

Comparing the Effects of Flipped Classrooms and Traditional Lectures on Students' Critical Thinking Dispositions in Family Education Courses

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One of the principal purposes of the family education course (FEC) in Taiwan is to promote students' critical thinking. Flipped Classroom is a modern active learning strategy which could guide students to understand and use concepts. The study developed and evaluated 8-week courses aimed at comparing the effects of the Flipped Classroom (FC) and traditional lecture (TL) on Taiwan students' critical thinking disposition in FEC. A quasi-experimental design, with an experimental group of 35 students and 32 students in the control group, was used to estimate the impacts of educational interventions. Pre- and post-tests were managed for both groups. Students in the experimental group participated in a FC course. These results showed that the FC group students who received the interventions significantly improved their critical thinking ability as assessed by their Critical Thinking Test (CTT), Critical Thinking Disposition (CTD) scores and the fact that the effects of instructional strategies on CTD was statistically significant. This study's findings also indicated the positive effects of the FC on students' critical thinking skills and dispositions. Analysis of the student focus group interviews also showed that the experimental group learned how to have the ability, methods and skills to think about the families' problems using critical thinking from the course. Each student's expectation for their future family could also be more clearly presented.

Key words: *Flipped Classroom (FC), Family education course (FEC), Critical thinking.*

Introduction

Under the impact of globalisation and technology, families change rapidly. The Taiwanese government regards family policy as the cornerstone of national competitiveness. With the world's first family education law in 2003, it provided for the promotion of family education.

In the eleventh school year, Home Economics Groups in vocational high schools offer a compulsory family education course; a total of four credits. Its main purposes are to make students understand the connotation of family education, arouse their interest in learning family education-related issues, and construct healthy marriage and family values.

Critical thinking is one of the basic skills for learning family education. The family education course (FEC) sets many problems about value building, judgment and choice. These are important for improving critical thinking together, with the quality of family life.

Critical thinking has two main components; critical thinking skills and critical thinking disposition (CTD) (Ennis, 1987). There is a significant, positive correlation between CTD and critical thinking skills (Profetto-McGrath, 2003). Two key requirements for promoting critical thinking promotion through FEC are students' active involvement in teaching-learning processes, and teachers' ability to stimulate their critical thinking. Teachers should act as facilitators for students' critical thinking, instead of simple information suppliers (Nelson, 2017).

Flipped Classroom (FC) is a modern active learning strategy. It has become increasingly popular in recent years. The fundamental purpose of this instructional approach is to enable a more effective use of time inside the classroom, with teachers being available for immediate feedback and assistance (O'Flaherty & Phillips, 2015). One of the strategies is to deliver lecture content outside of the classroom through videos (Abeysekera & Dawson, 2015). With some basic knowledge acquired before class, the students can then devote more in-class time to active learning exercises such as collaborative problem-solving, team-based discussions, debate, questioning, role-playing, writing or student presentations (Horng Jeou Shyan et al., 1998; O'Flaherty & Phillips, 2015), which can be advanced with a teacher's guidance.

The study aimed to compare the effects of Flipped Classroom and traditional lectures on Taiwan students' critical thinking in FEC.

Literature

Related research on Flipped Classroom

In recent years, the concept of “Flipped Classroom” has been attracting attention in the field of teaching, all over the world. Flipped Classroom is a student-centred original thinking, and its main purpose is to meet the learning needs of individual students and improve the value of the classroom (Bergmann & Sams, 2012).

The Connotation and Assessment of Critical Thinking

The concept of critical thinking includes clarifying, building the foundation for inferential inference, and the ability to infer and apply strategies (Norris & Ennis, 1989). Previous studies reported that FC has increased students’ marks, promoted their collaborative learning and teamwork, encouraged their motivation in learning, and improved their critical thinking (Njie-Carr et al., 2017).

The existing reviews of such studies (e.g., Lo & Hew, 2018; O’Flaherty & Phillips, 2015; Seery, 2015) have generally suggested that this instructional approach is at least as effective as the traditional lecture-based format, in terms of student achievement. Although some studies reported no score difference between FC and traditional courses, other studies proved that FC can significantly improve both non-knowledge and knowledge ability. However, it is worth noting that most of these reviews have focused on higher education. Few studies have compared flipped classrooms in vocational high schools. Given this lack of empirical evidence, the present study compares the effects of FC and TL on students’ CTD in Taiwan, as well as the promotion of their learning achievement test (LAT). The practical aim of the study was to improve Taiwan students' critical thinking, thereby improving their ability to fulfil the needs of family life (Jabarullah et al., 2020).

Methods

Design

This quasi-experimental study was done in 2019 using a non-equivalent control group pre-test, post-test design. The learning situation was supplemented by group interviews.

Setting and Participants

The research objects were second-year students of the Department of Child Care, in a vocational high school in central Taiwan. To avoid unduly influencing the school’s operation



and normal teaching, without changing the class and school time, the students of two classes of the FEC taught by the researcher were divided into groups, to carry out experimental teaching research. As to the background of the student participants, the classes were divided randomly by the school's office of academic affairs from first-year. To avoid the Hawthorne effect and the John Henry effect, the students in both the experimental group and the control group were informed of the experiment during its course.

The experimental group (FC) was 35 in number, and the control group(TL) numbered 32. The FC students had mobile phones or computers, Internet access, and could browse Google classroom electronic courses.

Intervention

The study intervention was to teaching the Social Changes and Family units in FEC, for the students in the FC and TL groups using FC and TL, respectively. The course was run for both groups in 100-minute, once-a-week sessions, for 8 weeks. The instructor of both groups was the same. Moreover, students in both groups were referred to the same textbook and were provided with the same course syllabus. At the beginning of the intervention, the overall and the daily syllabuses were provided to students in both groups.

For FC, the instructor recorded the lecture of each session, and provided the recordings together with PowerPoint presentation slides and short video clips related to the content of each session on the Google Classroom website. They ranged from 15 to 19 minutes (Table 1).

Table 1: PPT and Video Contents for FC

Week	PPT Topic	Video Topic	Total Length
1	Introduction for the syllabus		
2	The Changing of family	Changing Batteries	15: 33 min
3	Typical family, single parent family, reconstituted family	My mother struggled alone	13: 25 min
4	Foreign marriage family, dual careers family, and intergenerational parenting family	The story of the new immigrants	18: 28 min
5	Special children family, two places family, adoptive family	Grandparents take it easy	14: 57 min
6	Cohabitation family, Gay family	Gay's family story	13: 58 min
7	Family values in transition	Make a promise, protect the home together	14: 55 min
8	An introduction to the Singapore system debate		

FC students learned the contents before class and answered five core multiple choice questions on Google Forms. At the beginning of each session, FC group students were randomly arranged to small 4-6 student groups in which they could see each other face-to-face, to improve their teamwork and communication skills. Then, teachers explained the pre-class questions. After that, the students conducted group discussions, debates or role-playing activities, group presentations. At the end of class, the group cooperated to complete the learning sheet (Table 2). For TL, the teacher used oral presentations or screen demonstrations to lecture the PPT, videos and other teaching materials in the class. At the end of each section, students needed to answer five core questions.

Data Collection

In this study, a learning achievement test and the "Critical Thinking Test (CTT)", "Critical Thinking Disposition (CTD) Scale" and the "Learning achievement test(LAT)" were used as the measurement tools for the pre-test and post-test. The qualitative data were analysed by the researchers, and the teaching activities were observed and recorded. The learning situation is supplemented by group interview records.

Table 2: Issues and active contents for FC

Week	Issues	Active content
1	No	Research tool pre-test
2	The 102 - year - old dad	group discussion, learning sheet
3	Single parent families can also have good parenting	group discussion, role-playing activities
4	Superwoman is my enemy	group discussion, role-playing activities
5	Little stars in the heart	group discussion, learning sheet
6	Same-sex marriage of a 24-year-old Taiwanese boy and a 75-year-old British man	group discussion, debate, learning sheet
7	Is it ok to live together before marriage?	Singapore system debate
8	Issues presentation	group presentations, Research tool post-test

Critical Thinking Test (CTT)

The CTT scale was developed by Yeh Yu Chu, Yeh Pi Ling, & Hsieh Chia Chen (2000), for the local critical thinking ability test, for primary and secondary schools. It consisted of 25 questions. The total scores were 25 points. The higher the score, the stronger the critical thinking would be. The test was limited to 20 minutes. In terms of reliability analysis, the total test Cronbach's alpha values were 0.76(Yeh Yu Chu et al., 2000). This study performed a reliability test of this scale with a Cronbach alpha values of .791. It had a good reliability.

Critical Thinking Disposition (CTD) Scale

CTD refers to the attitudes beneficial to critical thinking. The scale items were scored on a Likert-type scale with six points, ranging from 1("almost never") to 6 ("always"). It consisted of 20 questions. The students circled the number according to their actual situation. The test time was not limited, but it was about 10 minutes.

The higher the score, the better the tendency for critical thinking. As to reliability, the Cronbach's alpha values of the scale were .88(Yeh Yu Chu, 1999). This scale was tested for reliability, revealing a Cronbach alpha value of .685; it had an acceptable reliability.

Learning Achievement Test (LAT)

The achievement test in this study refers to the students' scores in the FEC test. Both before and at the end of the teaching unit, student achievement in cognitive learning was assessed by

tests. The higher the test scores at the end of the course, the better the learning effect. The test paper was compiled by the researcher, and then assisted by three other teachers of the FEC in the same school who assisted in reviewing the questions. The test paper was used as the pre-test and post-test. The test difficulty and details were designed according to the course content.

There were 10 difficult questions, 20 questions of medium difficulty, and 10 easy questions. In accordance with Bloom's Cognitive Domains, there were 12 knowledge questions, 18 understanding questions, five application questions, and five analysis questions. The total test contained 40 questions, with 2.5 points for each question, giving a total score of 100 points.

Focus Group Interviews

In the study, the eight participants were given the researcher-designed, semi-structured interviews titled "Students' Perspectives on a FC" compiled by the researcher. The interview questions were sent to three specialists, to ensure construct validity. They consisted of nine open-ended questions. Data from the participants were organised as themes and codes which were then analysed by means of descriptive analysis. The results presented in percentages and frequencies were also supported by the thoughts of participants. Open-ended questions used in focus group interviews addressed: Did they understand the pre-class videos? Do they like the Flipped Classroom model? Do they like the learning sheets used in FC? Do they like the learning sheets used in FC? Do they like the debates used in FC? Do they like the group discussions used in FC? Do they like the group discussions used in FC? Do they like the role-playing activities used in FC? Do they like the group presentations used in FC? Do they apply the thinking skills in future family life?

Data Analysis

The collected data were analysed using the SPSS software (v. 20.0), and via the descriptive statistics measures (including frequency distribution, mean, and standard deviation) and statistical methods (including paired-sample t-test, independent-sample t-test, and the one-way ANCOVA). There were insignificant ($P > 0.05$) in the distribution of critical thinking ability between groups, and then covariate analysis. The level of significance was set at <0.05 . Students' answers to the open-ended questions in the group focus interviews were also analysed through categorisation. The interview content of the qualitative data according to the theory as a conceptual classification code, and then the classification result, was interpreted, reviewed and revised.

Results

The results of the study showed that before the intervention, there were no significant differences between the groups, in terms of the mean CTT scores. Similarly, these mean scores did not significantly change in the TL group during the study. However, the mean scores of overall CTT significantly increased in the FC group. Accordingly, the independent-sample t-test indicated that after the intervention, the mean scores of overall CTT in the FC group were significantly greater than the control group (Table 3).

Table 3: Between- and within-group comparisons regarding the mean scores (SD) of CTT.

CTT	Group	Pre-test		Post-test		
		M	SD	M	SD	P value ^b
Overall CTT	FC	17.46	3.54	18.71	3.42	0.15
	TL	16.47	3.74	17.00	3.50	0.246
	P value ^a	0.217		0.047		

^a The independent-sample t-test.

^b The paired-sample t-test.

The results showed that before the intervention, there were no significant differences between the groups, in terms of the mean scores of CTD. Moreover, the paired-sample t-test showed these mean scores did not significantly change in the TL group during the study. However, the mean scores of overall CTT significantly increased in the FC group. Accordingly, the independent-sample t-test indicated that after the intervention, the mean scores of overall CTD in the FC group were significantly greater than the control group (Table 4).

Table 4: Between- and within-group comparisons regarding the mean scores of CTD

CTD	Group	Pre-test		Post-test		
		M	SD	M	SD	P value ^b
Overall CTD	FC	88.37	10.71	92.54	12.04	0.029
	TL	85.28	12.34	82.59	11.53	0.104
	P value ^a	0.277		0.01		

^a The independent-sample t-test.

^b The paired-sample t-test.

Covariance analysis of variance was used to evaluate the effects of instructional strategy (FC and TL) on CTT and CTD. The study showed that the effect of overall CTT was not statistically significant (Table 5), while the effect of instructional strategy was statistically significant on overall CTD (Table 6).

Table 5: Summary of covariance analysis of CTT for the FC and TL Groups

Source	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>p</i>	η_p^2
Overall CTT Pre-test	384.91	1	384.91	62.80	.000	.495
Groups	18.20	1	18.20	2.97	.090	.044
Within Groups	392.22	64	6.12			
Total	826.26	66				

Table 6: Summary of covariance analysis of CTD for the FC and TL Groups

Source	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>p</i>	η_p^2
Overall CTD Pre-test	3588.89	1	3588.89	42.05	.000	.397
Groups	1038.61	1	1038.61	12.17	.001	.160
Within Groups	5461.51	64	85.33			
Total	10705.07	66				

In other words, the mean scores of overall CTT, and overall CTD in the FC group, were significantly greater than the TL group, and the effect of instructional strategy on CTD was statistically significant. However, the effect of instructional strategy on overall CTT was not statistically significant.

The results of the independent-sample t-test showed that before the intervention, there were no significant differences between the groups in terms of the mean scores of LAT. But, the paired-sample t-test showed that the mean scores of the FC group and TL group significantly increased (Table 7). Accordingly, the independent-sample t-test indicated that after the intervention, both the experimental group and the control group had made significant progress.

Table 7: Between- and within-group comparisons regarding the mean scores of LAT

	Group	Pre-test		Post-test		
		M	SD	M	SD	P value ^b
LAT	FC	64.63	8.71	81.41	11.56	<0.0001
	TL	61.55	8.57	80.86	10.19	<0.0001
	P value ^a	0.15		0.836		

^a The independent-sample t-test.

^b The paired-sample t-test.

Students talked about their experiences, which are summarised and organised as themes and codes in Table 8.

Table 8: Summary of themes and code of the focus group interview

Theme	Code	Frequency	Percentage
Pre-class PPT & videos	Understand	6	75.0
	Don't understand	2	25.0
Flipped Classroom model	Yes	6	75.0
	Partially	2	25.0
Learning sheet	Yes	8	100.0
Debates	Yes	7	87.5
	No	1	12.5
Group discussions	Yes	7	87.5
Applying the thinking skills	Yes	8	100.0
	Partially	1	12.5

The summary of the interviews which presented with Students' Statement as Table 9.

Table 9: Summary of the focus group interviews

Questions	Students' Statements
Pre-class PPT & videos	<i>S1: "The issues in the film will be integrated with our own experience."</i>
	<i>S3: "PPTs and videos are easier to understand than a book."</i>
Flipped Classroom model	<i>S3: "I had a better impression of the content of the course and was more willing to participate in it."</i>
	<i>S4: "I understood it better and grasped the key points better."</i>
	<i>S7: "It takes time to organise the content."</i>
Learning sheet	<i>S2: "You can integrate the key points in class."</i>
	<i>S4: "I can rearrange my thinking to make myself more aware of the course."</i>
Group discussion	<i>S1: "You can hear different ideas."</i>
	<i>S7: "You can combine different ideas with other people's opinions."</i>
Applying the thinking skill	<i>S3: "I can have more ideas to face the family problems."</i>
	<i>S5: "With methods, I have more confidence to face the future family life."</i>
	<i>S6: "I will have a happy family life after applying thinking skills"</i>

Discussion

Study findings showed significant increases in the mean scores of overall CTD in the FC group. These findings implied the effectiveness of FC in promoting students' CTD and, thereby, critical thinking skills. These findings could be imputed to the fact that FC combines active student-centred and self-directed learning, uses different educational techniques, and promotes face-to-face relationships between teachers and students (McDonald and Smith, 2013). Our participants noted that FC has advantages such as more interesting and more deep learning and retention, as well as student-centred learning. Similarly, students who had participated in a previous study reported that listening to recorded lectures before each lesson, carrying out practical classroom activities, and using the learned concepts in practical situations, effectively promoted their learning and deep thinking (Hanson, 2016).

When considering the students' workload before class, an empirical study (Vazquez & Chiang, 2015) has suggested that the tolerable length of all video clips per class is about 20 minutes for each flipped lesson. In addition, the study was conducted on a small sample of



students, in a single course of vocational high school; thus, findings may have limited generalisability.

Conclusion

This study indicated that FC promotes students' CTT and CTD. FC actively involved students in learning activities both before and during classes, while TL has no significant effects on CTT and CTD. Teachers could enhance the effectiveness of FC by providing electronic contents to students. Further researches are needed to produce more reliable results.



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