AN EXPLORATORY STUDY OF THE EFFECTIVENESS OF FLIPPED CLASSROOM IN HIGHER EDUCATION

Abstract

Using a sample of 82 year-one students who studied a diploma course of organizational behaviour in the flipped classroom and another sample of 196 year-one students who studied the same course but in the non-flipped classroom, we explore the different effects between the two forms of classrooms on students' preparation, class participation, attitudes, perception of course effectiveness, and learning and skills development. We found that the flipped classroom approach performs better than the traditionally lecture-based approach in enhancing students' technology readiness. In the flipped classroom setting, students' preparation for online modules influences positively their class participation. Students' preparation and class participation, their attitudes and perception of course effectiveness, have the moderately positive effects on their learning and skills development.

Introduction

The flipped classroom model of teaching and learning has grown exponentially over the past ten years. This model was first introduced by two Chemistry teachers Aaron Sams and Jonathan Bergmann in Woodland Park High School in Colorado in 2006. At present, flipped-classroom approach is widely implemented in elementary, secondary, and higher education levels (Sinouvassane & Nalini, 2016).

The transition to a flipped classroom setting changes a traditionally teacher-centric classroom, in which all class time is used for explaining lecture contents. In a flipped classroom, some materials that are traditionally delivered in a lecture format are moved to an online format. Consequently, students gain more flexibility during the course of learning but meanwhile hold more responsibility for their own learning (Howell, 2013). It is expected that flipped classroom would promote the effectiveness of face-to-face classroom activities, and further enhance students' learning (Yoshida, 2016). However, there is limited empirical evidence to justify such positive effects of the flipped-classroom model (Prashar, 2015),

especially in the college setting. The current study aims to fill this gap of research by examining a sample of students who studied a diploma course of Organizational Behaviour (OB) in the flipped classroom and another sample of students who studied the same course but in the traditionally lectures-based classes at a publicly funded college in Toronto. Beyond identifying the differences in students' preparation and class participation, in students' attitudes in terms of engagement, preference and satisfaction, in students' perception of course effectiveness, and in students' learning and skills development, between the two samples, the current study also explores the potential predictors of students' perception of course effectiveness, learning and skills development.

In the text to follow, we review the pertinent research and propose five hypotheses to be tested in the current study. This is followed by a description of research methodology. We then report research findings and discuss their implications to flipped classroom practices. Finally, we highlighted some limitations of the current study and future research directions.

An Overview of Pertinent Research on the Flipped Classroom

Over the past five years, flipped classroom has received considerable research attention. Although empirical research on the flipped classroom in higher education is limited, there is some evidence on the positive effects of this new approach on students' learning motivation and outcomes (Moran & Milsom, 2015; Yoshida, 2016). For example, Hung (2015) found that students in the flipped classroom devoted more effort in studying course materials than those in the non-flipped classroom. Park and Howell (2015) found that, by doing on-line quizzes prior to a lecture, students were motivated to participate in the lecture. Simpson and Richards (2015) found that students who studied on-line materials for class ahead of time were more engaged in class activities and discussion. Wong, Ip, Lopes and Rajagopalan (2014) revealed that the flipped classroom approach leads to a higher level of student satisfaction. It is also reported that students in the flipped classroom have a higher level of perception of course effectiveness (Park & Howell, 2015; Prashar, 2015), greater learning (Belfi, Bartolotta, Giambrone, Davi, & Min, 2015; Simpson & Richards, 2015; Sinouvassane & Nalini, 2016; Yoshida, 2016), a higher level of self-

efficacy (Kenna, 2014), more enthusiasm in course contents (Tune, Sturek, & Basile, 2013), a better fit of self learning style (Baepler, Walker, & Driessen, 2014) and increased skills and abilities (Moran & Milsom, 2015; O'Flaherty & Phillips, 2015; Prashar, 2015). Hence, we hypothesized that:

H1. The flipped classroom approach performs better than the traditionally lecture-based approach in motivating students' preparation and class participation, fostering students' engagement and satisfaction, improving course effectiveness as perceived by students, and enhancing students' learning, self-efficacy, enthusiasm, fit of self learning style, and skills development.

The previous research on the flipped classroom has mainly focused on its effects on students' learning motivation and outcomes in contrast to the non-flipped classroom. There is a lack of research attention on what factors in the flipped classroom setting influence course effectiveness, and students' learning and skills development as well. Studying the traditionally lecture-based models in higher education, however, researchers have found that students' preparation and class participation, and students' attitudes in terms of engagement, preference and satisfaction, all predict course effectiveness as perceived by students (Kerkelä, Jonsson, Lindwall, & Strand, 2015; Manohar, Acharya, Wu, Hansen, Ansari, & Schilling, 2015), which in turn predicts students' learning and skills development (Bhana, 2014; Kong, Qin, Zhou, Mou, & Gao, 2014; Laschinger et al., 2008; McGaghie, Issenberg, Petrusa, & Scalese, 2010). Consequently, we hypothesized that:

H2a. In the flipped classroom setting, students' preparation has the positive impact on their class participation.

H2b. In the flipped classroom setting, students' preparation and class participation, and their attitudes in terms of engagement, preference and satisfaction, have the positive impact on their perception of course effectiveness.

H2c. In the flipped classroom setting, students' preparation and class participation, and their attitudes in terms of engagement, preference and satisfaction, and their perception of course effectiveness, have the positive impact on their learning and skills development.

Methods

Sample and Procedure

The two samples for the current study are from a diploma course of OB in a publicly-funded college in Toronto, which included 15 sections in Winter 2016 (three sections employing the flipped classroom model, and the other 12 sections being traditionally lecture-based). 718 students in total enrolled in the OB course, including 164 in the flipped classroom sections and 554 in the non-flipped classroom sections.

For the three flipped classroom sections, two rounds of surveys were conducted in Week 3-4 and in Week 13-15, respectively. 82 out of 164 students (a 50.00% effective response rate) participated in both rounds of survey. For the non-flipped classroom sections, one round of survey was conducted in Week 13-15. 196 out of 554 students (a 35.38% effective response rate) filled the survey questionnaire in class. The demographic data of the two samples are shown in Table 1.

Table 1

Demographic Data of Two Samples

Variables	***Answers***	***Flipped Classroom***		***Non-Flipped Classroom***	
		Frequency	***Percent***	***Frequency***	***Percent***
Age	20 years or younger	28	34.1%	79	40.7%
	21-25	38	46.3%	78	40.2%
	26-30	5	6.1%	21	10.8%
	31-35	5	6.1%	13	6.7%
	36-40	3	3.7%	1	0.5%
	40 years or older	3	3.7%	2	1.0%
Gender	Male	43	52.4%	106	54.4%
	Female	39	47.6%	89	45.6%
Programs to study	Business Administration	31	40.3%	73	39.0%
	Accounting	19	24.7%	53	28.3%
	Finance	7	9.1%	16	8.6%
	HR	1	1.3%	10	5.3%
	Marketing	19	24.7%	35	18.7%
Years in the current program	Year 1	44	53.7%	106	54.1%
	Year 2	18	22.0%	64	32.7%
	Year 3	18	22.0%	26	13.3%
	Year 4	1	1.2%	0	0.0%
	Others	1	1.2%	0	0.0%
Number of courses to take this semester	1-2	9	11.0%	5	2.6%
	3	1	1.2%	1	0.5%
	4	4	4.9%	11	5.7%
	5	17	20.7%	34	17.5%
	6	39	47.6%	108	55.7%
	7 Courses or more	12	14.6%	35	18.0%

We further conducted an analysis of variance (ANOVA) against four demographic variables (i.e., age, gender, program to study, years in the current program, and number of courses taken) to explore any significant differences between the two samples[1]. No statistically significant between-sample differences were found, except the number of courses to be taken ($F = 7.34$; $p < .01$). The students in non-flipped classroom sections took more course loads (0.4 more on average) than the students in the flipped classroom sections.

Research Variables

Students' preparation. *Student preparation for on-line modules* was measured by one item adapted from Hung's (2015) scale, and another item developed by the authors. For non-flipped classroom sections, only one item (i.e., "On average, what percentage of materials posted on Blackboard did you read prior to coming to class?") was used because the other one was not applicable to traditionally lecture-based classes. *Students' preparation for lectures* was measured by two items adapted from the college's course evaluation questionnaire.

Students' participation. *Students' participation in online modules* was measured by one item developed by the authors. *Students' participation in lectures* was measured by two items adapted from the college's course evaluation questionnaire.

Students' engagement. Two forms of student engagement were examined in the current study. First, *students' general learning engagement* was measured by ten items adapted from Hung's (2015) scale. Scores on the ten items were averaged to derive an overall score to measure this variable. The reliability of the ten items is 0.89 (Cronbach's α) for flipped classroom sections, and 0.90 (Cronbach's α) for non-flipped classroom sections. Second, *students' engagement in the course* was measured by one item adapted from Baepler et al.'s (2014) scale, and another item from Kim, Kim, Khera and Getman's (2014) scale. Scores on the two items were averaged to derive an overall score to measure the variable. The reliability of the two items is 0.83 (Cronbach's α) for flipped classroom sections, and 0.62 (Cronbach's α) for non-flipped classroom sections.

Students' preference. *Students' preference of flipped classroom* was measured by one item adapted from Sinouvassane and Nalini's (2016) scale, and another item from Galway, Corbett, Takaro, Tairyan and Frank's (2014) scale. Scores on the two items were averaged to derive an overall score to measure the variable. The reliability of the two items is 0.95 (Cronbach's α). For non-flipped classroom sections, this variable was not examined because it was not applicable to traditionally lecture-based classes.

Students' satisfaction. *Students' satisfaction with the course* was measured by one item adapted from Hung's (2015) scale, one item from Kim et al.'s (2014) scale, and another item from Moffett and Mill's (2014) scale. Scores on the three items were averaged to derive an overall score to measure the variable. The reliability of the three items is 0.82 (Cronbach's α) for flipped classroom sections, and 0.76 (Cronbach's α) for non-flipped classroom sections.

Course effectiveness. The current study employed 11 measures to assess course effectiveness. *Instructor's teaching effectiveness in general* was measured by seven items adapted from the college's course evaluation questionnaire. Scores on the seven items were averaged to derive an overall score to measure the variable. The reliability of the seven items is 0.86 (Cronbach's α) for flipped classroom sections, and 0.88 (Cronbach's α) for non-flipped classroom sections. *Instructor's teaching effectiveness for online modules* was measured by one item adapted from the college's course evaluation questionnaire. For non-flipped classroom sections, this variable was not examined because it was not applicable to traditionally lecture-based classes. *Effectiveness of evaluation methods for online modules* was measured by one item adapted from the college's course evaluation questionnaire, and another item from Galway et al.'s (2014) scale. Scores on the two items were averaged to derive an overall score to measure the variable. The reliability of the two items is 0.62 (Cronbach's α). For non-flipped classroom sections, this variable was not examined because it was not applicable to traditionally lecture-based classes. *Effectiveness of instructor's interaction for online modules* was measured by three items adapted from Kim et al.'s (2014) scale. Scores on the three items were averaged to derive an overall score to measure the variable. The reliability of the three items is 0.76 (Cronbach's α). For non-flipped classroom sections, this variable was not examined because it was not applicable to traditionally lecture-based classes.

Effectiveness of instructor's instruction for online modules was measured by one item adapted from Kim et al.'s (2014) scale, and another item from the college's course evaluation questionnaire. Scores on the two items were averaged to derive an overall score to measure the variable. The reliability of the two items is 0.76 (Cronbach's α). For non-flipped classroom sections, this variable was not examined because it was not applicable to traditionally lecture-based classes. Moreover, scores on the above seven items for measuring evaluation methods, instructor's interaction and instruction for on-line modules were averaged to derive an overall score to measure *effectiveness of online modules*. The reliability of the seven items is 0.85 (Cronbach's α). For non-flipped classroom sections, this variable was not examined because it was not applicable to traditionally lecture-based classes. *Instructor's teaching effectiveness for lectures* was measured by one item adapted from the college's course evaluation questionnaire. *Effectiveness of evaluation methods for lectures* was measured by one item adapted from the college's course evaluation questionnaire. For non-flipped classroom sections, this item was not used. Instead, the three items (i.e., "Assignments given by the instructor greatly enhanced my learning of course materials." "Quizzes given by the instructor greatly enhanced my learning of course materials." "Exams given by the instructor greatly enhanced my learning of course materials.") for measuring students' learning from the course were used to measure the variable. The reliability of the three items is 0.83 (Cronbach's α). *Effectiveness of instructor's interaction for lectures* was measured by three items adapted from Kim et al.'s (2014) scale, two items from the college's course evaluation questionnaire, one item from Galway et al.'s (2014) scale, and another item from Howell's (2013) scale. Scores on the seven items were averaged to derive an overall score to measure the variable. The reliability of the seven items is 0.89 (Cronbach's α). For non-flipped classroom sections, only two items (i.e., "The instructor encouraged student participation in class by posing questions, through class discussions and/or group work, etc." "The instructor treated me with courtesy in class.") adapted from the college's course evaluation questionnaire were used. Scores on the two items were averaged to derive an overall score to measure the variable. The reliability of the two items is 0.61 (Cronbach's α). *Effectiveness of instructor's instruction for lectures* was measured by one item adapted from Kim et al.'s (2014) scale, and another item from the college's course evaluation

questionnaire. Scores on the two items were averaged to derive an overall score to measure the variable. The reliability of the two items is 0.68 (Cronbach's α) for flipped classroom sections, and 0.65 (Cronbach's α) for non-flipped classroom sections. To measure *effectiveness of lectures*, **s**cores on the above ten items for measuring evaluation methods, instructor's interaction and instruction for on-line modules were averaged to derive an overall score to measure the variable. The reliability of the ten items is 0.91 (Cronbach's α). For non-flipped classroom sections, scores on the seven items for measuring evaluation methods, instructor's interaction and instruction for lectures were averaged to derive an overall score to measure the variable. The reliability of the seven items is 0.78 (Cronbach's α).

Students' learning. *Students' learning from the course* was measured by two items adapted from Sinouvassane and Nalini's (2016) scale, one item from Yoshida's (2016) scale, one item from Wong et al.'s (2014) scale, one item from Kim et al.'s (2014) scale, and other three items developed by the authors. Scores on the eight items were averaged to derive an overall score to measure the variable. The reliability of the eight items is 0.85 (Cronbach's α). For non-flipped classroom sections, two items (i.e., "I learn more from the flipped classroom over traditional (lecture-based) classes." "I feel that flipped classroom is a more effective way than the traditional (lecture-based) method to learn OB concepts, theories and principles.") were not used because they were not applicable to traditionally lecture-based classes. As a result, scores on the remaining six items were averaged to derive an overall score to measure the variable for non-flipped classroom sections. The reliability of the six items is 0.87 (Cronbach's α). *Students' learning from online modules* was measured by two items adapted from the college's course evaluation questionnaire, one item from Kim et al.'s (2014) scale, one item from Baepler et al.'s (2014) scale, one item from Yoshida's (2016) scale, three items from McLaughlin et al.'s (2013) scale, and the other three items from Moran and Milsom's (2015) scale. Scores on the 11 items were averaged to derive an overall score to measure the variable. The reliability of the 11 items is 0.92 (Cronbach's α). For non-flipped classroom sections, this variable was not examined because it was not applicable to traditionally lecture-based classes. *Students' learning from lectures* was measured by three items adapted from Moran and Milsom's (2015) scale, two items from McLaughlin et al.'s (2013) scale, and another item from the

college's course evaluation questionnaire. Scores on the six items were averaged to derive an overall score to measure the variable. The reliability of the six items is 0.83 (Cronbach's α). For non-flipped classroom sections, two items (i.e., "In-class lectures greatly enhanced my understanding of OB concepts, theories and principles." "As a learning experience, the content and topics of in-class lectures are excellent.") were not used due to their overlaps with the other items to be surveyed in the non-flipped classroom sections. As a result, scores on the remaining four items were averaged to derive an overall score to measure the variable. The reliability of the four items is 0.76 (Cronbach's α).

Furthermore, the current study examined the other three learning variables, including: self-efficacy, enthusiasm, and perceived fit of self learning style. Specifically, *students' self-efficacy* was measured by one item adapted from Baepler et al.'s (2014) scale and the other three items adapted from Kim et al.'s (2014) scale. Scores on the four items were averaged to derive an overall score to measure the variable. The reliability of the four items is 0.73 (Cronbach's α) for flipped classroom sections, and 0.82 (Cronbach's α) for non-flipped classroom sections. *Students' enthusiasm* was measured by one item adapted from the college's course evaluation questionnaire, and another item from Tune et al.'s (2013) scale. Subtraction of the scores on one item (i.e., "At the end of semester, my enthusiasm about the course was high.") from the scores on the other item (i.e., "Before the course began, my level of enthusiasm to take this course was high.") resulted in an overall score to measure the variable. *Students' perceived fit of self learning style* was measured by one item adapted from Moran and Milsom's (2015) scale and another item from Baepler et al.'s (2014) scale. Scores on the two items were averaged to derive an overall score to measure the variable. The reliability of the two items is 0.83 (Cronbach's α) for flipped classroom sections, and 0.77 (Cronbach's α) for non-flipped classroom sections.

Students' skills development. The course of organizational behaviour aims to enhance students' communication, problem-solving, critical thinking, analytical, decision making, organization and team building skills (Kinicki, Fugate, & Digby, 2016). Moreover, the flipped classroom approach has been found to increase students' use of technology (Moran & Milsom, 2015). Hence, the current study examined students' development of eight different skills as follows. *Students' communication skills*

development was measured by two items adapted from Ferreri and O'Connor's (2013) scale. Scores on the two items were averaged to derive an overall score to measure the variable. The reliability of the two items is 0.72 (Cronbach's α) for flipped classroom sections, and 0.84 (Cronbach's α) for non-flipped classroom sections. *Students' problem-solving skills development* was measured by two items developed by the authors. Scores on the two items were averaged to derive an overall score to measure the variable. The reliability of the two items is 0.63 (Cronbach's α) for flipped classroom sections, and 0.74 (Cronbach's α) for non-flipped classroom sections. *Students' critical-thinking skills development* was measured by one item developed by the authors. *Students' analytical skills development* was measured by one item developed by the authors. *Students' decision-making skills development* was measured by one item developed by the authors. *Students' organization skills development* was measured by one item adapted from Moffett and Mill's (2014) scale. *Students' team-building skills development* was originally measured by two items adapted from Ferreri and O'Connor's (2013) scale. However, the reliability of the two items was too low so we only used one item (i.e., "Flipped classroom helped me develop the ability to work effectively individually.") for the current study. *Students' technology readiness development* was measured by one item adapted from Moran and Milsom's (2015) scale, one from Kim et al.'s (2014) scale, and another item from Sinouvassane and Nalini's (2016) scale. Scores on the three items were averaged to derive an overall score to measure the variable. The reliability of the three items is 0.75 (Cronbach's α). For non-flipped classroom sections, one item (i.e., "The technologies used for the out-of-class activities enhanced my ability to learn.") was not used because it was not applicable to traditionally lecture-based classes. As a result, scores on the remaining two items were averaged to derive an overall score to measure the variable for non-flipped classroom sections. The reliability of the two items is 0.84 (Cronbach's α). Furthermore, the current study examined *students' skills acquisition*, which was measured by the average scores on the above 12 items for measuring communication, problem-solving, critical thinking, analytical, decision making, organization and team building skills, and technology readiness. The reliability of the 12 items is 0.91 (Cronbach's α). For non-flipped classroom sections, scores on the

11 items (excluding the one to measure technology readiness) were averaged to derive an overall score to measure the variable. The reliability of the 11 items is 0.92 (Cronbach's α).

All items as described above, except those for measuring students' preparation for online modules, students' participation in online modules, students' preparation for lectures and students' participation in lectures, have used a five-point Likert-type response format (0= Not Sure; 4 = Strongly Agree). When analyzing data, we excluded those answers as "0 = Not Sure".

Data Analyses

One-way ANOVA analyses were run against all research variables to assess the significance of the differences between the two rounds of surveys for flipped classroom sections, and between the second-round survey for flipped classroom sections and the survey for non-flipped classroom sections.

Bivariate correlation analyses were used to examine all relationships among the research variables. Multiple regression analyses were then used to assess the cause-to-effect relationships among the research variables. When examining students' participation, students' preparation variables were first entered (Step 1). When examining teaching effectiveness, students' preparation variables were first entered (Step 1), followed by students' participation variables (Step 2), and then by students' attitudinal variables in terms of engagement, preference, and satisfaction (Step 3). When examining students' learning and skills development, students' preparation variables were first entered (Step 1), followed by students' participation variables (Step 2), and then by students' attitudinal variables in terms of engagement, preference, and satisfaction (Step 3), and then by teaching effectiveness variables (Step 4).

Results and Discussions

Students' Preparation

To examine students' preparation for online modules and for in-class lectures, we first ran ANOVA analyses of the two rounds of survey data for flipped classroom sections (see Table 2).

Table 2

ANOVA for Two Rounds of Studies in Flipped Classroom Sections

Variables		*N*	*Mean*	*SD*	*F*	*p-value*
Preparation for Online Modules (Quantity)	Flipped Classroom Round #1	83	3.07	1.07	6.53	0.01
	Flipped Classroom Round #2	82	2.62	1.19		
	Total	165	2.85	1.15		
Preparation for Lectures (Quantity)	Flipped Classroom Round #1	85	2.58	1.12	12.73	0.00
	Flipped Classroom Round #2	82	1.93	1.24		
	Total	167	2.26	1.22		
Preparation for Lectures (Time)	Flipped Classroom Round #1	85	2.22	1.08	17.32	0.00
	Flipped Classroom Round #2	82	1.51	1.13		
	Total	167	1.87	1.16		
Students' General Learning Engagement	Flipped Classroom Round #1	66	1.86	0.72	1.06	0.31
	Flipped Classroom Round #2	71	1.73	0.74		
	Total	137	1.79	0.73		
Students' Engagement in the Course	Flipped Classroom Round #1	83	3.16	0.69	0.38	0.54
	Flipped Classroom Round #2	77	3.08	0.78		
	Total	160	3.12	0.73		
Students' Preference of Flipped Classroom	Flipped Classroom Round #1	85	3.06	0.97	0.09	0.77
	Flipped Classroom Round #2	75	3.01	1.01		
	Total	160	3.04	0.98		
Students' Satisfaction with the Course	Flipped Classroom Round #1	80	3.10	0.68	0.00	0.98
	Flipped Classroom Round #2	72	3.09	0.76		
	Total	152	3.09	0.72		
Students' Learning from the Course	Flipped Classroom Round #1	82	3.07	0.77	0.02	0.89
	Flipped Classroom Round #2	72	3.05	0.82		
	Total	154	3.06	0.79		
Students' Learning from Online Modules	Flipped Classroom Round #1	78	3.25	0.56	0.07	0.80
	Flipped Classroom Round #2	74	3.23	0.56		
	Total	152	3.24	0.56		
Students' Learning from Lectures	Flipped Classroom Round #1	80	3.21	0.61	0.10	0.75
	Flipped Classroom Round #2	75	3.24	0.53		
	Total	155	3.22	0.57		

The ANOVA results indicate the statistically significant differences in students' ***preparation for online modules*** (*F = 6.53; p < .05*), so as students' ***preparation for in-class lectures*** (*F = 12.73; p < .001 and F = 17.32; p < .001*). An examination of mean values further reveals that students reduced their reading of the materials posted on Blackboard per week by approximately 10% after two months' study of the course in the flipped classroom setting. They also reduced their reading of the materials for in-class mini-lectures (textbook and other handouts) per week by approximately 10%. The time that students took to read and study for in-class mini-lectures was reduced by approximately 20 minutes per week. There are two explanations for these findings. From the students' perspective, they reduced their effort in course preparation because they have acquired more knowledge through two months' study of the course in the

flipped classroom setting. Another explanation is that students are under more time pressure in the second half of the semester because of the numerous due dates for major assignments from their other courses. Consequently, they reduced the time allocated to the course of OB.

Second, we ran ANOVA analyses of the survey data for flipped classroom sections (Round #2) and for non-flipped classroom sections (see Table 3).

Table 3

ANOVA for Flipped and Non-Flipped Classroom Sections

Variables		***N***	***Mean***	***SD***	***F***	***p-value***
Preparation for Online Modules (Quantity)	Flipped Classroom	82	2.62	1.19	0.61	0.44
	Non-flipped Classroom	195	2.49	1.29		
	Total	277	2.53	1.26		
Preparation for Lectures (Quantity)	Flipped Classroom	82	1.93	1.24	1.95	0.16
	Non-flipped Classroom	196	1.70	1.24		
	Total	278	1.77	1.24		
Preparation for Lectures (Time)	Flipped Classroom	82	1.51	1.13	2.91	0.09
	Non-flipped Classroom	196	1.26	1.12		
	Total	278	1.33	1.13		
Participation in Online Modules (Frequency)	Flipped Classroom	79	2.15	1.55	0.30	0.58
	Non-flipped Classroom	191	2.05	1.27		
	Total	270	2.08	1.35		
Participation in Lectures (Frequency)	Flipped Classroom	82	2.78	0.57	7.62	0.01
	Non-flipped Classroom	194	2.92	0.29		
	Total	276	2.88	0.40		
Participation in Lectures (Frequency in Other Courses)	Flipped Classroom	81	2.51	0.95	24.91	0.00
	Non-flipped Classroom	193	2.90	0.36		
	Total	274	2.78	0.62		
Students' General Learning Engagement	Flipped Classroom	71	1.73	0.74	0.10	0.76
	Non-flipped Classroom	137	1.70	0.74		
	Total	208	1.71	0.74		
Students' Engagement in the Course	Flipped Classroom	77	3.08	0.78	0.78	0.38
	Non-flipped Classroom	185	3.17	0.72		
	Total	262	3.15	0.74		
Students' Satisfaction with the Course	Flipped Classroom	72	3.09	0.76	2.82	0.09
	Non-flipped Classroom	177	3.26	0.67		
	Total	249	3.21	0.70		
Instructor's Teaching Effectiveness	Flipped Classroom	73	3.34	0.55	11.81	0.00
	Non-flipped Classroom	186	3.58	0.48		
	Total	259	3.51	0.51		
Instructor's Teaching Effectiveness for Lectures	Flipped Classroom	81	3.38	0.68	14.25	0.00
	Non-flipped Classroom	194	3.68	0.54		
	Total	275	3.59	0.60		
Effectiveness of Evaluation Methods for Lectures	Flipped Classroom	75	3.10	0.67	0.67	0.41
	Non-flipped Classroom	183	3.18	0.70		
	Total	258	3.16	0.69		
Effectiveness of Instructor's Interaction for Lectures	Flipped Classroom	80	3.41	0.65	8.56	0.00
	Non-flipped Classroom	191	3.62	0.48		
	Total	271	3.56	0.54		

Effectiveness of Instructor's Instruction for Lectures	Flipped Classroom	80	3.31	0.61	24.88	0.00
	Non-flipped Classroom	194	3.66	0.49		
	Total	274	3.56	0.55		
Effectiveness of Lectures	Flipped Classroom	73	3.25	0.52	10.18	0.00
	Non-flipped Classroom	177	3.46	0.44		
	Total	250	3.40	0.47		
Students' Learning from the Course	Flipped Classroom	69	3.09	0.55	2.57	0.11
	Non-flipped Classroom	177	3.23	0.63		
	Total	246	3.19	0.61		
Students' Learning from Lectures	Flipped Classroom	78	3.23	0.59	0.59	0.44
	Non-flipped Classroom	176	3.29	0.55		
	Total	254	3.27	0.57		
Students' Self-Efficacy	Flipped Classroom	72	3.14	0.58	0.13	0.72
	Non-flipped Classroom	167	3.10	0.66		
	Total	239	3.11	0.64		
Students' Enthusiasm	Flipped Classroom	80	0.19	1.06	2.09	0.15
	Non-flipped Classroom	194	0.40	1.10		
	Total	274	0.34	1.09		
Fit of Students' Learning style	Flipped Classroom	81	3.24	0.75	0.25	0.62
	Non-flipped Classroom	191	3.19	0.76		
	Total	272	3.21	0.75		
Students' Skills Acquisition	Flipped Classroom	66	3.16	0.55	2.02	0.16
	Non-flipped Classroom	154	3.03	0.62		
	Total	220	3.07	0.60		
Students' Communication Skills Development	Flipped Classroom	76	2.85	0.76	0.05	0.82
	Non-flipped Classroom	186	2.87	0.81		
	Total	262	2.87	0.80		
Students' Problem-Solving Skills Development	Flipped Classroom	80	3.16	0.66	0.00	0.98
	Non-flipped Classroom	189	3.16	0.73		
	Total	269	3.16	0.71		
Students' Critical Thinking Skills Development	Flipped Classroom	76	3.17	0.81	0.71	0.40
	Non-flipped Classroom	193	3.26	0.76		
	Total	269	3.23	0.77		
Students' Analytical Skills Development	Flipped Classroom	78	3.36	0.70	1.11	0.29
	Non-flipped Classroom	193	3.25	0.76		
	Total	271	3.28	0.74		
Students' Decision Making Skills Development	Flipped Classroom	78	3.04	0.81	0.04	0.84
	Non-flipped Classroom	189	3.02	0.84		
	Total	267	3.02	0.83		
Students' Organization Skills Development	Flipped Classroom	81	3.16	0.90	1.48	0.23
	Non-flipped Classroom	184	3.03	0.79		
	Total	265	3.07	0.82		
Students' Team Building Skills Development	Flipped Classroom	81	3.20	0.89	0.02	0.90
	Non-flipped Classroom	190	3.21	0.77		
	Total	271	3.21	0.80		
Students' Technology Readiness Development	Flipped Classroom	77	2.95	0.78	4.34	0.04
	Non-flipped Classroom	176	2.70	0.91		
	Total	253	2.77	0.88		

The ANOVA results indicate no statistically significant differences in students' preparation for online modules ($F = 0.61; p > .05$) and for in-class lectures ($F = 1.95; p > .05$ *and* $F = 2.91; p > .05$) between

flipped classroom and non-flipped classroom sections. This implies that students put the same level of effort in preparing a flipped classroom course as they do for a traditionally lecture-based course.

Students' Participation

To examine students' participation in online modules and in-class lectures, we ran ANOVA analyses of the survey data for flipped classroom sections (Round #2) and for non-flipped classroom sections (see Table 3). The ANOVA results indicate no statistically significant differences in students' participation in on-line discussions ($F = 0.30;\ p > .05$), whereas statistically significant differences in students' participation in in-class lectures ($F = 7.62;\ p < .01$ *and* $F = 24.91;\ p < .001$). An examination of mean values further reveals that students in flipped classroom sections participated less in-class lectures than those in non-flipped classroom sections. This implies that the flipped classroom model does not encourage students to attend in-class lectures.

To examine whether students' preparation for online modules and in-class lectures could account for their decreased participation in in-class lectures, we ran two more analyses (i.e., correlation analysis, and the multiple regression analysis) of the survey data for flipped classroom sections (Round #2). Correlation analysis[2] reveals that students' preparation for online modules in terms of the percentage of materials posted on Blackboard they read is correlated negatively with their participation in online modules as measured by the frequency students' participate in on-line discussions ($r = -.26;\ p < 0.05$), but correlated positively with their participation in mini-lectures as measured by the frequency students attend mini-lectures ($r = .30;\ p < 0.01$). However, the multiple regression analysis results (see Table 4) suggest that students' ***preparation for online modules*** only influence positively students' participation in mini-lectures ($\beta = .35;\ p < .01$). This implies that, by reading the materials posted on line, students may increase their interests in the topics and are thus motivated to come to mini-lectures to listen to the instructor's interpretation of these topics. The hypothesis (H2a) that in the flipped classroom setting students' preparation has the positive impact on their class participation is partially supported. In consideration of the previous ANOVA analysis results, which found that students' participation in in-class lectures in the flipped classroom sections is significantly lower than that in the traditionally lecture-based sections, we

conclude that such motivation is limited, at least not as effective as those factors (e.g., face-to-face interactions with the instructor and with the peers, etc.) motivating students to attend a traditionally lecture-based class.

Table 4

Multiple Regression Analyses of Students' Preparation and Participation (Beta and p-values)[a]

Variables	*Participation in Online Modules (Frequency)*	*Participation in Mini-Lectures (Frequency)*	*Participation in Lectures (Frequency in Other Courses)*
Step 1			
Preparation for Online Modules (Time)	.06	-.16	.03
Preparation for Online Modules (Quantity)	-.28*	.35**	.20
Model F Value	2.79	4.51*	1.76
R^2	.07	.11	.04
ΔR^2	.04	.08	.02
Step 2			
Preparation for Mini-Lectures (Quantity)	.10	-.10	-.01
Preparation for Mini-Lectures (Time)	-.01	-.12	.18
Model F Value [b]	1.48	2.70*	1.24
R^2	.07	.13	.06
ΔR^2	.02	.08	.01
Step 3			
Participation in Online Modules (Frequency)		.06	.21
Model F Value		2.20	1.70
R2		.13	.10
ΔR2		.07	.04

[a] n = 82. * *P<.05.* ** *P<.01.* *** *P<.001.*

Teaching Effectiveness

To examine teaching effectiveness in terms of instructor's teaching effectiveness, the effectiveness of evaluation methods and of instructor's interaction and instruction, we ran ANOVA analyses of the survey data for flipped classroom sections (Round #2) and for non-flipped classroom sections (see Table 3). The ANOVA results indicate statistically significant differences in all teaching effectiveness variables except the effectiveness of evaluation methods for lectures ($F = 0.67; p > .05$). An examination of mean values further reveals that students in the flipped classroom rated instructor's teaching effectiveness, instructor's teaching effectiveness for lectures, the effectiveness of instructor's interaction for lectures, the effectiveness of instructor's instruction for lectures and the effectiveness of lectures in non-flipped

classroom sections significantly lower than their counterparts in non-flipped classroom sections. This implies students perceive traditionally lecture-based classes more effective than the flipped classroom.

To explore the relationships of teaching effectiveness with students' preparation and participation, and their attitudes, we ran two more analyses (i.e., correlation analysis, and the multiple regression analysis) of the survey data for flipped classroom sections (Round #2). Correlation analysis[2] reveals 17 out of 44 significant correlations between teaching effectiveness variables and students' preparation variables, nine out of 33 significant correlations between teaching effectiveness variables and students' participation variables, and 34 out of 44 significant correlations between teaching effectiveness variables and students' attitudinal variables.

We then ran the multiple regression analyses to explore how students' preparation and participation, and students' engagement, preference and satisfaction influence their perception of teaching effectiveness. Seen from Table 5, students' perception of ***instructor's teaching effectiveness in general*** is influenced positively by their preparation for mini-lectures as measured by the percentage of the materials for mini-lectures that students read prior to coming to class ($\beta = .38;\ p < .05$) and by students' satisfaction with the course ($\beta = .34;\ p < .05$). Students' perception of ***instructor's teaching effectiveness for online modules*** is influenced positively by their engagement in the course ($\beta = .53;\ p < .01$). Students' perception of ***the effectiveness of evaluation methods for online modules*** is influenced positively by their participation in online modules as measured by the frequency they participate in online discussions ($\beta = .35;\ p < .01$), by the frequency they participate in the other courses ($\beta = .27;\ p < .05$), and by their engagement in the course ($\beta = .62;\ p < .001$). Both students' perception of ***the effectiveness of instructor's interaction for online modules*** ($\beta = .41;\ p < .05$) and their perception of ***the effectiveness of instructor's instruction for online modules*** ($\beta = .43;\ p < .05$) are influenced positively by their engagement in the course. Students' perception of ***the effectiveness of online modules*** is influenced positively by their preparation for mini-lectures as measured by the percentage of the materials for mini-lectures that students read prior to coming to class ($\beta = .36;\ p < .05$), by their participation in online modules as measured by the frequency they participate in online discussions ($\beta = .29;\ p < .05$), by the frequency they participate in the other

courses ($\beta = .29; p < .05$), and by their engagement in the course ($\beta = .58; p < .001$). None of students' preparation, participation, satisfaction, preference and engagement variables influences significantly students' perception of ***the instructor's teaching effectiveness for mini-lectures***. Students' perception of ***the effectiveness of evaluation methods for mini-lectures*** is influenced positively by their participation in online modules as measured by the frequency they participate in online discussions ($\beta = .26; p < .05$), and by their engagement in the course ($\beta = .46; p < .05$). Students' perception of ***the effectiveness of instructor's interaction for mini-lectures*** is influenced positively by the frequency they participate in the other courses ($\beta = .31; p < .05$).

Students' perception of ***the effectiveness of instructor's instruction for mini-lectures*** is influenced positively by their participation in online modules as measured by the frequency they participate in online discussions ($\beta = .30; p < .05$). Students' perception of ***the effectiveness of mini-lectures*** is influenced positively by their participation in online modules as measured by the frequency they participate in online discussions ($\beta = .27; p < .05$), and by their engagement in the course ($\beta = .39; p < .05$). Taken together, students' engagement in the course is the most influential factor for teaching effectiveness by affecting significantly all five effectiveness variables for online modules as well as two out of 5 effectiveness variables for mini-lectures. Students' participation in online modules are the second influential factor by affecting significantly two out of 5 effectiveness variables for online modules as well as three out of 5 effectiveness variables for mini-lectures. Moreover, students' preparation for online modules and mini-lectures together explain 9% of the variances in students' perception of instructor's teaching effectiveness in general, 1% of the variances in students' perception of instructor's teaching effectiveness for online modules, and 1% of the variances in students' perception of instructor's teaching effectiveness for mini-lectures. Students' participation in online modules and mini-lectures together explain 1% of the variances in students' perception of instructor's teaching effectiveness in general, and 4% of the variances in students' perception of instructor's teaching effectiveness for mini-lectures. Students' attitudes in terms of satisfaction, preference and engagement together explain 33% of the variances in students' perception of instructor's teaching effectiveness in general, 27% of the variances in students' perception of instructor's

teaching effectiveness for online modules, and 4% of the variances in students' perception of instructor's teaching effectiveness for mini-lectures. Hence, the hypothesis (H2b) is partially supported; that is, in the flipped classroom setting students' preparation and class participation, engagement, preference and satisfaction, have the moderately positive impact on their perception of course effectiveness.

Table 5

Multiple Regression Analyses of Teaching Effectiveness (Beta and p-values)[a]

Variables	*Instructor's Teaching Effectiveness In General*	*Instructor's Teaching Effectiveness for Online Modules*	*Effectiveness of Evaluation Methods for Online Modules*	*Effectiveness of Instructor's Interaction for Online Modules*	*Effectiveness of Instructor's Instruction for Online Modules*	*Effectiveness of Online Modules*
Step 1						
Preparation for Online Modules (Time)	-.01	.03	-.02	.15	.02	.06
Preparation for Online Modules (Quantity)	-.05	-.14	-.10	-.22	-.09	-.15
Preparation for Mini-Lectures (Quantity)	.38*	.29	.13	.47**	.32	.36*
Preparation for Mini-Lectures (Time)	.09	.05	.35	-.11	.11	.13
Model F Value	2.54*	1.18	2.43	2.38	1.98	2.77*
R^2	.16	.08	.14	.14	.12	.16
ΔR^2	.09	.01	.09	.08	.06	.10
Step 2						
Participation in Online Modules (Frequency)	.06	.14	.35**	.24	.16	.29*
Participation in Mini-Lectures (Frequency)	-.03	-.09	-.12	.02	-.03	-.03
Participation in Mini-Lectures (Frequency in Other Courses)	.23	.12	.27*	.21	.28	.29*
Model F Value	1.95	.92	3.69**	.2.64*	2.18*	3.85**
R^2	.21	.11	.32	.25	.22	.33
ΔR^2	.10	-.01	.23	.16	.12	.25
Step 3						
Students' General Learning Engagement	.09	-.14	-.16	-.10	.16	-.05
Students' Engagement in the Course	.25	.53**	.62***	.41*	.43*	.58***
Students' Preference of Flipped Classroom	.12	.15	-.10	.14	-.03	.02
Students' Satisfaction with the Course	.34*	-.04	.09	-.10	.10	.03
Model F Value	5.05***	2.95**	6.99***	3.13**	3.40**	6.77***
R2	.54	.39	.60	.40	.43	.60
ΔR2	.43	.26	.52	.27	.30	.51

[a] n = 82. * *P<.05.* ** *P<.01.* *** *P<.001.*

Table 5

Multiple Regression Analyses of Teaching Effectiveness (Beta and p-values; Cont'd)[a]

Variables	*Instructor's Teaching Effectiveness for Mini-Lectures*	*Effectiveness of Evaluation Methods for Mini-Lectures*	*Effectiveness of Instructor's Interaction for Mini-Lectures*	*Effectiveness of Instructor's Instruction for Mini-Lectures*	*Effectiveness of Mini-Lectures*
Step 1					
Preparation for Online Modules (Time)	-.12	-.09	.14	-.24	.04
Preparation for Online Modules (Quantity)	.07	-.16	-.07	-.10	-.09
Preparation for Mini-Lectures (Quantity)	.21	.20	.46*	.30	.43*
Preparation for Mini-Lectures (Time)	.09	.08	-.23	.19	-.13
Model F Value	1.17	0.58	2.22	1.85	1.82
R^2	.08	.04	.14	.11	.12
ΔR^2	.01	-.03	.08	.05	.05
Step 2					
Participation in Online Modules (Frequency)	.26	.26*	.23	.30*	.27*
Participation in Mini-Lectures (Frequency)	.19	.18	.17	.14	.20
Participation in Lectures (Frequency in Other Courses)	-.12	.22	.31*	.01	.27
Model F Value	1.47	2.48*	4.63***	2.21*	4.38**
R^2	.16	.24	.38	.22	.37
ΔR^2	.05	.15	.30	.12	.29
Step 3					
Students' General Learning Engagement	.08	.01	.14	.19	.13
Students' Engagement in the Course	.26	.46*	.31	.33	.39*
Students' Preference of Flipped Classroom	.24	-.16	.13	.05	.05
Students' Satisfaction with the Course	-.26	.06	-.15	-.08	-.11
Model F Value	1.57	2.72**	4.17***	2.36*	4.27***
R2	.25	.37	.49	.34	.49
ΔR2	.09	.24	.37	.20	.38

[a] n = 82. * *P<.05.* ** *P<.01.* *** *P<.001.*

In consideration of the previous ANOVA analysis results that students in flipped classroom sections reported a significant lower level of perceived teaching effectiveness than those students in the non-flipped classroom sections, and that there is no statistically significant differences in students' engagement in the course between the two round of surveys of the flipped classroom sections and between the flipped and non-flipped classroom sections, we conclude that students' participation in online modules accounts

for the main differences in students' perception of teaching effectiveness between the flipped and non-flipped classroom sections.

Students' Learning and Skills Development

To examine students' learning, we ran ANOVA analyses of the two rounds of survey data for flipped classroom sections (see Table 2). The ANOVA results indicate no statistically significant differences in students' perceived learning from the course ($F = 0.02; p > .05$), perceived learning from on-line modules ($F = 0.07; p > .05$), perceived learning from mini-lectures ($F = 0.10; p > .05$), self-efficacy ($F = 0.13; p > .05$), enthusiasm ($F = 2.09; p > .05$), and perceived fit of self learning style ($F = 0.25; p > .05$). This means that students' perceived learning, self-efficacy, enthusiasm and fit of self learning style did not change significantly after two months' study of the course in the flipped classroom setting.

To examine students' skills development, we further ran ANOVA analyses of the survey data for flipped classroom sections (Round #2) and for non-flipped classroom sections (see Table 3). The ANOVA results indicate no statistically significant differences in all students' learning and skills development variables except student's technology readiness ($F = 4.34; p < .05$). An examination of mean values further reveals that student's technology readiness in the flipped classroom sections was higher than that in the non-flipped classroom sections. This implies that the flipped classroom model does enhance students' ability to use technology (including Internet) for self-learning. Such a finding is reasonable because students in the flipped classroom are "forced" to study online modules every week and therefore are exposed to web-based technologies more often than those students attending a traditionally lecture-based class.

Taken all ANOVA results together, we concluded that the hypothesis (H1) is not supported; that is, the flipped classroom approach does not perform better than the traditionally lecture-based approach in motivating students' preparation and class participation, fostering students' engagement and satisfaction, improving course effectiveness as perceived by students, and enhancing students' learning, self-efficacy, enthusiasm, fit of self learning style, and skills development, though it does enhance students' technology readiness.

To explore the relationships of students' learning and skills development with students' preparation and participation, their attitudes and perceived teaching effectiveness, we ran two more analyses (i.e., correlation analysis, and the multiple regression analysis) of the survey data for flipped classroom sections (Round #2). Correlation analysis[2] reveals 24 five out of 60 significant correlations between students' learning and skill development variables and their preparation variables, ten out of 45 significant correlations between students' learning and skill development variables and their participation variables, 46 out of 60 significant correlations between students' learning and skill development variables and their attitudinal variables, and 155 out of 175 significant correlations between students' learning and skill development variables and their perception of teaching effectiveness.

We then ran the multiple regression analyses to explore how students' preparation and participation, students' preference, engagement and satisfaction, and students' perceived teaching effectiveness influence students' learning and skills development. Seen from Table 6, students' ***learning from the course*** is influenced positively by their preparation for mini-lectures as measured by the percentage of the materials for mini-lectures that students read prior to coming to class ($\beta = .42;\ p < .05$), by their participation in on-line modules as measured by the frequency that students participate in online discussions ($\beta = .28;\ p < .05$), and by their engagement in the course ($\beta = .40;\ p < .01$), preference of flipped classroom ($\beta = .23;\ p < .05$) and satisfaction with the course ($\beta = .28;\ p < .05$). Students' ***learning from on-line modules*** is influenced positively by their satisfaction with the course ($\beta = .41;\ p < .01$). Students' ***learning from mini-lectures*** is influenced positively by their engagement in the course ($\beta = .59;\ p < .01$), and their perception of the effectiveness of mini-lectures ($\beta = .47;\ p < .01$). Students' ***self-efficacy*** is influenced positively by their preference of flipped classroom ($\beta = .31;\ p < .05$) and satisfaction with the course ($\beta = .42;\ p < .01$). None of the research variables for students' preparation and participation, attitudes, and teaching effectiveness has significant effects on students' ***enthusiasm*** and on ***the fit of their learning style***. Moreover, students' ***skills acquisition*** is influenced positively by their participation in online modules as measured by the frequency they participate in online discussions ($\beta = .43;\ p < .01$).

Table 6

Multiple Regression Analyses of Learning and Skills Development (Beta and p-values)[a]

Variables	*Students' Learning from the Course*	*Students' Learning from On-Line Modules*	*Students' Learning from Lectures*	*Students' Self-Efficacy*	*Students' Enthusiasm*
Step 1					
Preparation for Online Modules (Time)	-.03	.07	-.01	-.15	.30
Preparation for Online Modules (Quantity)	-.14	.02	.15	.06	.29
Preparation for Mini-Lectures (Quantity)	.42*	.24	.25	.20	.06
Preparation for Mini-Lectures (Time)	.20	.08	.10	.17	-.09
Model F Value	3.44*	1.81	2.65*	1.26	3.78**
R^2	.22	.12	.18	.09	.23
ΔR^2	.16	.06	.11	.02	.17
Step 2					
Participation in Online Modules (Frequency)	.28*	.22	.17	.31*	-.06
Participation in Mini-Lectures (Frequency)	.02	.10	.18	-.11	-.05
Participation in Lectures (Frequency in Other Courses)	.16	.00	.16	.12	-.08
Model F Value	3.34**	1.55	2.87*	1.61	2.26*
R^2	.34	.19	.31	.19	.25
ΔR^2	.24	.07	.20	.07	.14
Step 3					
Students' General Learning Engagement	-.02	-.08	.00	.05	-.10
Students' Engagement in the Course	.40**	.32	.59**	.17	.12
Students' Preference of Flipped Classroom	.23*	.19	-.18	.31*	.19
Students' Satisfaction with the Course	.28*	.41**	.27	.42**	.30
Model F Value	18.25***	9.80***	5.54***	7.88***	3.72**
R2	.83	.71	.60	.67	.48
ΔR2	.78	.64	.49	.58	.35
Step 4					
Instructor's Teaching Effectiveness	.16	.25	.07	.29	.05
Effectiveness of Online Modules	.10	.18	.14	-.14	.07
Effectiveness of Mini-Lectures	.05	.16	.47**	-.01	.00
Model F Value	15.93***	11.70***	7.53***	6.47***	2.77**
R2	.85	.80	.74	.69	.49
ΔR2	.80	.73	.64	.59	.31

[a] n = 82. * *P<.05.* ** *P<.01.* *** *P<.001.*

Table 6

Multiple Regression Analyses of Learning and Skills Development (Beta and p-values; Cont'd)[a]

Variables	*Fit of Students' Learning style*	*Students' Skills Acquisition*	*Communication Skills Development*	*Problem-Solving Skills Development*	*Critical Thinking Skills Development*
Step 1					
Preparation for Online Modules (Time)	.09	.25	.04	.20	.06
Preparation for Online Modules (Quantity)	-.04	-.24	-.11	-.10	-.19
Preparation for Mini-Lectures (Quantity)	.34	.28	.17	.31	.17
Preparation for Mini-Lectures (Time)	-.11	-.08	.01	-.14	.19
Model F Value	1.24	1.18	.27	1.10	1.04
R^2	.09	.09	.02	.08	.08
ΔR^2	.02	.01	-.06	.01	.00
Step 2					
Participation in Online Modules (Frequency)	.16	.43**	.47**	.44**	.37*
Participation in Mini-Lectures (Frequency)	.06	.02	-.02	.00	.00
Participation in Lectures (Frequency in Other Courses)	.00	.13	-.02	.13	.04
Model F Value	0.91	2.70*	1.90	2.88*	1.76
R^2	.12	.30	.21	.29	.21
ΔR^2	-.01	.19	.10	.19	.09
Step 3					
Students' General Learning Engagement	-.27	-.06	-.16	-.16	.04
Students' Engagement in the Course	.35	.15	.14	.18	.48
Students' Preference of Flipped Classroom	.21	.31	.25	.37*	.09
Students' Satisfaction with the Course	.21	.25	.10	.15	-.11
Model F Value	4.43***	6.11***	2.56*	6.89***	2.28*
R2	.52	.62	.38	.63	.37
ΔR2	.40	.52	.23	.54	.21
Step 4					
Instructor's Teaching Effectiveness	.14	-.11	-.13	-.04	.13
Effectiveness of Online Modules	.29	.17	-.01	-.02	.11
Effectiveness of Mini-Lectures	-.01	.35	.29	.15	.34
Model F Value	3.97***	5.56***	2.07*	5.19***	2.41*
R2	.57	.67	.41	.63	.46
ΔR2	.43	.55	.21	.51	.27

[a] n = 82. * *P<.05.* ** *P<.01.* *** *P<.001.*

Table 6

Multiple Regression Analyses of Learning and Skills Development (Beta and p-values; Cont'd)[a]

Variables	*Analytical Skills Development*	*Decision Making Skills Development*	*Organization Skills Development*	*Team Building Skills Development*	*Technology Readiness Development*
Step 1					
Preparation for Online Modules (Time)	.18	.32	.02	.21	.14
Preparation for Online Modules (Quantity)	-.14	-.36	-.33	.11	-.16
Preparation for Mini-Lectures (Quantity)	.42*	.15	.21	.01	.33
Preparation for Mini-Lectures (Time)	-.06	-.07	.20	.03	-.06
Model F Value	2.27	1.47	1.30	1.34	1.10
R^2	.15	.10	.09	.09	.08
ΔR^2	.09	.03	.02	.02	.01
Step 2					
Participation in Online Modules (Frequency)	.28*	.39**	.38**	.44**	.29*
Participation in Mini-Lectures (Frequency)	-.17	-.02	.06	-.11	.06
Participation in Lectures (Frequency in Other Courses)	.31*	.11	.07	.03	.21
Model F Value	2.99*	2.42*	2.32*	2.55*	2.23*
R^2	.30	.26	.25	.27	.25
ΔR^2	.20	.15	.14	.16	.14
Step 3					
Students' General Learning Engagement	.04	-.15	.17	-.02	-.15
Students' Engagement in the Course	-.20	-.10	.14	.18	.23
Students' Preference of Flipped Classroom	.45*	.02	.04	.19	.16
Students' Satisfaction with the Course	.10	.45*	.37*	.10	.36*
Model F Value	2.94**	2.77**	3.62**	2.77**	6.53***
R2	.42	.40	.47	.40	.62
ΔR2	.28	.26	.34	.26	.53
Step 4					
Instructor's Teaching Effectiveness	-.20	-.34	-.23	.15	-.01
Effectiveness of Online Modules	.26	.41	.47*	-.01	-.07
Effectiveness of Mini-Lectures	.45*	.19	.18	.09	.07
Model F Value	3.19**	2.74**	3.72***	2.19*	4.82***
R2	.52	.48	.55	.42	.62
ΔR2	.36	.30	.41	.23	.49

[a] n = 82. * *P<.05.* ** *P<.01.* *** *P<.001.*

Specifically, students' ***problem-solving skills*** development is influenced positively by their participation in online modules ($\beta = .44;\ p < .01$), and by their preference of flipped classroom ($\beta = .37;\ p < .05$). However, none of the research variables for students' preparation and participation, attitudes, and teaching effectiveness has significant effects on students' ***communication skills*** development and ***critical thinking skills*** development. Students' ***analytical skills*** development is influenced positively by their participation in online modules ($\beta = .28;\ p < .05$), by the frequency that they participate in the other courses ($\beta = .31;\ p < .05$), by their preference of flipped classroom ($\beta = .45;\ p < .05$), and by their perception of the effectiveness of mini-lectures ($\beta = .45;\ p < .05$). Students' ***decision making skills*** development is influenced positively by their participation in online modules ($\beta = .39;\ p < .01$), and by their satisfaction with the courses ($\beta = .45;\ p < .05$). Students' ***organization skills*** development is influenced positively by their participation in online modules ($\beta = .38;\ p < .01$), by their satisfaction with the courses ($\beta = .37;\ p < .05$), and by their perception of the effectiveness of online modules ($\beta = .47;\ p < .05$). Students' ***team building skills*** development is influenced positively by their participation in online modules ($\beta = .44;\ p < .01$). Students' ***technology readiness*** development is influenced positively by their participation in online modules ($\beta = .29;\ p < .05$), and by their satisfaction with the courses ($\beta = .36;\ p < .05$). Taken together, students' participation in online modules is the most influential factors for students' learning and skills development by affecting significantly eight out of 15 variables, followed by students' satisfaction with the course that affects significantly six out of 15 variables, and by students' preference of flipped classroom that affects significantly four out of 15 variables. Moreover, students' preparation for online modules and mini-lectures together explain 16% of the variances in students' learning from the course, 6% of the variances in students' learning from on-line modules, 11% of the variances in students' learning from mini-lectures, 2% of the variances in students' self-efficacy, 17% of the variances in students' enthusiasm, 2% of the variances in fit of students' learning style, and 1% of the variances in students' skills acquisition. Students' participation in online modules and mini-lectures together explain 8% of the variances in students' learning from the course, 1% of the variances in students' learning from on-line modules, 9% of the variances in students' learning from mini-lectures, 5% of the variances in

students' self-efficacy, 0% of the variances in students' enthusiasm and in fit of students' learning style, and 18% of the variances in students' skills acquisition. Students' attitudes in terms of satisfaction, preference and engagement together explain 54% of the variances in students' learning from the course, 57% of the variances in students' learning from on-line modules, 29% of the variances in students' learning from mini-lectures, 49% of the variances in students' self-efficacy, 21% of the variances in students' enthusiasm, 41% of the variances in fit of students' learning style, and 33% of the variances in students' skills acquisition. Students' perceptions of different aspects of teaching effectiveness together explain 12% of the variances in students' learning from the course, 9% of the variances in students' learning from on-line modules, 15% of the variances in students' learning from mini-lectures, 1% of the variances in students' self-efficacy, 0% of the variances in students' enthusiasm, 3% of the variances in fit of students' learning style, and 3% of the variances in students' skills acquisition. To sum up, it can be concluded that students' attitudes in terms of satisfaction, preference and engagement explain a majority of the variances in students' learning outcomes in the flipped classroom setting. Hence, we concluded that the hypothesis (H2c) is partially supported. In the flipped classroom setting, students' preparation and class participation, attitudes in terms of engagement, preference and satisfaction, and perception of course effectiveness, have the moderate but positive impact on their learning and skills development.

Limitation and Future Directions of Research

Overall, the current study has three main limitations. First, the sample size for the flipped classroom is small (n = 82), so the results of the current study may not be representative and should be treated as exploratory. Future research should employ a larger sample to examine all research variables. Furthermore, the traditional educational environment looks at designing delivery methods that speak to the average students. The current study examined a sample that consists of a proportion of students with their first language not being English. We also acknowledge that students differ in learning styles and the levels of comprehension of knowledge. Hence, future research should include first language, learning style, and knowledge in OB as control variables.

Second, both students' learning and skills development take time. The current study collects data within one semester, which may not capture the changes in students learning and skills development. Future research should conduct a longitudinal study of the effectiveness of the flipped classroom over a number of semesters. A longitudinal study could also help explore the other potential effects of flipped classroom design, such as encouraging students' collaboration, relationship building, peer learning, and interaction with the instructor and classmates.

Third, the current study uses self-reported data to evaluate students' preparation and participation, perceived teaching effectiveness, learning and skills development. Except students' inputs, it is equally important to survey those instructors who teach or will teach in the flipped classroom setting. An effective flipped-classroom requires instructors' commitment of extra resources and time for preparing online materials (Simpson & Richards, 2015). Moreover, the instructors' ability to make meaningful connections between on-line modules and mini-lectures is critical to students' learning (Larson & Yamamoto, 2013). Hence, future research should examine the relationships between instructors' attitudes, commitment, knowledge and experiences and students' learning experiences and outcomes in the flipped classroom.

Conclusion

Although the flipped classroom model has received much attention in the higher education over the past ten years, its effectiveness is yet to be justified. The findings from the current study imply that the flipped classroom approach performs no better than the traditionally lecture-based approach in motivating students' preparation and class participation, fostering students' engagement and satisfaction, improving course effectiveness as perceived by students, and enhancing students' learning, self-efficacy, enthusiasm, fit of self learning style, and skills development. However, this new approach does help students develop their technology readiness. In the flipped classroom setting, students' preparation for online modules influences positively their class participation. Moreover, students' preparation and class participation, and their attitudes in terms of engagement, preference and satisfaction, have the moderately positive impact on their perception of course effectiveness, which further influences positively their learning and skills development.

Note:

1. ANOVA analysis results will be provided upon request.

2. Correlation analysis results will be provided upon request.

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