

MDP12

Flipped Classroom to Improve Students' Understanding in a Research Methodology Class in a Public Higher Education Institution

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Abstract. As novice researchers, postgraduate students in a Masters in education program are required to take a research methodology course in which the characteristics, design, and methodologies of different types of research are examined. There is a tremendous amount of information and a large amount of readings to be done, and most students finding difficulty in understanding the different research methods well. In this study, an exploratory implementation study is done to determine if a Flipped Classroom model could be implemented in a research methodology class to address this issue and to increase quantity and quality of interactions for improving learning. The study employs a design and developmental approach to investigate the possibility of implementing this design among 10 volunteers. Data from interviews, observation, as well as pre and post tests were collected to determine if this model could be implemented on a larger scale. This is a preliminary study and the findings cannot be generalized. However, this research may still provide insights on the implementation of Flipped classroom, and enable researchers to determine the possibilities for it to be extended to other subjects.

Keywords: Flipped classroom, Design and Developmental Research, exploratory implementation study, research methodology course

1. Introduction

Novice researchers in public higher education institutions are required to take an introductory research methodology course in order to be familiar with the various research designs. This is to enable researchers to conduct research using appropriate methodology consisting of suitable data collection procedures and analysis, according to purpose and design of the research. However, research has shown that novice researchers have misconceptions on

the different research designs even after attending an introductory research methodology course (Henson, Hull & Willi, 2010; Cochran-Smith, & Zeichner, 2005; Murtonen & Lehtinen, 2003; Leininger, 1992). Novice researchers have difficulties in reporting research appropriately according to the research design (Henson, Hull & Willi, 2010; Cochran-Smith, & Zeichner, 2005) and linking theory with practice (Murtonen & Lehtinen, 2003), as well as seem to lack interest in learning the different research methodologies (Cochran-Smith, & Zeichner, 2005; Murtonen & Lehtinen, 2003; Leininger, 1992). In addition, novice researchers tend to prefer to focus on traditional research methodologies and do not seem to want to learn newer and more advanced research methods (Henson, Hull & Willi, 2010). They also seem to lack skills for conducting relevant research (Miller, Drill & Behrstock, 2010) and designing robust research designs (Reunamo & Pipere, 2012; Burkhardt & Schoenfeld, 2012). Hence, novice researchers should be given the opportunity to practice research and critically read research papers (Cochran-Smith, & Zeichner, 2005).

Educational research courses should be structured to encourage collaboration and reflection in research practice (Cochran-Smith, & Zeichner, 2005). More time should be focused on the delivery of knowledge and relating theory to practice in order to correct misconceptions. Researchers have suggested that a practical approach for instruction personalized to the learner in order for novices to be familiar with different research designs (Cochran-Smith, & Zeichner, 2005). Research should be relevant and suitable with the current advances in the field (Henson, Hull & Willi, 2010; Miller, Drill & Behrstock, 2010). Novice researchers also need to be motivated in learning and in conducting responsible research, and this may be done through research structures that encourage collaboration and team work (Cochran-Smith, & Zeichner, 2005). The instructor should allow students to be critical when reading research and to challenge findings of other researchers (Cochran-Smith, & Zeichner, 2005). In addition, instructors should encourage reflection in research practice (Cochran-Smith, & Zeichner, 2005).

However, there does not seem to be sufficient time in a research methods class to cover the above aspects in the course. It has been suggested that information and communications technology may be a solution. Discussion forums and online assignments have been used for teaching research methods in order to evaluate knowledge and skills, and giving feedback to improve performance (Stocks & Freddolino, 1999). As online resources, example

videos, could be developed easily and delivered to students anywhere, learning could be done at the students own pace, and using different strategies (Davies, Dean & Ball, 2013; Khan 2012). Online resources may also include podcasts and articles, which should be accessed before the class, allowing the face-to-face class time to be more interactive (Davies, Dean & Ball, 2013).

The flipped classroom (FC) approach, where students view online resources before the class, may be able to address the issue of lack of time to deliver the vast amount of knowledge and skill required in a research methods course. Online materials can be viewed before class, and the class time can employed more as a workshop to enquire about lecture content and test their skills in applying knowledge (EDUCAUSE Learning Initiative (ELI), 2014). In addition, where the traditional teacher-centered classroom is passive and instruction is delivered to the level of the average student in the classroom, the FC caters to the individual students, thus making learning active and personalized to the learner (Davies, Dean & Ball, 2013). In this way learners are more confident of the learning and become independent learners (Enfield, 2013).

2. The purpose of the study

This study is an exploratory case study on the implementation of the FC approach for a postgraduate research methods class in a Masters in education in a public of higher education institution in Malaysia. Online materials in the form of screencast videos would be developed and vodcast for 5 lectures on a series of topics on different research methods. The approach and the perceptions of the students would be evaluated in order to answer the following research questions:

- What are the students' perception on the use of powerpoint slides and videos for understanding in a research methods class?
- What are the students' perception on the use of videos with powerpoint slides for learning in a research methods class?
- What are the students' perception on the FC in a research methods class?
- What are the effects of the FC on learning research methods?

3. Flipped Classroom (FC)

A pair of school teachers from Colorado, Jonathan Bergmann and Aaron Sams, school have been credited with the advent of the FC (Kachka, 2012). Salman Khan popularized the FC concept at the Aspen Ideas Festival 2010 when he caught Bill Gate's attention with the Khan Academy's videos (Khan Academy, 2011). No doubt the Khan Academy produced thousands of videos stored in the TED Talks repository, but the use of a learning management system to deliver content for a flipped classroom may have been in 1995 by Baker (Baker, 2000, Johnson & Renner, 2012).

The flipped concept was defined earlier as peer instruction by Eric Mazur, a Harvard physics professor for more than two decades using technology to promote higher order thinking skills (Berrett, 2012). In addition, traditional subjects such as literature classes and law seminars has been taught this way as students are required to read texts before class and class time was used for discussion (Kachka, 2012). However, advances in technology brings about new ways of blending and flipping the classroom to make it more productive (Kachka, 2012). And considering the benefits of this model, more research in exploring different models of FC and the potential is required.

The flipped classroom (FC) has been traditionally defined as a class flipped as lectures are done at home through teacher-created videos for direct instruction with students, while homework is done in class as individualized learning activities with the teacher (Bergmann, Overmyer & Wilie, 2013). However, the FC is not just online videos, as the focus is on the interaction and the meaningful learning activities that occur during the face-to-face time (Bennett, Kern, Gudenrath, & McIntosh, 2012; Bergmann, Overmyer & Wilie, 2013). Moreover, it is not an online course, nor does it replace the teacher as it notes the teacher's role is important in structuring the interactions (Bergmann, Overmyer & Wilie, 2013).

The FC increases interaction and enables students and teachers to have personalized contact time while being engaged (Bergmann, Overmyer & Wilie, 2013). It is based on both direct instruction and constructivist's approach (Bergmann, Overmyer & Wilie, 2013). The teacher-centered content after used in direct instruction is archived and can be reviewed anywhere and anytime (Bergmann, Overmyer & Wilie, 2013; Spencer, Wolf & Sams, 2011). While activities ensure students are made responsible for their own learning with the teacher as a "guide on the side" (Bergmann, Overmyer & Wilie, 2013).

In order to succeed in the FC, the teacher must have very clear objectives (Spencer, Wolf & Sams, 2011). This is reflected in the content which is delivered through teacher-centered videos. In-class activities should help students understand the objectives and process what they have learnt in the context of the world they live in. The class activities might include developing student-generated content, problem-solving, inquiry-based activities and project-based learning (Spencer, Wolf & Sams, 2011). Activities can reach higher orders of critical thinking, using collaboration and real-world context as students have the freedom to ask exploratory questions and go beyond the core curriculum (Bennett, Kern, Gudenrath, & McIntosh, 2012)

The FC has been practiced for high school science and mathematics (Kachka, 2012; Khan, 2010), learning computer applications (Johnson & Renner, 2012), and in higher education (Berrett, 2012; Hughes, 2012; Zappe, Leicht, Messner, Litzinger, & Lee, 2009). However, most of these studies have been on a small scale.

Lage, Platt & Treglia (2000) attempted using a variety of instructional strategies such as lecturing, conducting experiments, group assignments for the collaboration, and self-directed study using technology to cater for personalization with increasing student contact time in an introductory economics course. This was referred to as the Inverted classroom where lectures would be viewed before class and class time was for clarifying difficult concepts. In an undergraduate architectural engineering class, lecture content was delivered via online video out of the classroom and active learning for problem solving took place in the class (Zappe, Leicht, Messner, Litzinger & Lee, 2009).

3.1. Flipped Learning

The Flipped Learning Network (FLN) differentiates between flipped learning (FL) and FC. While the FC is a logistical arrangement of delivering the materials and the activities, FL focused on the learning processes in achieving the learning outcomes (Talbert, 2014). Hence, the enthusiasts of FL emphasize that FL must be based on the FLIP pillars: a flexible environment, learning culture, instructional content, and a professional educator (FLN, 2014). Hence, FL is not just inverting the classroom but involves designing a course to include self-regulated learning and deep learning on a personal level

in order to produce learners who are confident, problem solvers and life-long learners (Talbert, 2014).

The concept of FL has been defined as a pedagogical approach where instruction moves from the group learning space to the individual learning space for a dynamic and interactive learning environment, with the instructor as a facilitator for creative engagement in the subject matter (FLN, 2014). There is opportunity for students to review, discuss and investigate course content with the instructor in the class (Hughes, 2012). Flipping the classroom has proven to be an advantage when teaching the content is limited by time (Lage, Platt & Treglia, 2000). In addition, it can cater to a variety of learners and integrated with a variety of instructional strategies (Lage, Platt & Treglia, 2000).

3.2. A Model for FC Instruction

There are a variety of models to implement the FC (Davies, Dean & Ball, 2013; Hughes, 2012). The basic premise is that the students review lecture materials outside class and come to class prepared to participate in the learning activities (Hughes, 2012). Enfield's (2103) model of flipped learning uses instructional videos and articles for the design of instruction to cover content knowledge and process skills (see Fig. 1). Enfield had the learners review the assigned video or article in line with a set of Preparatory Questions before the class. During class, he first allowed formative assessment using a quiz based on the Preparatory Questions, which was followed with activities to assess understanding and engage learners. Enfield (2103) categorizes in-class activities as follows: (a) teacher-led demonstration of new concepts, (b) teacher-led demonstration of concepts in videos in which both teacher-led demonstrations allowed students to be called to explain and elaborate, (c) group activities and tasks for students to practice skills learnt, (d) open lab time for completion of projects.

Enfield's model was used for designing instruction for the research methods class, in which a Quiz was used to for the first formative assessment. In class activities included discussions of aspects of research from the video, in readings of research articles, and design of the participants own research project.

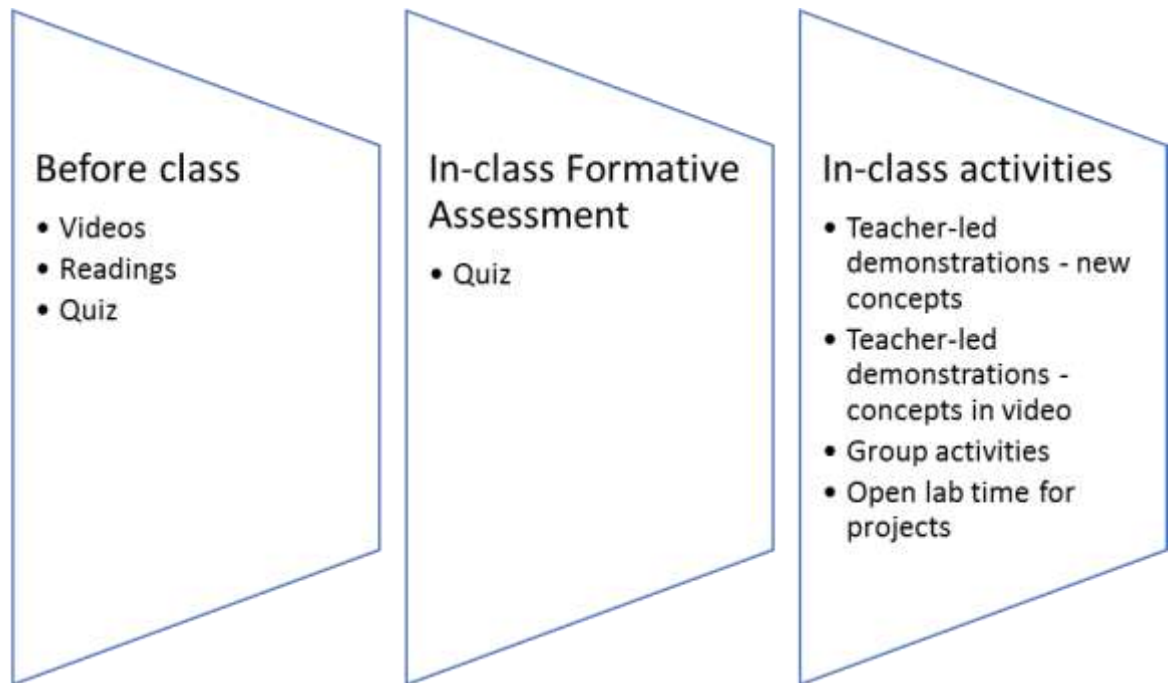


Fig 1: Enfield’s model of Flipped classroom for learning process skills.

4. Methodology

This is an exploratory case study, which is part of a design and developmental research in which resources and lessons were developed. The sample was ten volunteers from a research methods course in a Masters in education program in a public higher education institution. They were first year students from different fields and did not have previous exposure to research methods.

4.1. Resource materials

The class was designed based on Enfield’s model of the FC. Readings, powerpoint slides and videos of the delivery of the powerpoint slides were designed for the FC. The in-class assessment, consisting of a quiz was developed. In addition, new concepts that should be demonstrated, and group activities were planned as in-class activities.

Firstly, powerpoint slides were developed for the identified topics. These slides could be used for self-accessed study, or for explanation of the related concepts by the lecturer. Next, a video script was written using these powerpoint slides. The script was verified by a subject matter expert, who was a lecturer experienced in the research methods. The MoveNote application

was used to develop of videos based on these scripts. The video consisted of screencasts of the powerpoint slides with video and audio recording of the lecturer and could be accessed online through the repository. The vodcasts were delivered through the institution's learning management system as links to the videos on the Movenote repository.

The in-class activities would consist of demonstration of research procedures related to a specific design, and discussion and activities related to the research method.

4.2. Procedure

Firstly, the participants were asked to view the powerpoint slides on the research topics, and were told that they would be given a quiz on the topics. The participants then took the quiz, which would be the pretest for the research topics.

Over five weeks, one video per week was vodcast to the participants, who were asked to view the video before class. This was followed by in class activities on the topic. At the end of the lessons, a post test was conducted to gauge the participants understanding of the topics. In addition, the participants were interviewed to determine their perceptions of the implementation.

4.3. Instruments

The instruments consisted of a quiz or pretest on the topics, and post test which tested similar areas in on the topics. An interview protocol to enquire on their experiences and perceptions in learning using videos and powerpoint slides was also prepared.

5. Findings

5.1. Powerpoint slides and videos for understanding

When only powerpoint slides was used for self-accessed learning, there was mixed feelings. Fauziah, a high-achiever in the class found it very useful: "I can get a lot of information from the slides. It is better than reading the textbook prescribed." Azelin, an average student in class also noted, "I understand the topic better now." On the other, many were confused. Jefri

admits, "I cannot understand. There is so much information, and it is confusing to read the slides." Hence, when powerpoint slides alone is used to deliver instruction on research methods, not all students were able to understand the lesson.

When the videos developed with the powerpoint slides were used, all the participants agreed that it was useful for improving understanding. The commented "I could understand easily", "I am able to repeat the video to understand and get knowledge", "I am now able to understand the topic before class discussion."

The powerpoint slides alone may not be able to cater to all students for understanding. On the other hand, videos seemed to be better for self-accessed learning before the class. Videos can be used to draw attention to important points. The visual and audio components appeal to learners as it can cater to learners with different learning styles.

5.2 Videos with powerpoint slides for learning

All the participants preferred learning with the powerpoint slides incorporated into a video as it seemed to be better for learning. They seem to believe there was more information in the video. As Amirah stated "there is more detailed information explained in the video."

In addition, viewing the video helps them remember better. Mariatul shared on learning after viewing the video, "I have better memory," and Azelin, "I am able to give an indepth explanation on the topic with examples."

The participants had different learning preferences. All of them agreed that they learnt better using the powerpoint slides, or video with interaction with the lecturer. However, some were hesitant if they could learn from just interaction with the lecturer, without powerpoint or video. This may indicate that the participants preferred learning with interaction with the lecturer. This indicates that there is a possibility for learning using the FC concept as it seems to cater to students learning preference.

The videos were also not interactive, and some suggested adding more interactive elements to make the video more professional. "Add in the activities and discussion question for class in the videos as well."

5.3 Students' perception on the FC in a research methods class

Azlina prefers this approach compared to the normal lecture as it helps her prepare better for class: "I am able to get the information live before class."

Then, I can get all the questions I want to ask in class ready.” The participants also agreed that this approach improved interaction in class and improved learning. Mariatul stated that “I can view the video over and over again to make sure I understand.”

The in-class interaction with the lecturer after viewing the video assisted learning. “I interact better as I have the prior knowledge,” Fauziah explained. The participants also liked the online interaction but were not certain whether online interaction contributed to learning.

It also encouraged higher order thinking skills as Amy notes, “I am able to know the lesson better, then I can make predictions and know what to ask in class.”

All the students said that they would recommend the use of videos in the flipped classroom approach in other courses. In addition, they were confident that their peers could learn better using this approach.

The participants noted some technical errors that needed to be improved on, example the sound system was not so good and the audio recording was not of good quality in some of the slides.

5.4 Effects of the FC on learning research methods

There is a possibility that the FC approach improves achievement. The pretest and posttest results were compared. Most of the participants improved in their test results, with a mean posttest score of 16.6 as compared to the pretest score of 14.6. This indicates an increase in the mean marks of the tests.

The participants were more motivated in learning. They wanted videos on more topics and were also interested in learning research methods using this approach. Jefferi shares, “Learning is not just limited to the class.”

There was more interaction in class compared to a normal lecture, as the lecturer need not explain much on the topic and was answering questions and doing activities to improve learning and understanding. The learners were also interested in interacting in class.

The participants also indicated that they were more confident and improved their ICT skills as they were required to log-in the Learning Management System and access the videos. In addition, they all agreed that the FC saves time. “I can view the videos whenever I am free, even when travelling back to my hometown,” and “Its saves time for studying and I can do more things.”

6 Implications and Conclusions

The FC in this case utilised videos and powerpoint slides to be viewed before class. However, videos seemed to more acceptable than powerpoint slides for improving understanding. Powerpoint slides presented the information in total, and not all students could understand the concepts easily as too much information was available but not connected to the learners' prior knowledge. Thus learning was not meaningful. The FC classroom emphasises that learning should be meaningful to the learner (Bennett, Kern, Gudenrath, & McIntosh, 2012; Bergmann, Overmyer & Wilie, 2013).

On the other hand, videos developed with the powerpoint slides had the advantage of integrating pauses and timing to enable connections between the content and prior knowledge to be made. It could also be used to draw attention thorough annotation, voice over on slides or videos on difficult concepts. However, there were minor technical aspects in the video which could be improved on such as being more interactive and better audio. In general, the videos seemed to be more meaningful and personalized to the learner, an important concept in FC (Davies, Dean & Ball, 2013). All the participants agreed that FC was useful for improving understanding as the videos used could be reviewed repeatedly anytime (Bergmann, Overmyer & Wilie, 2013; Spencer, Wolf & Sams, 2011).

Videos appealed to learners with different learning styles, who may have preference for different modalities for learning, verbal or visual as compared to just powerpoint slides. In a FC, all the different modalities were addressed. Besides the verbal and visual modalities in the video, the kinaesthetic element was present in the interactions during class activities. Hence, learning is personalised and individualised to the learner (Davies, Dean & Ball, 2013). This addressed the issue of lack of interest in learning the different methodologies as the learners were more engaged in learning (Cochran-Smith, & Zeichner, 2005; Murtonen & Lehtinen, 2003).

The participants were learning with the powerpoint slides incorporated into a video in this case study and they believed there was more detailed information in the video, rather than the slides alone. In addition, viewing the video helps learners recall better, with more examples. This enable the novice learner to be more aware and confident of the different research designs.

All the participants agreed that they learnt better using the FC, both with powerpoint slides alone, or video. It was the interaction with the lecturer

which convinced them. Some participants felt they would not learn as much if they just interacted with the lecturer, without the powerpoint or videos.

Hence, the FC with both interaction and the appropriate resources were important. The resources enable the learner to understand concepts and discuss and interact better during class time. There was more interest in interacting in class and more opportunities to answer questions and activities to improve understanding. This was because the participants could read papers, collaborate on their class activities, and discuss critically research in practice (Cochran-Smith, & Zeichner, 2005). This would improve higher order thinking among learners, and enable learners to be more engaged.

The FC approach also seemed to improve achievement as there was an increase in the mean marks of the participants. However, more rigorous testing should be done to ensure if the FC contributed significantly to their achievement.

The FC certainly motivated learning research methods as the participants were interested and wanted more videos on more topics. They also indicated they would recommend to others, an important aspect in motivation. In addition, the participants were more confident of using IT and felt that their ICT improved when using FC. The FC also saved time. Hence, this exploratory study seem to indicate that FC could address many of the issues in teaching research methods.

Further research could be done to determine the effectiveness of FC. There seems to be potential in using FC for different subjects in not only teaching facts and concepts, but to develop higher order thinking. Hence, there is also a need to determine whether FC can be effectively implemented for research methods and for subjects other than science, mathematics and computer science. Instructional models such as Enfield's process model has been used for teaching processes. However, is this model for FC effective in teaching the research process and higher order thinking and reasoning skills needs to be investigated.

This preliminary study provides an insight on the implementation of Flipped classroom and indicates the possibility of implementing it for a research methods class. Its findings cannot be generalized, but it provides an indication of the perceptions of Malaysian graduate students in employing the FC for learning. Hence, researchers could look into the possibility of extending the FC to other subjects.

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