, the SPOC teaching model indeed helped improve their learning achievement.

Students' learning feedback

For students in the experimental group, an "SPOC Quality Survey" was created on the Virtual University Platform. This survey consisted of 38 items, of which 10 were more representative. The survey results for these items are presented in Table 2. As shown in this table, students' feedback was quite positive, and most students supported using learning portfolios as a basis for learning evaluation.

CONCLUSIONS

The analysis of the results showed that in comparison with the traditional didactic teaching model, the SPOC teaching model did not cause students to fall behind in learning accounting. Instead, after a semester's adoption of this model, it helped the experimental group to score significantly higher in the posttest than in the pretest.

Besides, the students' feedback also shows that a high proportion of students in the experimental group agreed that the SPOC teaching model facilitated teacher-student and student-student interactions (above 91%) and could arouse higher-level thinking in them (93%). The experimental results show that SPOC is absolutely a way to improve sustainable education in the field of accounting.

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