

PAPERS

Flipped Classroom: Prospect in Freeing up Classroom Instructional Hours and Students' Attitude Towards Flipped Classroom Strategy

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Abstract

Flipped classroom is a pedagogical model that employs video, reading assignments, practice problems, and other digital technology-based resources outside the classroom to introduce the concept for more meaningful learning. In the Bhutanese education system, the conflict between limited availability of time and coverage of large volumes of syllabus material has become a central issue in curriculum design. Therefore, this study explored how flipped classrooms could be mediated to free up of classroom instructional hours without affecting student learning. This study also assessed students' attitudes towards flipped classroom strategy. A total of 83 students participated in this study. A pre-test and post-test experimental research design for classroom instructional hours and survey questionnaire were employed to study students' attitude towards flipped classroom strategy. SPSS was used for statistical analysis of the data on attitude rating and pre-test and post-test difference. Key findings include flipped classroom saved an average of up to 13.29% of instructional hours without affecting students' learning. The difference of pre-test and post-test mean score for learning between the experimental and control group is not significant ($p>.05$, $t=0.394$). However, with a mean score of 4.60 on a five scale Likert scale for positive statements and a mean score of 1.49 for negative statements, students have positive attitude towards flipped classroom.

Keywords: flipped classroom, instructional hours, attitude, syllabus

Background

Education in Bhutan follows a strict instructional model – students learn new materials in class and, do their homework at home. Teachers then review their homework and this results in repetition of the process. Flipped classroom model, however, presents a new way of engaging students which is based on teachers embracing technology and different strategy in which students can be connected to their learning. Flipped classroom is a pedagogical model that

employs video, reading assignments, practice problems, and other digital, technology-based resources outside the classroom to introduce the concept for more meaningful learning (Bergmann & Sams, 2007). Flipped learning model of education combines face-to-face classroom instruction with computer-based activities, making a point of integrating technology into the lesson, rather than simply having it play a supplemental role. There is no such thing as one definition of flipped classroom. But some commonalities persist across all practices. In a flipped classroom, direct instruction and theoretical content usually delivered face-to-face lectures or classroom settings are delivered online through videos (either created by the teachers or extracted from other sources), and the work traditionally done as homework is brought back into the classroom (Bergmann & Sams, 2014). Flipped classroom model aims to improve student engagement and outcome by mirroring the rapidly developing technologies students will be engaged in other fields (Ozdamli & Asiksoy, 2016). Bergmann and Sams (2014) set out a range of advantages of flipped classrooms including students getting help on difficult topics, enhancing interaction, allowing for differentiation, creating conducive learning atmospheres, and learning at their own pace. Central to the model, however, is that students are encouraged to take initiative when it comes to absorbing new material offered online rather than passively listening to a teacher's lectures. By using online content as the basis for face-to-face classroom interactions, students are encouraged to engage with online content more than they did with lecture content, and to be active participants in the classroom. Although flipped learning model can be used across the age spectrum, we observed that it is particularly suitable for secondary school students who are familiar with technology and can take responsibility to learn more independently.

Education in Bhutan and the Opportunities for a Flipped Classroom Model

One of the pressing issues in Bhutanese education system is the amount of syllabus content that has to be delivered to students in each level of classes. Many teachers complain that they do not get sufficient time to cover the required syllabus in the allocated instructional hours (a situation also aggravated by the removal by the Ministry of Education of Saturday classes since 2019). Utha et al. (2016) also agree that coverage of syllabus is a big hindrance given the limited timeframe. Teachers are concerned with the bulky and rigid syllabus in Bhutanese education system (Gyamtsso et al., 2017). The situation is aggravated by the mandate for teachers to use student-centred teaching learning approaches such as Kagan cooperative, guided enquiry, project based, and discovery learning which require additional instructional hours. Teachers face the dilemma of either forgoing the syllabus completion or employing student-centred teaching learning pedagogies. Strayer (2012) states that teachers often find it difficult to manage their limited classroom period and student-centred pedagogies to have an effective

teaching learning. Gyamtso et al. (2017) have pointed out that exam-oriented syllabus focuses mostly on syllabus coverage. The Bhutanese education system at present is overtly based on academic meriting basis (with summative assessment comprising 80% or more and a mere 20% or less for formative assessment) and as such forgoing syllabus is not a choice for either teachers or students. On the other hand, reducing student-centred teaching and learning pedagogies to the point where teachers' are expected to be just facilitators also distracts from the key aims of teaching and education.

This conflict arises particularly in the context of events which take time away from the academic year. Public holidays, co-curricular activities, literary activities, annual school programmes, national occasions, international day celebrations, and numerous ad-hoc programmes (prescribed by ministry, dzongkhag, departments, schools, corporations, individuals etc.) have to be considered. As of April 26, 2018, Pelbar Higher Secondary School (name changed) missed 18 out of the possible 68 instructional days (9 days for public holidays that includes His Majesty's birthday celebration, Losar-New Year, and Paro Tshechu-local festival; 9 days of school programmes on account of preschool activities, annual school religious ritual, intra-school games and sports competition, annual school marathon, and National Council Member of the Parliament election). This comes to around 26% of the total instructional days. These do not include missed and shortened classes for meetings and other ad-hoc programmes. These co-curricular and extra-curricular activities, however, are very important because of its focus on wholesome education, life skills education, and competency-based learning. Teachers have also been asked to take on additional evaluation roles and responsibilities which will enhance the education system but also take time and effort separate from classroom teaching. It may be possible to cover all of the required syllabus and activities related to academic matters for the given academic year if not for the extra-curricular activities and adhoc programmes. However with this reduction in overall time for classroom teaching, alternative models of instruction need to be explored. In order to ensure quality education and personal development outcomes for students within this context, it is important to understand if there are other non-traditional ways of achieving the syllabus requirement within the set timeframes. These strategies such as flipped classroom model, however, have to be tested, researched and elucidated so as to ensure their applicability within the Bhutanese setting.

This study was undertaken with the students of Pelbar Higher Secondary School in Paro District, Western Bhutan. The study investigated three key questions:

1. What impact does a flipped class model have on managing the time shortage

(syllabus coverage) for secondary school students?

2. What was the impact of a flipped classroom model on student learning outcomes?

3. What is the attitude of students towards a flipped classroom model?

Literature Review

Flipped classroom was popularized by Aaron Sams and Jon Bergmann, who at the time were teachers at Woodland Park High School in Colorado, when they began using recorded lectures in 2007 (Garza, 2014). Flipped classroom is a pedagogical model that employs video, lectures, reading assignments, practice problems, and other digital, technology-based resources outside the classroom to introduce the concept, and interactive, group-based, problem-solving activities inside the classroom for more meaningful learning (American Association of Nurse Anesthetists, 2014; Bishop & Verleger, 2013). Students watch videos or online lessons, read online material, and complete assignments and assessments outside of class. Face-to-face class time is used to reinforce learning, to identify gaps in learning and to examine concepts more deeply (Williamson, 2012). Similarly, Flipped Learning Network (2014) defines flipped learning as “A pedagogical approach in which direct instruction moves from the group learning space to the individual learning space, and the resulting group space is transformed into a dynamic, interactive learning environment where the educator guides students as they apply concepts and engage creatively in the subject matter” (p. 1). Even though flipped learning leaders distinguish between flipped learning and flipped classroom, it does not necessarily mean two different concepts for the purpose of this study. According to the pioneers of flipped classroom Bergmann and Sams (2014), there is no such thing as one definition of a flipped classroom. However, they agree that there are some commonalities across the educational spectrums. The commonalities that they are referring to are that, in flipped class, direct instruction (lecture) is delivered at home via videos that teachers either create or curate, and that which has traditionally been done as homework is completed in class. Class hour is usually used for reflection and review of the instruction that students learned through videos.

As the definition suggests, flipped class is aimed at improving student engagement and outcomes. Even though most of the research articles on flipped classes are based on its effectiveness such as student engagement, positive interactions, and betterment of students' outcomes, there are enough claims and confirmation to assert that flipped classes also frees up classroom instructional hours. Flipped classroom allows time and opportunity for student-centred learning, peer interactions, and personalized instructions (Hamdan et al., 2013). According to Riisman (2014), use of flipped classes have many benefits that include freeing

up of class time. His research also found that flipped class allowed for class time to be used more efficiently and to stay on schedule. Similarly flipped classroom can reduce the amount of time spent in the physical classroom and can help in removing stress on classroom scheduling (Baepler, 2014). It help students learn at a pace that is most appropriate for each of them (Bergmann & Sams, 2012). With increased availability of class time, Bergmann and Sams (2014) also pointed out that teachers were worried about students' engagement. They called for these free hours created to be used for learning reinforcement and making meaning to what they learn on their own. Bristol (2014) also notes that content overload has become a common problem that teachers are dealing with at all levels of academia. With the use of flipped classroom, he believes that students can pursue the knowledge and comprehension before coming to class and use the class time to focus on application and analysis. In Bhutanese education system too, syllabus has become a big hindrance to the limited time available (Utha et al., 2016). As such, the freed up time can also be efficiently used for syllabus coverage. But this should not impede students learning in any way.

An understanding of student attitude towards different learning traits can be critical in the assessment of student willingness for flipped classroom, which is a prerequisite for successful implementation of flipped classroom strategy (Teng & Chaw, 2013). In a study on students view on the use of flipped classroom, Butt (2014) states that after his experience with flipped classroom for an entire course, students' view towards the flipped classroom approach, on an average, became far more positive. Students were content with flipped classroom activities, with many agreeing that the class time interaction was beneficial to their understanding of course concepts. Students perceived that flipped classroom activities were more student-oriented than traditional class (Kim et al., 2014). Student satisfaction inclines to be higher in flipped classroom and blended learning than in traditional lecture method of teaching (Kelly et al., 20009). In a study on evaluation of flipped classroom, Thompson and Mombourquette (2014) stated that the overall opinion of students on flipped classroom were mixed, yet, majority of them expressed their interest of enrolling in another flipped classroom.

Methodology

The study was undertaken in one of the higher secondary schools in the Paro District (Pelbar Higher Secondary School), Western Bhutan. A total of 83 class XII students participated in the study. The experimental group consists of 36 students and control group had 47 students. Both the site and sample were selected using purposive sampling method as all the researchers are teaching at the site school. This would not only minimize the disturbance to instructional hours and the cost incurred for travel. However, division of the classes into experimental and control group were selected through random sampling. Although flipped learning

model can be used across all age spectrum, we observed that it is particularly suitable for secondary school students who are familiar with technology and can take responsibility to learn more independently.

Multiple Choice Question (MCQ) pre-test and post-test on the lesson were administered to both the experimental and control group. Mean score and independent sample t-test were used to assess the difference in dependent variable test score between pre-test and post-test. For the experimental group, pre-test was first administered on the topic chosen. The students were then asked to watch the given video clip and go through the power point presentation prior to classroom learning (treatment). After that, through hands on activity in the classroom, students learn and exhibit their understanding of the concept/topic. Finally, the post-test was administered after the completion of the topic.

For the control group, pre-test and hands on activity was administered and conducted in the classroom until the students learn and exhibit their understanding of the concept/topic. No video clip and power-point presentations are given to them. Post-test was administered after the completion of the topic.

Exact instructional (class) time taken by the experimental and control group for the teaching learning of given topic were recorded by the time recorder. The time recorder was also the same person throughout the course of implementation for both experimental and control group. The experimental group received the treatment-watching video clip, before the actual classroom teaching and learning in their leisure time. For the purpose of this study, an English lesson on story titled “Lamb to the Slaughter” was used as a learning concept. For the students in experimental group, a video clip and a power point presentation was provided as pre work. Since every students did not have computer and smart phone to go through the video and power point presentation at home, arrangements were made for them to watch the clips in the school Information Technology lab anytime during their free hours. The actual teaching in the classroom for both the experimental and control group were done by the same teacher.

Attitude questionnaire designed by the researchers was used for the collection of experimental students’ attitude on flipped classroom. Attitude attributes are described by statements that reflected participants’ attitude towards flipped classroom strategy that they experienced. It is accorded with 5-point Likert scale from 1-Strongly Disagree to 5-Strongly Agree. Mean score and one-sample t-test were used to compare the mean scores of positive and negative statements with that of the neutral test value so as to confirm their attitudes towards flipped classroom strategy.

Findings and Discussion

Introduction

The findings are presented under four themes namely flipped classroom and instructional hours, effect of reduced instructional hours on students learning, students' attitude towards flipped classroom, and students' general comments on flipped classroom strategy including demographic information as detailed below.

Demographic Information

A total of 83 students from all four sections of class XII participated in the study. The four sections are randomly divided and assigned as experimental group (A and C) and control group (B and D). The number of students in experimental group and control groups are 36 and 47 respectively. The number of male and female are also 36 and 47 respectively. No other demographic information or academic achievement labels considered for the group division.

Flipped Classroom and Instructional Hours

An English lesson on the story titled 'Lamb to the Slaughter' was divided into eight parts and taught over the period of eight days. One part was taught in a specified period on each day. Both the experimental and control group were presented the same lesson and checked on their understanding so that the lesson taught in each class were basically completed at their own pace. The experimental group had already done their homework of watching video lesson on the same lesson on their own time without impacting actual instructional hours. Time was recorded by a researcher for every part of the specified teaching hours for all sections that include both experimental and control group as shown in Table 1.

Table 1

Daily Instructional Time Taken by Each Group (in minutes)

	Day /time	day/ time	day/ time	day/ time	day/ time	day/ time	day/ time	day/ time
	1	2	3	4	5	6	7	8
Control	34.59	41.14	40.81	43.17	32.63	37.62	40.57	40.67
Experimental	30.40	37.58	30.50	38.73	28.59	20.35	37.63	34.24

The difference between the control and experimental group starts from the low of 2.94 minutes to as high as 17.27 minutes within a session of 50 minutes. The time taken to complete the specified topic is lesser in experimental group than

the control group in all eight sessions. Table 2 shows the total time recorded for the coverage of the whole lesson and mean instructional time per session recorded to complete the teaching for the two groups.

Table 2

Average Instructional Hours Recorded for Each Group

	Total time for 8 periods recorded over 8 days (minutes)	mean instructional time recorded (minutes)
Control	311.23	38.90
Experimental	258.05	32.26
Difference	53.18	6.65

The mean time saved by flipped classroom strategy is 6.65 minutes per period of 50 minutes each. This accounts to around 13.29% which means we get an extra period of 50 minutes for every 7.5 periods of 50 minutes each. This would seem to reflect similar results the authors found when introducing flipped classroom models with other senior high school students in the year 2017. In the flipped classroom implemented by the same authors in the delivery of genetic engineering lesson in class XI biology, it took 3 periods of 50 minutes for the experimental groups, whereas, the control group took almost 4 periods of 50 minutes each to complete the same topic. This also aligns with the work of Smith (2013), who found that approximately one-third of total class time was recovered over the course of each semester in a university chemistry classroom. Riismandel (2014) and Bergmann and Sams (2012) also found that the use of flipped classroom strategy increased the availability of class time. In all of these studies, the freed up class hours were used for learning reinforcement and interactive classroom learning session. Similarly, the extra time gained through the application of flipped classroom strategy in this study was used for the completion of the mandated syllabus.

Effect of Reduced Instructional Hours on Students Learning

Pre-test and post-test were administered to both experimental and control group. It included 20 MCQs on the lesson learned. The same test were conducted before the delivery of the lesson (pre-test) and after completion of the lesson (post-test). The mean scores, equality of mean scores of pre-test, post-test, and their difference between the experimental and control groups is reflected in Table 3.

Table 3*T-test for Equality of Means*

	Groups	N	Mean	Std. deviation	Mean diff	t	Sig. (2-tailed)
Pre-test	Experimental	36	9.06	2.203	1.141	2.342	0.022
	Control	47	7.91	2.195			
Post-test	Experimental	36	13.69	1.636	1.354	3.595	0.001
	Control	47	12.34	1.748			
Difference	Experimental	36	4.64	2.180	0.213	0.394	0.694
	Control	47	4.43	2.627			

There is significant difference between the pre-test scores and post-test scores of experimental and control group with $p < 0.05$, $t = 2.342$ for pre-test and $p < 0.05$, $t = 3.595$ for posttest. However, there is no significant difference between the pre-test and post-test score of the two groups ($p > 0.05$, $t = 0.394$). Therefore, the effect of classroom teaching did not differ between the experimental and control group, even though instructional time required to complete the same concept was less in experimental group. The researchers did not find any literature that specifically calculated the classroom time advantage afforded by the use of flipped classroom strategy even though there were agreement on the strategy freeing up class hours.

Students' Attitude Towards the Flipped Classroom

The participants for the attitude questionnaire are only the experimental groups ($N = 36$) since the flipped classroom strategy was only implemented for them only. Table 4 shows mean and the significance difference between the mean positive and negative scores and that of the neutral value (3), in the 5-point Likert scale. The 5-point shows the degree of agreement with the statements with 1 = 'Strongly Disagree' to 5 = 'Strongly Agree'. The neutral value 3 is 'neither agree nor disagree' attitude. Positive statements support the preference for the use of flipped classroom strategy whereas, negative statement do not support the use of the same as a classroom instructional strategy. Positive statements consists of the statements of preference such as; liking, meaningful learning, interactive classroom, engaging classroom, greater participation, and their commitment. Negative statements include time wastage, preference for traditional method, and non-enhancement of students learning,

Table 4*One Sample t-test*

	Test Value (neutral attitude score) = 3				
	N	mean	Std. Deviation	t	Sig. (2-tailed)
positive statements	36	4.601	0.347	27.6667	.000
negative statements	36	1.486	0.467	-19.47	.000

The mean scores for the positive and negative statements are 4.601 and 1.486 respectively. Their differences with that of the neutral value are highly significant with $p < 0.001$, $t = 27.67$ for positive statements and $p < 0.001$, $t = -19.47$ for the negative statements. As per McLaughlin et al. (2013), significantly, more students preferred a flipped classroom format after completing a course through flipped classroom strategy. Butt (2014) also states that after his experience with a flipped classroom for the entire course, students' view towards a flipped classroom approach, on an average, became far more positive. Flipped classroom has positive impacts on students' attitude and also helps in students' performance (Wilson, 2013). With this result on students' attitude, it is an opportunity for educators to embrace the approach in our daily teaching learning experience.

Students' General Comments on the Flipped Classroom Strategy

Students' general comment were compiled from the students' responses on three complementary questions in the attitude questionnaire sheet. The questions were: 'How did you find the flipped class?' 'What do you feel about learning through flipped class?' and 'Any other comments?' Almost all students were positive about using a flipped classroom strategy. They agreed that flipped classroom strategy was helpful, informative, interesting, and was a unique experience. Many of them stated that it helped in better comprehension of the concept, more participation, greater opportunities, additional learning, greater interaction, and better engagement during instructional hours. Students felt that flipped classroom is more effective, meaningful, and beneficial than traditional lecture method. They also expressed their wish and willingness to participate in flipped classroom strategy in the future. Some of them also expressed their worry about not having means or technologies at home to practice flipped classroom effectively.

The findings also revealed that flipped classroom is an effective way to reduce the limited instructional hours at the disposal of teachers and students to complete the prescribed syllabus. It is also one form of engaging and making students part of their learning process. Even with these advantages, most Bhutanese

students do not have the technological means to watch video clips and power point presentation at home. But with the increase in the use of smart phones by students of higher classes, flipped classroom implementation will become more reliable. There are a lot of limitations in this study. This study implemented the flipped classroom for a specific language subject with class 12 students. Further research in different subjects with greater range of participants can be carried out. The attitude questionnaire had 4 negative statements out of 16 and this might also have impacted students' attitude scores. Since the participants were students of the researchers, their attitude might have been influenced to please the teachers.

Conclusion

Flipped classroom strategy proved to be effective in managing instructional hours. It helps in freeing up actual classroom instructional hours that can either be used for syllabus coverage or other enhancement activities. Despite the reduced instructional hours, students' learning were not compromised in implementing a flipped classroom. As for the students' attitude, they were positive with the use of flipped classroom strategy in their daily teaching learning session. Students agreed with full conviction that they prefer flipped classroom strategy over traditional lecture method and it helped them in meaningful learning. They felt that the instructional hours were more interactive, engaging, and motivating.

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Bak Bir Rai has been serving as the Principal of Shari Higher Secondary School in Paro Dzongkhag for the last 11 years. Prior to this he served as a Teacher and Vice Principal for 18 years. He graduated with Bachelors of Education from Samtse College of Education and later Masters in Educational Leadership and Management from Paro College of Education, Royal University of Bhutan, Paro. Mr. Bak Bir Rai is the recipient of National Order of Merit (Gold Medal) from His Majesty the King in 2015 for his Excellent Leadership in School Management. He completed School Leadership Development Programme (SLDP-5), organised by the Ministry of Education (MoE) and Royal Institute for Governance and Strategic Studies.