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To Flip or Not to Flip: The Challenges and Benefits of Using Flipped Classroom in Geography Lessons in Brunei Darussalam

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Abstract

This study examined the use of flipped classroom in geography lessons in one of the pre-university colleges in Brunei Darussalam. The benefits and challenges of using the flipped classroom as a pedagogical tool in geography were also investigated. Data were collected through action research adopting the use of a flipped classroom approach. This meant that learning geography as subject content was done outside the classroom. The findings of this study revealed that it was not necessary to apply flipped classroom for every lessons. Yet, this study found that flipped classroom was most beneficial when students worked on the application of geographical concepts where they learned to analyse and evaluate given scenarios. A significant improvement in the students' academic achievement was also observed where through the interactive classroom activities, students developed a deeper understanding of the subject concepts. On the other hand, there were challenges in conducting a flipped classroom, for instance, some students had problems in accessing the lessons outside the classroom. This was one of the crucial elements conveyed in order to successfully implement a flipped classroom and to create an active learning environment during the class time. Without learning the concepts before the class time, the students reported the feeling of being lost, and thus could not fully participate in the classroom activities. Furthermore, a significant amount of time was wasted during the class time in teaching the students the concepts since they were supposed to have learned them prior to the lesson itself. Finally, the flipped classroom was also found to be a challenge to implement in a classroom known to have a passive learning environment.

Keywords: learning styles, teaching strategies, geography skills, flipped classroom, pre-university

1. Introduction

In the 21st century teaching and learning, the role of a teacher has changed from the provider of either information or knowledge to a facilitator that guides and supports the students in their learning (Jaidin et al., 2014, 2015; Shahrill et al., 2015; Wood et al., 2014, 2015). In the former role, students are passive in the learning process and, in the latter students are active and more involved in their own learning. These passive learning styles are often explored and documented in comparative studies of the Asian learners when compared to their Western counterparts (Chua & Lateef, 2014; Shahrill, 2009; Tong, 2014).

Active learners are where students learn and discover concepts, theories and facts by themselves (Jaidin, 2009; Jawawi, 2009, 2010; Shahrill, 2009). For students to be active, a teacher would have to design lessons that involve the students asking questions (Mohd Roslan, 2010, 2014; Jawawi, 2009; Salam & Shahrill, 2014; Shahrill, 2009; Shahrill & Clarke, 2014), and collaborating towards achieving decisions agreed by everybody (Sulaiman & Shahrill, 2014, 2015). This collaborative learning leads the students to interact with one another, build knowledge and acquire skills of analytical, critical and higher order thinking (Botty & Shahrill, 2014; Rashid & Jaidin, 2014; Shahrill & Clarke, 2014).

However, time is an issue to having those kinds of lessons where normally the time period of a subject to be taught is given only one hour. To add to that, teachers are expected to complete the syllabus by certain time frames in order for students to be able to score in the examinations held at the end of an academic year (Botty et

al., 2015; Hamid et al., 2013; Ismail et al., 2015; Law et al., 2015; Matzin et al., 2013, 2015; Mundia, 1996, 2010a, 2010b; Shahrill et al., 2013). Too often, the time left for teachers to teach the subject was not sufficient to provide learning activities that involve collaboration and the use of analytical skills (Sulaiman & Shahrill, 2014, 2015; Yassin et al., 2015).

By definition, Geography is the study of space with relation to nature and human. In this subject, students are expected to develop their thinking skills and acquire the ability to analyse and evaluate situations. The limited duration of class time often hinders the designing of a geography class with hands on activities. One way on how the issue of time insufficiency can be solved is by implementing a flipped classroom where the students learn outside the classroom before the lesson. With the students learning the concepts or theories of a subject beforehand, there will be less lecturing by the teacher and more of students' involvement in the learning process. In addition, ample time management may be secured for active learning environment where students practice their thinking skills within the classroom. Teachers will also have more time for one-on-one interactions with the students and may also be able to focus on the less capable students.

2. The Flipped Classroom

The model of the flipped classroom was first described as "The Classroom Flip" where the lectures are moved outside of the classroom and the "homework" into the classroom (Baker, 2011). This model of classroom was inspired when it was realised that the students were able to easily obtain the lecture notes online. Baker reduced the amount of lecturing in his class and focused on the students' understandings and application of his course. This model is illustrated in Figure 1 below. Flipped classroom allows the teacher to act as a facilitator in the classroom and to guide the students in learning (Baker, 2011).

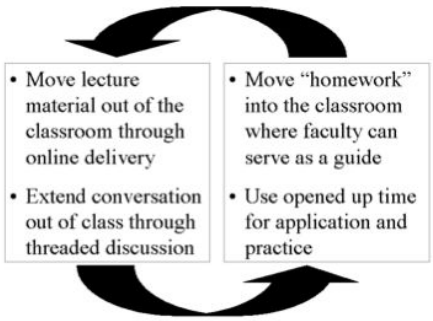

Figure 1. The flipped classroom model (Baker, 2000)

Meanwhile, in a study by Lage, Platt and Treglia (2000), flipping the classroom was to appeal to all the different types of learners. They had identified that some students learn best by listening to lectures, some by collaboration with others, and some by doing experiments or practical works (Lage et al., 2000). However, with the allocated class periods and limited time, to accommodate to these various kinds of learners would be somewhat unachievable. For this to be possible Lage and colleagues (2000) carried out lessons outside the classroom and had the homework assignments done during the class time. The course content were not jeopardised and student were able to work on hands on activities and learn in a collaborative manner.

Strayer (2007) reported that the purpose of flipping the classroom is to have an active learning environment during the class time while ensuring content coverage. Many of the classroom activities when a class is flipped are constructivist in nature. As opposed to the traditional classroom where students repeat newly gained information in tests or exams, a constructivist classroom involves the students internalising and transforming new information while developing new understandings (Brooks & Brooks, 1999).

2.1 Flipped Classroom: A Constructivist Learning

Flipped classroom is a combination of direct instruction and constructivist learning (Bergmann et al., 2011). It is a scaffolding technique that develops students' thinking skills and shapes them to become responsible and independent learners (Vygotsky, 1978). In other words, students were able to complete the given tasks through the support and guidance from the teacher, or through working with their peers. Without the teacher's guidance, the students were claimed to not be able to complete the assigned task.

The purpose of having a flipped classroom in this present study is to have a class time with the learning environment that develops the students thinking skills. It creates a constructivist classroom. Brooks and Brooks (1999) stated that in a constructivist classroom, the teacher behaved in such a manner that prompted the students with questions, to have them voice their views, and be involved in their learning instead of providing the students with information and asking for correct answers. Flipped classroom is seen as a scaffolding technique because it builds their knowledge of a certain subject that will be applied later on inside the classroom. According to Piaget (1971), learning does not occur when a person imitates or copies information but when the person acts on it. The knowledge or information that the students had obtained from the lesson, outside the classroom gave hints or guidance for the learning activities during the class time that mostly involve the application of concepts and problem solving.

Despite the students required to be independent learners, a teacher also plays an important role in facilitating the students' learning. The platform for learning outside the classroom should have meaningful objectives that coincide with the school's curriculum. Consequently, the learning activities inside the classroom should challenge the students' thinking skills rather than promoting the students to imitate the knowledge that they have gained from the lesson outside of the classroom.

2.2 The Benefits and Challenges of Flipped Classroom

The flipped classroom model intends to bring students' learning experience to a whole new level. With the flipped classroom, students found the class time to be more meaningful and personal where they experienced more control in their learning (Baker, 2011). Although flipping the classroom means that the students have more responsibilities and thus more workload, they took this more of a benefit than a burden (Lage et al., 2000).

In the survey conducted by Lage and colleagues (2000), students reported that they preferred the flipped classroom to the traditional lecture. They stated that they enjoyed working in groups, felt that the classroom setting was informal, and the students felt more comfortable to ask questions and discuss openly. In contrast with the findings from Strayer (2007), the results showed that the students experienced feelings of unsettledness in this classroom environment and felt lost. Moreover, the students' willingness to engage and participate in the learning activities plays a role in the classroom. Nonetheless, educators were able to approach and work with individual students during the class time without sacrificing any course coverage (Lage et al., 2000). The flipped classroom model allows teachers to spend more time with struggling students and allows more freedom to the advanced learners to work independently. Bergmann (2011) reported that with the lesson carried outside the classroom, he now had time to have one-on-one interactions with the students.

According to Fritzky (2013), normally about fifteen to twenty minutes will be spent to explain new concepts to students, and along the way there will be interruptions by students asking questions if they do not understand. However with the learning taken outside the classroom and posted online as video, students had the freedom to stop and replay the video if there are parts that they do not understand. The extra time Fritzky had in class was fully utilised for the students to apply concepts and solve real-world problems. Based on Fritzky's study, the success of flipping the classroom was evidenced by the improvement of students' results and was reported by the school inspector as record-breaking.

In the flipped classroom model, not all lessons of a subject have to be "flipped". It is most beneficial to certain topics that contain large amount of content or concept that needed to be understood before the practical work and the application can be done. However, according to Afstrom (2013), once a classroom is flipped it will never go back to the traditional state. The concept of inverting the classroom means transitioning the classroom from being teacher-centred to students-centred and most likely will not shift back the other way. This is supported by the findings of Wrights (2012), a chemistry teacher who used to flip her classroom once in a while by creating and posting online videos. When Wrights (2012) flipped her classroom, she developed the students' thinking skills by prompting them to reflect on their learning and teaching them how to evaluate and work with their peers. She realised that after one year of flipping her classroom her students began to do more research on their own to the extent that they did not need her videos anymore to learn. Eventually the flipped lessons disappeared completely and even she had stopped lecturing in class. Wrights experienced what Baker (2011) had reported; the students were in control of their learning. The classroom became a place where the students built their own knowledge and shared their findings.

Despite the benefits of having lessons outside the classroom, Hertz (2012) pointed out the challenges of implementing it. Accessibility to the lesson outside the classroom, which normally requires computer and Internet access, has always been an issue whether it is in the rural or urban areas, and suggestions of using the computers in school library or public library was advised. Hertz (2012) argued that the availability of computers

in such places is often limited. To add to that, the Internet connections in schools are known to be weak and it took some time to load a web page. This was a factor that discouraged students to want to access the online lesson. However, the lack of technology and accessibility was not an issue for Wrights (2012). She used whatever devices her students had; a couple of IPads, a few computers and students' cell phones. Those students without any devices shared with the others who had and made it work. Moreover, access to mobile technology is growing. In 2011, half of all the computing devices sold were mobile devices (Gartner, 2012; Johnson & Renner, 2012).

In a traditional classroom, little is required from the students. With this model of flipped classroom, students are to take responsibility for their own learning. If they have not viewed the lesson outside the classroom, it could be difficult for them to follow the lesson within the classroom. This technique of teaching might not be as effective as it should be. From the study of Johnson and Renner (2012), there were students in a class that practiced flipped teaching who did not participate in the lesson outside the classroom. The class then technically split into two, which made it difficult for the teacher to group and assist the students in their learning. The teacher stated that it was important for the students to understand that in order for them to succeed, they have to take responsibility of their learning, not only in the classroom but also outside the classroom. Additionally, Johnson and Renner (2012) stated that if having homework is not a routine or the common culture for the class, it would be an obstacle to having an effective flipped teaching.

2.3 Flipped Classroom in Geography Lessons

Most of the flipped classroom model is used in subjects like mathematics and sciences (based on the subject's vast amount of learning videos available online). As previously mentioned, the Geography curriculum aims to develop learners with investigative abilities and decision-making skills (Cambridge International Exam, 2015), which can be achieved by engaging the students with learning activities that encourage higher-order thinking skills. The teacher-oriented traditional classroom focuses on the transferring of information and involves the recalling or restating the given information, which is of the lowest order of thinking skills. The purpose of flipping the classroom in this study is to develop higher-order thinking skills amongst the students that include the comprehension, application, analysis, synthesis and evaluation of knowledge (Bloom et al., 1984). A recent study conducted by Tong (2014) showed that flipping four geography classes of the secondary one level (equivalent to Year 7) in a Hong Kong secondary school proved to be a successful implementation, reflecting similarly to those discussed by earlier studies.

3. The Purpose and Significance of the Research

The purpose of this study is to investigate how flipped classroom can be used in teaching and learning of Geography. Geography is a subject that involves studying a place in relation with the nature and human. It requires students to identify situations by analysing and interpreting any given data of an area. For students to acquire these geographical skills, they may need a lot of practice, which could be time consuming with the limited class time.

The concept of flipped classroom in this study is based on the constructivist theory. It is a scaffolding technique that develops the students' knowledge and thinking skills. The students gain their knowledge of certain geographical concepts outside the classroom before the class time. Subsequently applying it later in the classroom activities that involved either solving real-world problems or evaluating scenarios.

The following research questions are derived for this study. Firstly, how can flipped classroom be used in Geography lessons? And secondly, what are the challenges and the benefits of flipped classroom in the teaching and learning of Geography?

4. Methodology

This present study adopted an action research approach to investigate the challenges and benefits of flipped classroom in Geography lessons. Notably, Lewin (1946) first coined the term action research and it involves a "spiral of cycles" (Elliot, 1991). According to Kemmis and McTaggert (1990), the cycle goes through four major phases: planning, acting, observing and reflecting. The research design for this study is shown in Figure 2 and the explanations are given below. The cycle used in this study was adapted from Kurt Lewin's model of action research.

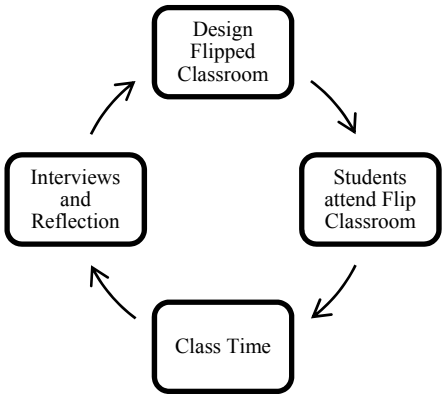

Figure 2. Action research cycle (Adapted from the Spirals of Cycles by Elliot, 1991)

Design Flipped Classroom: The planning part of this research is designing the flipped classroom, which involved creating an online lesson, and preparing classroom activities that uses the knowledge the students obtained from the online lesson.

Students Attend the Flip Classroom: The students were instructed to attend the online lesson before the class time and to participate in the classroom activities.

Class Time: Class time refers to the classroom time that followed after attending the online lesson. Observations were made and recorded during the class time that included the students' responses and behaviours.

Interviews and Reflection: After the class time, the students were called for interviews to clarify what was observed during the class time, and to find out their learning experiences. The results from both the interviews and observations were analysed and used for the next flipped classroom.

4.1 Data Collection

Observations were used as a method of data collection in this study. The teacher, who is also the first author, played the role of a participant observer in this research and recorded information as it occurred in the classroom. However the presence of the observer might influence the behaviours of the participants. What was observed might not be genuine and there is also a possibility of misinterpretation, and often as we passively received information from the observations, many questions were raised in our minds. Thus to validate the findings through observations, member-checking method (Creswell, 2009) was used to determine its accuracy, and a follow-up interview with the participants were carried out to confirm or clarify what was observed.

Additional forms of data collected were one-to-one and focus group interviews. The questions involved finding out the difficulties the students encountered in learning outside and inside the classroom. Students were also asked about their learning experiences both outside and inside the classroom. Due to respecting the students' wishes for their interviews not to be audio recorded, all their responses were noted in written form.

4.2 Participants

This study was conducted in one of the government pre-university colleges in the Brunei-Muara district. It involved one lower six (equivalent to a Year 13) Geography class. In total, 25 students took part in this study. Permissions to conduct the study were sought from the relevant department at the Ministry of Education, as well as from the relevant leaders of the college. The Geography class that participated were selected at random and the students were informed of the research beforehand. All the students had no objections and voluntarily participated in the study. Due to ethical reasons, the names of the college and the students involved in this study will remain anonymous to protect their confidentiality.

5. Results and Discussion

5.1 How Can Flipped Classroom Be Used in Geography Lessons?

In the flipped classroom conducted in this study, the class time was designed to have activities to allow the students the chance to be active and be involved in their own learning. The features and concepts on the Geography topic "Storm Hydrograph" were delivered through the website created before the class time. Thus the students were prepared and equipped with the knowledge and information on storm hydrograph even before the real class time. In the classroom, the teacher started the lesson by asking the students if they had any questions

regarding the online lesson that were instructed of them before the lesson. However, none of the students asked any questions. She then proceeded to explain briefly about storm hydrograph and briefly outlined the factor that affect the shape of the storm hydrograph. It was noted that when she prompted the students to participate in the explanation by subsequent questioning, only few students responded to the questions. For the students' activities, the teacher distributed activity sheets to each student. The classroom settings were arranged in such a way that the students were seated in groups of five, and they were encouraged to interact with one another in completing the activities. There were five groups altogether. The classroom observations revealed the students were quiet at first and appeared to be doing the activities on their own despite the close proximity they had with each other. They only began to discuss when the teacher had moved further away from them. The students admitted in the interviews that they were uncomfortable and shy to speak in the teacher's presence. They stated that they did not want the teacher to know that what they discussed may be incorrect responses and in turn they will be embarrassed by their actions. They were used to being passive learners, however this new lesson approach inevitably pushed them out of their comfort zones. This behaviour portrayed the lack of confidence the students possessed. Noticeably, the level of activity increased in the next few lessons that followed, as they were consistently required to be engaged and involved in discussions to complete the activity sheets.

When the next flipped classroom was conducted, it was evident that the lesson experienced a more active learning environment in comparison to their previous Geography lessons. When the students were asked if they have any questions about the online lessons that they were instructed to attend before the class, surprisingly a few students raised their hands. Furthermore, when the activity sheet was given to the students, they immediately started discussing to work on the questions. The students were observed to be more comfortable discussing with their peers.

It should be noted that the flipped classrooms conducted in this study allowed the thinking skills of the students to be enhanced, although to determine any significant improvement may prove to be difficult within the limited time frame. The nature of activities provided to the students encouraged them to evaluate possible scenarios. By flipping the classroom, it allowed the creation of activities that required the students to apply their thinking skills. Furthermore, the flipped classroom in this study was seen to be most beneficial when students were working on the application of geographical concepts. For example, the flipped classroom lesson on how the processes of infiltration and interception might affect the shape of storm hydrograph, which could determine the likelihood of flooding. The online lesson via videos and slideshows demonstrated how geological factors affected the processes of infiltration and interception that consequently affected the storm hydrograph. Within the lesson itself, the students worked on several possible scenarios with different geological factors. In addition, they discussed about the nature of interception and infiltration pertaining to the different scenarios. As a result, this exercise created a more meaningful and deeper understandings of the content that contributed to the students' academic improvement.

5.2 The Challenges of Flipped Classroom in the Teaching and Learning of Geography

5.2.1 Time Consuming

The idea of conducting a flipped classroom in this Geography lesson was meant for the students to have sufficient time allocated in participating in hands on classroom activities and working on the application of the geographical concepts that they had learned online. By doing so, their thinking skills may be enhanced and they may learn to analyse, synthesise and evaluate scenarios. However, being typically passive during lessons, it was a challenge for the teacher to carry out the flipped classroom teaching approach. The students barely interacted with one another while doing the classroom activities at the start of implementing the flipped classroom. They did not even dare to ask questions at the beginning of the lesson when they were supposed to voice out if they did not understand any part of the online lesson. When the activity sheets were distributed, the students did not work together as were expected. They worked individually and quietly as if they were sitting for a test. Some of the students did not know what to do although there were clear instructions provided to them both verbally and in written form. Some students stated in the interviews that it was because they did not understand the online lesson and they had difficulties in doing the activity sheets. However instead of trying to get the teacher's attention for guidance, they sat quietly and waited for the teacher to approach them.

As previously mentioned, the students were grouped in groups of five. The teacher had enquired one of the groups if they had understood the concept of storm hydrograph and its components. Three of them responded with a yes, and two of them said no. The students who said yes were requested to explain to the other two while the teacher listened. She interjected few times to help with the explanations. The case was similar with the other groups; some of the students understood the online lesson and some of them did not. The whole lesson did not go

as what the teacher had planned, which was completing the activity sheets. It had turned out to be a session where the students taught each other and learned about the concepts and components of storm hydrograph. Therefore, the task of completing the activity sheets had to be subsequently moved to another class time.

There was a certain amount of time allocated to teach each topic of the subject. When the flipped classroom was planned, the classroom activities were designed to be completed within the amount of time allocated. However, with the students' passive behaviour in class, it was a challenge to complete the activities within the allocated time. Consequently, the activities had to be rescheduled for another class time. According to the teacher, this was a drawback since completing the entire syllabus on time was already an issue without the flipped classroom itself.

5.2.2 Accessing the Online Lessons

One of the major challenges in conducting the flipped classroom was the availability of the Internet access as well as computers. Students were required to access the Internet outside schooling hours in order to be able to go to the online lesson before the class time. Being able to go online is fundamental in implementing the flipped classroom. From the interviews, it was reported that only 11 students had the Internet connection installed in their homes. The school did provide the students with the Internet access in the library, however with the limited number of computers available and the tedious procedure that needed to be followed in order to use one, consequently deterred the students.

In the first flipped classroom conducted, 19 out of the 25 students attended to the online lesson. The students that did not access the online lesson claimed either they had forgotten or they did not have the Internet access at home. Without accessing the online lesson, they felt somewhat "lost" and unsure of the classroom activities. As a result, not only they were not able to participate in discussions, they needed to be informed of what the online lesson was about before they can even begin doing the activity sheets. This was, as mentioned previously, time consuming.

However, having the Internet access in this case is not enough. Some of the students had accessed the online lesson via mobile phones and they did not experience the full learning experience that was intended for them to have because of the inability to view the videos and slideshows embedded from the website. The videos and slideshows were important in delivering the concepts of how the climate and the processes of infiltration and interception might affect the storm hydrograph. Although the students were able to access the online lesson, without viewing the videos and slideshows, they had missed an essential part of the lesson in understanding the concepts. Thus, not only the online lesson required access to an Internet connection, it also needed a computer to fully experience the available multimedia.

Out of the 19 students that had attended the online lesson only 6 of them used computers to access the lesson, while 13 of them used their mobile phones. Those students that accessed the lesson via mobile phones had missed out some part of the lesson that was crucial in building their understanding on how the process of interception and infiltration shaped the storm hydrograph. Because of the limited visual representations they had in the online lesson, those students stated that the lesson was "not clear" and "dull" thus loses their interests in learning. This was not only experienced by the mobile phone users, some of the students who viewed the lesson via computers had also experienced the lost of interest as the webpage took quite a while to load because of poor Internet connection.

In the second flipped classroom on the topic of River Processes, the designed online lesson was free of videos, animations and slideshows. The lesson used only texts, diagrams and images to deliver the subject content. This was to ensure students accessing either via computer or mobile phones would not miss out any part of the online lesson. From the total of 25 students, 23 students attended the online lesson; 12 via mobile phones and 11 via computers. Although there were various images and diagrams in the lesson, the students perceived the lesson as "dull" and "unattractive". Some of them commented it was as if they were reading the textbook and they lost interest rather quickly. They expressed that the lesson should be more interactive.

According to Bergmann and Sams (2012), Internet access was not necessary when conducting flipped classroom. There were other options in which the students can access the lesson outside the classroom before the class time. It was suggested to provide the students with USB sticks or DVDs so that they could view the lesson without going online. Specific software was needed for the online lesson to be put on USB sticks or DVDs without altering the interactive features it contained. However, the software was costly and since this research was not funded and time was limited, this option was eliminated.

5.2.3 Students' Lack of Interests

Some of the students did not attend the online lesson stating poor memory (being forgetful) as their excuse. The lack of commitment from those students had affected the classroom activities. A lot of time was spent on delivering the concepts of the online Geography lessons at the start of the lesson for the students to be able to complete the activity sheets. This somehow turned the nature of the classroom around, back to the traditional approach of teaching and learning. As was experienced by Johnson and Renner (2012), the classroom was eventually divided into two due to partial participations, and those who did not attend were not able to follow the classroom activities. However in the case of this present study, the students who did not attend the online lesson were mixed and grouped together with those who had attended. Consequently those that had learned the concepts before the class time explained them to those who had not in a discussion manner, which was essentially meaningful and allowed the students to have a deeper understanding of the concepts. It was more of a benefit rather than a challenge, but this process took a long time and needed close supervision, as there is a possibility of misconceptions.

Although some students attended the online lesson, there were cases where they forgot about what they had learned from the lesson by the time they had their actual Geography class. The lack of focus when attending to the online lesson contributed to this result. In the interviews, the students admitted that indeed they were distracted with other websites as well as their surroundings. Those students who accessed the online lesson via computers stated that they opened other webpages such as Facebook, Twitter and game sites while waiting for the online lesson to fully load. One student claimed that his initial intention to go online for less than half an hour ended up with few hours instead. The student got carried away from learning online, as he was more preoccupied to Facebook chatting and online gaming.

One of the students commented that the flipped classroom was "a waste of time" and he would rather spend time doing homework of the other subjects. The student failed to see that the online lesson was in fact his Geography homework. He stated that he was not able to comprehend how attending to the online lesson was comparable to the importance of completing the other subjects' homework, where they will be graded and the grades will be counted as part of their monthly assessment report. His lack of interest in learning was a challenge to successfully implement the flipped classroom in general. As mentioned previously, attending to the online lesson was vital to run an efficient flipped classroom.

5.2.4 Designing the Lessons

The flipped classroom in this study used the World Wide Web to deliver the subject content outside the classroom. The researcher chose a website as a platform for the online lesson and designed it as interactive as possible. As a beginner who lack appropriate and relevant knowledge on ICT, it was indeed a challenge to build a website that contained interactive features. Numerous trials and errors were carried out in trying to produce the website. A lot of time was spent researching which website was suitable, what features to include on the website and most importantly, how to create the website.

One of the features of flipped classroom is delivering the concepts via videos (Bergmann & Sams, 2012). Although there are numerous educational videos available online posted by educators all around the world, there was still the need to filter which suitable videos to use for the online lesson. Unlike other subjects, Geography syllabi are different in many regions. Thus it was difficult to find the relevant and suitable videos to post online that could both deliver the concepts of storm hydrograph and match the syllabus.

5.3 The Benefits of Flipped Classroom in the Teaching and Learning of Geography

5.3.1 Improvement in Academic Achievement

The foremost benefit of conducting a flipped classroom is the improvement in the students' academic achievement. The students had a deeper understanding on the processes of infiltration and interception, and how they resulted in different water flows (overland flow, through flow and base flow). The classroom activities along with the discussions the students had with both their peers and the teacher allowed the students to develop a deeper understanding on the processes of the hydrological cycle. The results of the pre-task and post-task comparisons showed the students wrote much better in the post-task and presented a clear explanation of how the different geological factors affected the processes of infiltration and interception.

There were 12 students eliminated from the pre-task and post-task analysis because their answers to the pre-task were not written using their own words. Since the pre-task was given as their homework before the flipped classroom was implemented, the students had the freedom to refer to the set of Geography notes that were given to them at the beginning of the academic year in order to answer the questions. Although their answers were

correct, there were instances where they copied the sentences directly from the notes.

The analysis of the task results comparison showed that there was significant improvement in the students' answers in terms of their understanding in the concepts of interception, infiltration and overland flow. Only a segment of the post-task lengthy answers were presented and only one of the students' pre-task and post-task answers was selected to represent the data in this paper because the academic improvements of the 13 students were analysed to be the same. In the pre-task, the student did not elaborate his/her answers as to why the process of interception or infiltration was high or low. These answers reflected that the student was simply recalling facts. Furthermore the student failed to understand the relationship between the processes of interception and infiltration. This misconception was in fact detected quite a few times with the other students when they did the classroom activities. It showed that they did not grasp the concepts when it was first introduced and taught in the class before the flipped classroom was conducted. Contrary to his/her pre-task's answer, the student correctly demonstrated the relationship of the processes in the post-task answers. This indicated that the student achieved a better understanding of the subject content. Moreover, the student was able to provide answers in a detail and an elaborate manner in comparison to his/her pre-task answers. He/she explained why the absence of vegetation would result in a high overland flow in phases that he/she had understood.

5.3.2 The Ability to Identify Students' Misconceptions

When the classroom was flipped, the class time was fully used to carry out activities. The researcher acted as a facilitator in the class and guided the students in completing the activity sheets given. This allowed the interaction with individual students and to identify their capabilities and level of understandings. When the students worked on the activity sheets and upon checking the students' progress and interacting with them, the researcher realised that most students did not fully grasp the concepts of infiltration and interception and how they might affect the water flow in the hydrological cycle. These concepts were prerequisites to learning the components of storm hydrograph. The interactions with the students allowed the actions in identifying their problems and correct their misconceptions on the spot. The students stated that they liked the student-teacher interactions within the flipped classroom. It enabled them to ask questions personally on the concepts of storm hydrograph that they did not understand without feeling shy.

Before the flipped classroom was implemented, the students were less interactive in class with their peers. This was mainly because their geography lessons were not designed to allow them to be active. Most of the lessons involved the teacher talking and the students passively listening. There were rare opportunities for the students to deal with classroom activities. When the flipped classroom was conducted, there were more observable student interactions. The closed interactions allowed the action in identifying both the less capable students and the advanced students in the class. It also allowed focusing more attention on those students that needed more guidance. These findings concurred to that of Lage et al. (2000), where the flipped classroom approach identified the different types of learners. It also allowed learners to work at their own paces.

5.3.3 Independent Learners

The flipped classroom encouraged the students to become more independent. In the first flipped classroom, the students did not show any signs of independency. The students came to class with only the knowledge they had gained from the online lesson. When asked whether they had made further research on their own about storm hydrograph before the class time, none of the students responded that they had done so. However, in the next flipped classroom conducted, the students were seen to be more prepared. Some of the students even made the extra effort to print out the online lesson to aid their learning in the classroom. Moreover, from the interviews, it was established that more than half the class made further researches on the online lesson to seek better understanding. These are the signs that were reported by Wrights (2012), whereby the students were progressing towards independency.

6. Conclusions

It should be noted that flipped classroom might not be feasible for all Geography lessons. It was most favourable when conducting the topics that involved application of concepts or solving real world problems. Flipping an introductory content of a topic restricted the creation of classroom activities that challenges the students' thinking skills.

One of the challenges in conducting the flipped classroom is the availability of Internet access and computers. As portrayed in this study, some of the students did not have access to the Internet and computers at their homes. They relied on the cellular network that could only be accessed via cell phones. Attending the online lesson via mobile phones limited their learning experiences as the multimedia features embedded in the website could only

be viewed when accessed using computers. Another challenge faced in implementing the flipped classroom was the lack of students' participations and interactions in the classroom activities. These hindered the lesson from achieving an active learning environment.

Moreover, it was determined through the pre-task and post-task analysis that there was an improvement in the students' academic achievement when the classroom was flipped. The students' tasks results showed that the students had better understanding on the processes of interception and infiltration. Although there was significant improvement in the students' academic achievement, 20 out of 25 students stated that they preferred the traditional classroom to the flipped classroom. They also said that the flipped classroom was "a lot of work" and "exhausting".

7. Recommendations

Based on the findings from this study, firstly we would like to suggest that if a teacher desires to flip a classroom, it would be more effective if there were various ways for the students to view the lesson outside the classroom. The online lessons given in this study relied too much on the availability of the Internet. According to Bergmann and Sams (2012), the designed online lessons could be burnt onto DVDs and viewed by using either a DVD player or a computer. Secondly, to most likely engage the students outside the classroom, the lesson itself should be designed with various different interactive features. Thus exposing the students to different kinds of learning tools and allowing the students to work around the lesson in their own style of preferences. Thirdly, it is not necessary to flip a classroom for the entire subject content. It is more beneficial to flip the lessons that are in the later section of the topic that involves the application of concepts to real world scenarios. And finally, the teacher must allow room for students' reflections on the flipped classroom in terms of their learning experience both inside and outside the classroom. The teacher needs to design lessons that will involve students actively asking questions. This would promote the students to be more involved in their own learning, and allow the teacher to adjust the lessons in accordance to the students' needs.

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