

ACTION STUDY OF FLIPPED LEARNING IN A SPECIAL CLASSROOM IN A VOCATIONAL HIGH SCHOOL

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Abstract - Students with special education needs face difficulties in self-learning and learning with classmates. This action study used a flipped learning math course in a special classroom in a vocational high school to improve self-learning and increase discussion between students. The participants were 14 students with special education needs who attended a vocational high school in New Taipei City. The major findings of this study are as follows: (1) students who previewed the classroom content by themselves showed improved post-test scores, and (2) improvement was observed in students who were divided into different groups based on their learning abilities for within-group discussions. This study also suggests some flipped learning strategies for students with special education needs and provides future research directions.

Keywords - Flipped learning, Action study, Students with special education needs

I. INTRODUCTION

1.1 Students with Special need

For math learning in special education, a teacher had to fulfill the need of students with different abilities. Students with special needs in special education of vocational high schools have difficulty in cognitive learning. In school day, it is not enough time for teacher to complete all the need of students. Duval(2006) many students had difficulties with comprehension of mathematics. Students with special needs have problems on cognitive learning, so they met difficulties in math.

In traditional classrooms, a teacher used didactic teaching to teach math, and it was hard to fulfill the special needs. Otherwise, students did not have a chance to review what they learned or self-learn at home. In order to help students with special needs, teacher would use digital device or materials to help them. Burton et al. (2013) used video-based interventions that helped students with disabilities to learn important academic and functional skills. It is important to use assistive learning products to help students with special needs such as digital equipment and digital learning material. Fernández-López et al.(2013) used mobile learning technology to support students with special education needs to improve their skills of language, math and social.

1.2 Flipped learning for students

In order to inspire students could fulfill self-learning and learn effectively, the flipped classroom is the good way to change the traditional classroom. The flipped classroom has been the educational innovation trend, and it emphasizes the use of teaching media self-learning and the discussion in the classroom. Bergmann and Sams (2012) stated the flipped classroom was focus on student-based learning and mastery learning. Flipped classroom emphasis student-based learning by digital media

before classes. In the classroom, teachers played roles of coach who help students by discussing with classmates and solving questions. The key point of the flipped classroom is preview before class. Halili(2014) stated the learner got improvement on learning by watching lectures videos outside the classroom. Students can learn by video anytime and in any places. Zhang et al. (2006) stated that students had better learning performance from the interactive video. Through videos, students can not only preview and review, but also solve their learning problems and make notes. Students viewed videos on an iPad that helped them to solve mathematical problems (Burton et al., 2013).

The other important part of flipped classroom is discussion in class. Because most of students do self-learning before the class, there are more spare time for discussion in classroom. Bishop et al. (2013) stated the flipped classroom had become useful because of having discussion in class. In order to help students can discuss in class, teacher need to divide students to sever groups and lead them to have discussion. Herreid and Schiller (2013) stated that interactive classroom actives are necessary in flipped classroom. Students can discuss with classmates, and teachers can help students solve problems.

1.3 An action study in math

In Taiwan, the flipped classroom has been widely used in a normal classroom. Hwang and Wang (2015) used a mobile technology device with learning strategies to build the flipped classroom. While in special education in Taiwan, the flipped classroom includes self-learning and discussion are seldom mentioned. As a teacher in special classroom at a vocational high school, I would try to take practice the flipped classroom in my math class. I used an action study and tried to modify strategies, I hope I could help students do self-learning in math and have more discussion in the classroom.

1.4 Purpose

The purpose of this action research study was to evaluate the effect of a flipped classroom model in a math class in the special class at a vocational high school. It evaluated the effect of “preview before class” and “discussion in classroom” which were key points of a flipped classroom. It conducted how did a teacher do and modify the teaching way to practice the model of flipped learning in special classroom in high school of Taiwan. The effect of preview before class in a flipped classroom of special education. The effect of discussion in a classroom in a flipped classroom model of special education.

II. METHODS

2.1 participants and design

There were 14 students in this flipped classroom. They were 16 years old students with intellectual

disabilities. They had different abilities of math learning, according to the learning effects from the last semester. In the purpose of the study, we used the flipped learning in the classroom and took an action study. In order to determine the effect of flipped learning, we used pre-tests and pro-tests. We also used a questionnaire to collect the data from students and parents. Otherwise, through video observation that help us to understand how did the teacher interact with students in the flipped classroom.

2.2 learning material

I used our school textbook for students in the special class. There were seven units in the textbook, and the design of math learning context was useful that students could use it in their dairy life. I tried to build the flipped classroom in math class according to teaching progress

Period	Teaching Unit	Flipped learning and Research
Trial period	Unit1-Multiplication Unit2-Division Unit3-Comprehensive application	Introduction and Research consent Ask for expert opinions Preview-Video learning Discussion-heterogeneous grouping
Duration period	Unit4-Productleaflets (Price operation) Unit5-Calendar (Calculate the date)	Collect opinions form students and parents Write teaching daily and find strategies to solve problems
Completion period	Unit6-Calendar (Calculate the date) Unit7-Clock & watch (perception time)	Analysis the date and finish the study

Table 1 - Teaching and research progress

I made lecture videos and put them on YouTube, so students can search them easily. Besides, I built the Facebook club where I could put the link of the videos and discuss with students after class.



Fig1:Lecture Video



Fig 2:The Facebook Club of The Flipped Classroom

2.3 Date collection procedure

The method of this study was an action study that

used the flipped learning to solve the problems of learning motivate and improve learning effects. According to research problems, we used pre-tests and pro-tests to understand the effects of the preview before class and discussion in class. In the preview class, students were asked for pre-tests. Students preview (videos and textbooks) before class, and they participate in discussion in class. When they finish learning of units, they did the pro-tests. Otherwise, we used questionnaires after three examinations and collect options of the flipped learning for math. In order to understand how teacher take practice the flipped classroom and find strategies to help students participates in preview and discussion, we used the “teaching daily record” and “video observation”.

2.4 Date analysis

T-tests analyze

The analysis used the SPSS statistical software package. We used the paired-samples T Test to analyze the effect of pre-tests and pro-tests.

Qualitative information

We collected information from students and parents. For students, we want to know their feedback and difficulties of learning. For parents, they would give feedback of their children at home.

Teaching dairy record

In the study, we collect teaching daily record and encoded that according to action study, which concluded questions, strategy and effectiveness.

Video observation

In the classroom, we made the video of the discussion. In the videos, we captured the key points and make them records. After recording, we encoded that according to action study as a teacher dairy record.

Reliability and Validity Analysis

In order to improve the reliability and validity, I asked the experts for help. In the beginning, I asked the digital learning professor for advice on my project. In order to make my pre-tests and pro-tests properly, I request the math teacher who had more than ten-years of teaching. Otherwise, I apply for the homeroom teacher as a peer inspection to help me

correct my observation analysis.

III. RESULTS**3.1The effect of flipped classroom**

Each test meant different learning contents. The average of protests were all higher than pretests. From the average value, the scores of pro-tests were higher than pre-tests. In standard deviation, the pre-tests were less than pro-tests. There were no difference between pre-tests and pro-tests from Test1, Test2 and Test3 ($p > .05$). From Tests3 to Tests10, the grades were different from Test4 to Test10 ($P < .05$). Students got improvement from the pre-tests and pro-tests. They could learn math by preview before classes and discussion with classmates. Students got better grades by the flipped learning, which included the preview of the videos and the discussion in the classroom.

Item	Average	N	Standard deviation	T	P
Test 1	Pretest	7.786	2.0448	-1.991	.068
	Protest	8.571	1.5046		
Test 2	Pretest	9.500	1.0919	.268	.793
	Protest	9.429	.5136		
Test 3	Pretest	7.000	2.5720	-1.924	.077
	Protest	7.786	2.4236		
Test 4	Pretest	5.071	2.5560	-10.691	.000*
	Protest	7.857	1.8752		
Test 5	Pretest	6.000	2.8555	-5.078	.000*
	Protest	8.357	1.4469		
Test 6	Pretest	6.143	1.7913	-5.377	.000*
	Protest	8.000	1.5689		
Test 7	Pretest	7.143	1.3506	-11.015	.000*
	Protest	9.143	.9493		
Test 8	Pretest	6.000	1.8811	-7.293	.000*
	Protest	8.143	1.2924		
Test 9	Pretest	5.571	2.2775	-8.446	.000*
	Protest	7.714	1.8157		
Test 10	Pretest	6.000	2.2532	-11.720	.000*
	Protest	7.929	2.0178		

* $P < .001$

Table 2 - T-test (Paired-Samples T Test)

3.2 Problems and strategies

In order to solve the problem of motivation, I built the flipped classroom and made learning videos for students. At first, the flipped classroom was an interesting way for students. They felt interesting about the teaching video made by their math teacher. However, students did not know how to learn math from the video, I had to teach them how to press stop and make key notes. Furthermore, some students did not watch videos before class, and I thought it wasted our time to replay videos. I tried to divide students into different groups. The students who did not preview could learn from video, and the others who had previewed could keep the next learning.

The discussion was the important part in my flipped classroom. At first, students' different ability of math, so I choose the heterogeneous grouping and guide students could learn from each other. Students liked to get in group with classmates that they can discuss with each other. However, students did not understand how to focus on discussing topic sometimes, I appointed the question and conduct them to make meaningful discussion. In addition, I found some students who had finished their assignments need to wait classmates in the same group. In order to master their learning, I gave them extra advanced teaching material and they could learn more instead of waiting and wasting their time in the classroom.

3.3 Feedback

The feedback came from students and parents helped me how to modify my teaching and research. I want to try my best to help students participate in previewing before class and discussion in class. Some students previewed by video and textbook, while some students did not watch the videos because of personal reasons. I would check if they preview before class and divided them to different groups. Through the feedback from students, I could modify my teaching video and I knew they learned the skills of learning from videos.

The feedback of discussion for students was inspiring me to help them learn more in class. Students learned not only by themselves, but also by classmates and the teacher. For some students who did not like to discuss with classmates would have more chances to learn how to help classmates in groups. In discussion, students learned how to solve problem, interact with classmates and understand what the other said.

Parent involvement has been the important part in special education. I got significant feedback from the student's parents. When students at home, their parents would know if they preview or not. Some parents who thought their children got improvement in math had the positive attitude toward future learning. I tried to encourage parents to participate in students' learning, and they could see the improvement from their children.

IV. DISCUSSION

In the study, I took an action study of flipping learning in my math class. For students, it was the first time for them to use the way to learn math. As a teacher, I did change my teaching way and return the learning right to the students. Students could do self-learning by videos and textbook before class. In class, it was busy and active for students and the teacher. Like the flipped learning in the study, the teacher tried to use the the flipped-mastery model and help students to master learning objectives (Bergmann & Sams, 2014). Every student in class had their own purpose of learning, including doing their task, discussing with classmates and asking questions for the teacher. The surrounding feeling in the class had become different and students become motivated and willing to think when they learned.

4.1 The effects of preview and discussion in flipped classroom

Students would get improvement when they did preview before class. Students could preview by video and textbook, while they learn better from the video as the previous study (Zhang et al., 2006). For students with special needs, they can learn more through video-based interventions (Burton et al., 2013). Through videos, students could prepare new units and review the lessons. Otherwise, the students have difficulties in math learning, they could use video to learn more times. Flipped learning helps teachers use teaching videos based on student-centered approach instead of direct instruction as their primary teaching (Sams & Bergmann, 2013). However, some students did not preview by the videos regularly. The content of videos should be made attractive and interactively, and students need to learn how to do self-learning from videos.

Students in the classroom could learn according their steps and discuss with classmates and the teacher to solve problems, as the flipped classroom that was focus on student-based learning and mastery learning (Bergmann & Sams, 2012). In discussing groups, students learned how to ask questions and gave the answers. Halili (2014) stated the learner got an improvement on learning by conducting interactive discussion in the classroom.

4.2 The support for students participate in flipped classroom

The support for students to involve in flipped classroom was necessary. In previews, teachers should guide students how to use video to learn by themselves and make notes. In the classroom, teachers need to divide students into different groups, lead them to discuss and solve their personal problems. As the study mentioned that teachers and students to take best advantages of time in flipped classroom (Sams & Bergmann, 2013). Moreover, teachers in flipped classroom should consider about

the student's strengths, needs and interests to increase student motivation in flipped classroom (Villanueva, 2016). When teachers supported students to involve in flipped classroom and change the traditional learning way, students would give feedback to teachers. As the research, teachers could make changes to improve instruction by the feedback from students (Villanueva, 2016).

4.3 Recommendations for future research

This study was an action study in the math class of special classroom. Through the progress of flipped learning, it showed how the teacher took strategies to help students participate in class and solve the problems. It was the start of flipped learning taken used in special classroom in Taiwan. Students could do self-learning and discussion if they got support from teachers. In the future study, the flipped learning could be widely used in different subjects in special classrooms. Moreover, the flipped learning could be taken at different ages of students with special needs. Otherwise, in order to meet the special needs of students, the types of flipped learning should be adjusted.

CONCLUSION

It was an action study of flipped learning for special students in math class. The teacher helped students preview by video or textbook as self-learning before class. The lecture videos could help students to learn and make notes by themselves. Besides, the discussion is the important part in flipped classrooms. Students can discuss with classmates and teachers to finish their task and solve personal problems. Teachers play an important part in discussion and lead students help each other to finish assignments. The feedback from teachers, students and parents in flipped learning help

teacher to adjust their teaching strategy to fulfill the special needs of students.

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