"A little flip goes a long way"

The impact of a 'partial'-flipped classroom design on student performance and engagement in a first year undergraduate economics classroom

Abstract

The flipped classroom is gaining prominence as an active learning pedagogy to engage a new generation of students. However, all courses do not lend themselves to a fully flipped design and instructors are often reluctant to flip lectures. In this study, I experimented with a "partial" flipped classroom design in a first-year undergraduate economics course. In this partial flipped format, traditional lectures were substituted with micro-lectures and the remaining class time was devoted to activities like quizzes, group work and student presentations. The full lectures were panopto recorded and put up on the e-learning site, Blackboard.

This format enabled me to combine the benefits of a traditional lecture with a flipped classroom design. In order to evaluate the effectiveness of the partial flipped classroom format, I compared the final exam scores of students in the partial flipped classroom with those in the control group, which followed a traditional lecture-based approach. The key results from the analysis revealed that students in the partial flipped classroom performed better in the final exams vis-à-vis students in the traditional classroom format. Furthermore, the partial flipped classroom format was associated with lower odds of students failing in the module. This format also resulted in better student engagement, more flexibility and enhanced student-tutor interaction within the classroom.

Keywords: Partial Flipped classroom, student performance, engagement, flexibility, active learning pedagogies, micro lecture

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1. Introduction

A major challenge in higher education teaching today is development of appropriate learning pedagogies to engage generation Z students. Generation Z represents a generation of 'digital natives.' born between 1995-2012[1]. They are more technologically sophisticated as compared to the previous generations, and have a natural aptitude for new devices and online interactions [2]. Studies have shown that Generation Z students suffer from low attention spans, and find it hard to engage with classroom lectures [3,4]. In this context, the traditional 'chalk and talk' style of teaching is being increasingly regarded as 'transmissive and passive, with little room for student participation, low student engagement and a learning environment supporting only a surface approach to learning'[5].

These deficiencies of 'chalk and talk' style approaches have not been sufficiently recognised in undergraduate teaching across many social science disciplines, including Economics[6]. It has been estimated that undergraduate lecturers on an average spend 65-80 per cent of the class time on traditional lectures[7]. However, the dominant role of lecturing in higher education is being increasingly challenged. Studies have revealed that a significant proportion of undergraduate students only acquire conceptual knowledge of the subject in a traditional classroom format. They are not able to adequately develop critical thinking, data analysis and reasoning skills, which are thought to be at the core of the curriculum [8]. Employers also reveal that many Business school graduates are not good at applying economic and finance principles to real world issues [2].

It is thus crucial to experiment with student-centred, active learning pedagogies in higher education. One such active learning pedagogy is the 'flipped' classroom model.

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A ‘flipped’ classroom involves replacement of traditional lectures with out of class delivery of course content through online resources. The in-class time is devoted to collaborative, hands on problem solving and discussion [9]. The overarching aim of this form of learning is to create a student-centred learning environment and transform the ‘acquisition of foundational knowledge as an out of class activity’[10]. In contrast to traditional lectures, this form of learning requires students to be active participants in sharing, understanding and constructing new forms of knowledge [11]. In a ‘flipped’ model, the role of the tutor is relegated to a ‘guide on the side’ instead of a ‘sage on a stage’ [12]. Thus, the tutor becomes more of a facilitator, rather than a content provider, which is the case in a traditional classroom lecture. As the focus of the learning process is shifted from the educator to the learner, students are able to take ownership of their learning process.

However, existing studies show that the impact of the flipped classroom on student’s academic performance is rather mixed. Calimeris and Sauer [13] implemented a ‘flipped’ classroom in a principles of microeconomics classroom and found that students in a ‘flipped’ classroom scored significantly higher on the mid-term as well as final exams, compared to students in a non-flipped classroom. However, some studies have reported that students in a ‘flipped’ classroom model perform only moderately better than a traditional lecture based format [14, 15,16,17]. Other studies have shown contradictory results and revealed that the students in the flipped classroom performed poorly, as compared to a traditional lecture based format [18,8].

With respect to evaluation of student engagement in a “flipped’ classroom format, there is also considerable variation in results. Vasquez and Chiang [19] examined student satisfaction in a first-year undergraduate microeconomics classroom, comprising of 900

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students. They found that a majority of students reported satisfaction with the 'flipped' learning design. These students reported that 'flipped' classroom format supported their learning needs better than a traditional lecture, and regarded it as more interactive. In a recent study, Ageline and Cabonell [20] demonstrated that a flipped classroom format implemented in an undergraduate English literature classroom helped to improve student's writing skills in terms of organisation and linking of ideas. Lage el al [21] found that the 'flipped' classroom helped to create more inclusivity in the classroom and support students with different learning styles. In another study, McLean and Attardi [22] analysed student perceptions of a flipped classroom experience. Their findings revealed that student valued the role of the tutor as a "facilitator" rather than an "information deliverer." Students also valued greater peer learning and more classroom interaction, which resulted in a flipped classroom format. Similar results were reported by other scholars as well [23, 24, 25, 26].

However, challenges remained with respect to student's engagement with the pre-class work and the assigned readings in a flipped classroom format. This was qualified by Heijstra and Siugroardottir [27] who implemented a 'flipped' classroom format in a graduate level research methods course. Their findings revealed that the student performance in a "flipped" classroom format depended crucially on their class preparation and the time spent viewing the recordings and the online material. Becker and Proud [16] also reported that the 'flipped' classroom design was associated with higher student satisfaction only among students who had engaged with the pre-class work and were able to pick up the first order cognitive skills comprising of understanding and reading the materials at home. Students who failed to engage or understand the pre-class videos became further disengaged in a 'flipped' classroom format. Furthermore, Foster and Stagl [28] revealed that students considered the workload in a flipped classroom

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format as too high and burdensome. They felt that they could achieve the same learning outcomes in a traditional classroom with much less pressure.

The 'flipped' classroom pedagogy is still in the nascent stage of development. Questions remain on the best practice models to be implemented in a 'flipped' classroom format, which would result in better student outcomes as well as higher student engagement in the classroom. This factor has been highlighted by recent scoping studies on the 'flipped' classroom design [29, 30]. Some scholars also argue that many a times tutors are reluctant to implement the flipped classroom model due to the additional time and costs involved [31]. Furthermore, the flipped classroom format does not give tutors adequate control over the classroom, and the synergies and tangents which emerge in a classroom lecture are often missing in a flipped classroom format [2]. Song et al [32] stated in this context, 'there is still a pressing new for studying HOW to implement the 'flipped' classroom and moreover to be able to connect this pedagogical design with evidence of advantages related to various aspects of student learning.'

This paper attempts to contribute to this critical area. I analyse how a traditional principles of economics classroom was converted into a partial flipped classroom format. In this format, the full lecture was offloaded on the online learning portal, Blackboard in the form of panopto videos. The class time was devoted to a micro lecture, followed by classroom activities like quizzes, classroom discussion and student presentations. This classroom design enabled me to combine the pedagogical benefits of a traditional lecture and a flipped classroom. One could reinforce on the key theoretical arguments in the micro-lecture, but at the same time reap the benefits of increased student participation from the flipped classroom format. I present in detail the design of the partial-flipped classroom model, and the process, which was implemented to evaluate student performance and perceptions of this model. The inquiry will serve as an exemplar for

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other tutors, trying to implement a 'flipped' classroom model. The results from this study will also provide further evidence on the opportunities as well as contestations surrounding the implementation of the partial 'flipped' classroom model.

The remainder of the paper is organised as follows. Section 2 puts forth the theoretical framework that underpinned the partial 'flipped' classroom model. Section 3 outlines the partial flipped classroom design, which was followed in this experiment. Section 4 compares the student performance in the partial flipped classroom, with the control group where in a traditional lecture-based approach was followed. Section 5 examines the student perception of the partial flipped classroom format through the module evaluation survey. Section 6 concludes.

2. Theoretical Framework

In this inquiry I analysed the partial 'flipped' classroom model in terms of two key learning perspectives-the social constructivist theory, and the cognitive load theory. These are umbrella theories that put the students' interests, learning styles and abilities at the centre of the learning process [33]. The constructivist theory of knowledge says that knowledge is a state of understanding that results from continuous interaction between the environment and the individual [34]. Students do not come to the classroom as blank slates, but as learners with their own prior experiences and perspective on the topic. When they encounter new forms of knowledge and new information on the given topic, it interacts with their prior knowledge of the subject and helps them to develop a unique understanding of the subject [35]. As such knowledge is constantly constructed and re-constructed by individuals, on the basis of their existing knowledge as well as lived experiences of the individual, and interaction with peers [36].

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A ‘flipped’ classroom is a pedagogical space in which ‘direct instruction moves from an individual space to a group space, resulting in the group space becoming a dynamic interactive space’ [37]. The ‘flipped’ classroom involves a reversal of Bloom’s taxonomy [38]. Students are able to do lower level cognitive work (understanding and comprehension) outside class, while class time is devoted to higher-order cognitive tasks comprising of problem solving, application of key concepts and analysis through, collaborative group work, problem solving, quizzes and classroom discussion. The ‘flipped’ classroom thus aligns well with the social constructivist approach, and is a useful theoretical framework to assess student engagement and performance within the classroom model. It would be instructive to see the channels through which autonomy and peer learning influence student outcomes in this classroom design.

The other mechanism through which the ‘flipped’ classroom impacts learning outcomes is through cognitive load. The cognitive load depends on: 1) learner outcomes 2) learner’s prior knowledge 3) learner settings [39]. The cognitive load theory states that the working memory has certain capacity and it experiences a number of ‘loads’ during the learning process [29]. These comprise of intrinsic load (the core of the concept), the extraneous load (the additional load that does not translate into learning) and the germane load (the additional load that helps learning by leading to the production of schema) [40]. In a ‘flipped’ classroom setting, the students are exposed to the materials before the class, they are therefore able to pace their learning and choose the learning strategy that is most conducive to their learning style. As a result, they may be able to identify the intrinsic load in advance, at the same time they may be able to reduce the extraneous component of their cognitive load.

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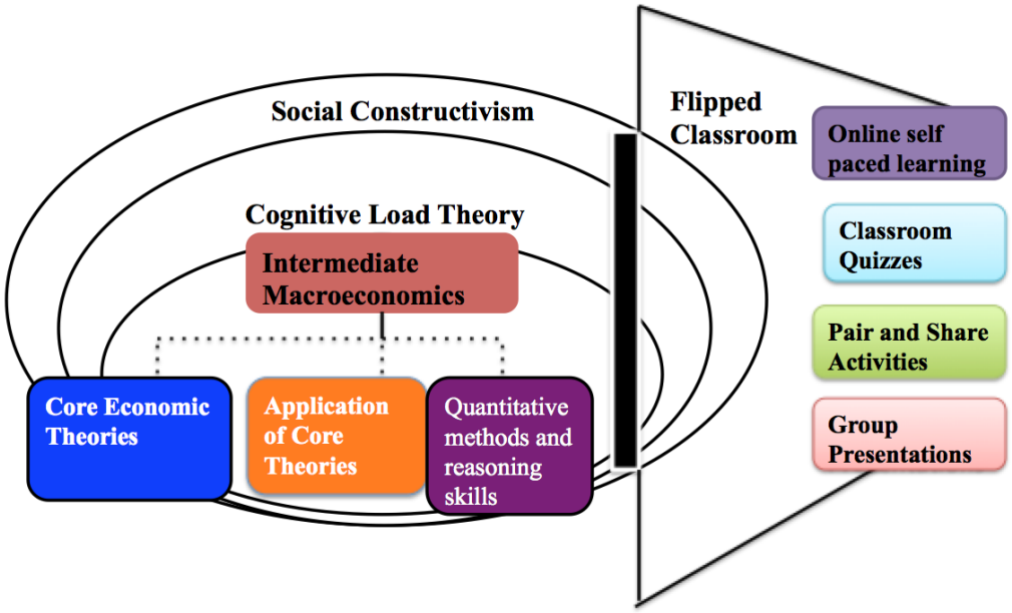

Figure 1: The conceptual framework of the design and implementation of the partial 'flipped' classroom model in a principles of economics classroom (Source: Own compilation based on review of literature)

These two theoretical frameworks informed the design, implementation and evaluation of the partial 'flipped' classroom model. Within this conceptual framework, I linked the partial 'flipped' classroom design to the key learning outcomes in the principles of economics course, which comprised of a) developing core competencies in economic theories and principles b) ability to apply economic theories to real world policy issues c) developing quantitative reasoning and problem-solving skills. The conceptual framework is presented in Figure 1 above. This framework illustrates how the partial 'flipped' classroom room was designed, rooted in the key tenets of the cognitive load theory and the social constructivism paradigm to achieve the key learning outcomes in terms of understanding economic theories, applying theoretical principles and developing quantitative reasoning skills. With a view to achieve these learning outcomes, the 'flipped' model had four key components: self paced online learning, quizzes, pair and

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share activities, group discussions and presentations. These key activities are explained in detail in the following section.

3. The "Partial" Flipped Classroom Design

The participants in this course comprised of 250 students enrolled in two sections of a principles of economics module. This was a compulsory course for all first year students. The course was traditionally taught through a weekly two-hour lecture followed by small group seminars of one hour each. The lectures covered the theoretical aspects of the module, while the seminars provided skill training in these areas. Previous course evaluations revealed that students found the lecture content too heavy and difficult to engage with. They also expressed that they would like to receive more hands-on support in the quantitative aspect of the module. The course redesign was thus motivated by the desire to fully engage students in the learning process and stimulate higher order thinking and problem-solving skills among students through the use of creative technologies.

At the beginning of the semester, students were informed of the purpose of the study and were asked to provide informed consent. The sections were randomly assigned to be either the 'partial-flipped' classroom section (n=120) or the 'traditional' section (n=130). Both the sections were taught by the same tutor. The traditional section continued to be taught through a weekly two hour lecture followed by small group seminars of one hour each. The same seminars were conducted for the 'partial' flipped classroom section as well. However, the lectures in the partial-flipped classroom were replaced by an alternative format.

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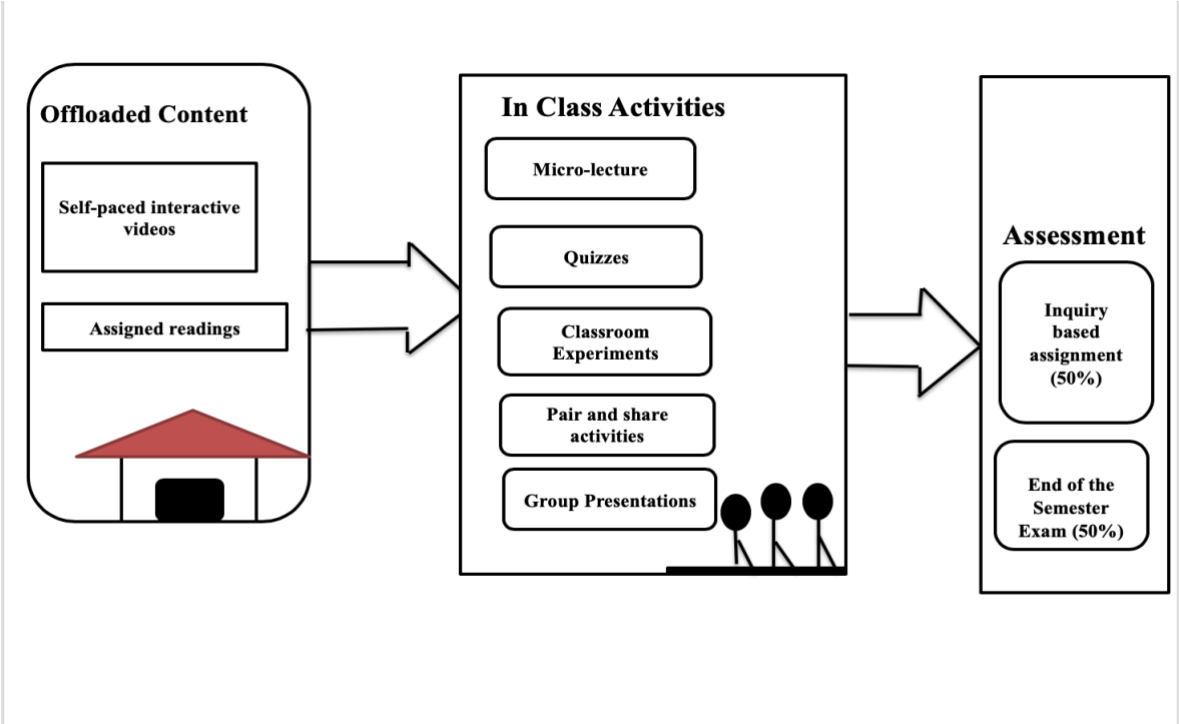

Figure 2: The Partial Flipped Classroom Design (Own Compilation)

As shown in Figure 2, in the new format, all the in-class lectures were converted to self-paced online videos. I pre-recorded 24 lectures in the form of videos using Panopto software and uploaded them on the online learning platform, Blackboard. These lectures emphasized on the critical concepts and theories, which students needed to learn prior to coming to class. These videos were interspersed with interactive learning exercises, which enabled students to regulate their own learning. The students could access these videos at any time on their computers or any internet-enabled device. They had the ability to pause, rewind and fast forward the videos and watch them at their own pace. Students were asked to view two videos each week with the average duration of 18.4 minutes (range of 15 to 29 minutes). Along with the pre-recorded videos, students were assigned background readings and textbook chapters each week. This constituted preparatory work for students prior to coming to class.

The 2-hour lecture was broken down into a number of activities in the 'partial' flipped classroom format. The class began with a micro-lecture. These 'micro-lectures'

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enabled me to direct and reinforce on the student's understanding of the online materials. I summed up the key aspects of the material, focusing on the graphs and derivation of equations. Fom my previous experience, I knew that students often struggle with this aspect of economic theory. This was followed by an MCQ quiz using pollseverywhere software. This quiz comprised of 10-15 multiple-choice questions. The students answered these questions through their hand-held devices and were allocated approximately 30 seconds per question. The responses were then analysed and feedback was provided to students. Students were then put in pairs and asked to solve 2-3 numerical questions or a case study related to the pre class classwork. While the students were solving the questions, I went around the class and provided them with step-by-step guidance. Finally, a few pairs of students were invited to come forth and present the answers to class. I followed this up with my own feedback and guidance on the numerical questions. In some of the sessions the "pair and share" activities were replaced by classroom games such as the market experiment for supply and demand. In the last part of the class four groups of 4-5 students each were asked to present a summary and interpretation of the pre-assigned readings and answer students questions on the topic. Each group was required to give presentations twice during the course of the semester.

Appropriate forms of assessment are considered crucial to the success of a 'flipped' learning design [41]. In this flipped classroom design, I adopted two forms of assessment, which enabled me to evaluate student's understanding of the materials, their numeracy skills and their ability to apply economic theories and policies to real world policy issues. These comprised of an inquiry-based assignment (50%) and an end of semester exam (50%). The assignment required students to conduct independent research and apply economic theories covered in class to a real-world problems. The end of semester exam comprised of ten MCQ based questions and two essay type questions.

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4. Outcomes of the 'partial' flipped classroom design

The outcomes of the partial 'flipped' classroom model were examined on the basis of the student performance in this course, as well as student perceptions and evaluation of this model.

4.1 Data Sources

I compared students' grades in the two assessment tasks i.e. the end of the semester exam and the inquiry-based assignment in the 'partial' flipped classroom model with those in treatment group where in a traditional lecture-based approach was followed. In addition to this, I asked students' in both the sections to fill in a short Qualtrics survey comprising of ten questions to collect information on their age, gender, ethnicity, parental education, household income, number of absences from class, average time spent studying at home, whether they worked part time during the semester and if they had studied economics at A levels. The students were asked to fill this survey in one of the seminar sessions and were awarded additional 2 marks in the final exam in order to incentivise them to complete the survey. 104 out of 120 students in the 'partial' flipped classroom section and 113 out of 130 students in the traditional classroom filled in the survey.

The student perception of the partial-flipped classroom model was based on the teaching evaluation survey. This survey was conducted at the end of the semester and comprised of 10 *Likert* type questions and one open ended question. Students rated statements about the partial 'flipped' classroom on a scale ranging from 1-4. 1 refers to 'strongly disagree' and 4 refers to 'strongly agree.' 82 out of the 120 students in the partial flipped classroom section completed the survey, which corresponded to 68.3 per cent of

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the class. The students were asked to fill in the survey in class during one of the revision sessions.

4.2 Modelling Student Performance in the Partial Flipped Classroom

I employed multiple regression analysis in order to evaluate the effects of a "partial" flipped design on student's academic performance. This technique is considered superior to a simple difference in means test between a flipped and non-flipped model as it allows to control for other demographic, parental and personal attributes that may affect a student's grades [13]. I follow the approach followed by Calimeris [13] and specify the regression model as:

$GRADE_i = a + b\ FLIP_i + S_iX + DiY + U_i$

1) $GRADE_i$ is the student's aggregate score in the final exam and the assignment.
2) i=1..n. FLIP is a dummy variable with the value equal to 1 if the student was enrolled in the partial flipped classroom and 0 if the student is enrolled in the partial flipped classroom.
3) D_i is a vector of academic controls including number of absences from class, average time spent devoted to independent studying and whether the student studied A level Economics and if the student works part-time during the semester.
4) X_i is a vector of demographic controls including gender, age, ethnicity and parental education.

In addition to this, I also analysed whether a partial flipped classroom model reduced the probability of a student failing the course. In the UK higher education system, a student who gets an overall grade below 40% fails the course. Following, Lombardini et al [8], I employed a binary logit regression model. In this model, the dependent variable was coded as 1 if the student's overall grade was below 40% and 0 otherwise.

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The results of this binary regression model were used to predict the probability of the student failing the exam given specific demographic characteristics {gender, age, ethnicity and parental education}, academic characteristics {number of absences from class, average time spend on independent study, whether the student studied A level Economics and if the student works part-time during the semester}

4.3 Results

Table 1 presents the summary statistics for the two sections-the partial flipped classroom (n=104) and the traditional lecture-based classroom (n=113). The differences between the two sections are determined to be significant on the basis of a t-test for difference in means. There are no significant differences between the two sections in the final grades for the assignment, while the students in the partial flipped classroom scored significantly higher in the end of the semester exam. There are no significant differences in the demographic characteristics (gender, age, ethnicity, parental education and household income) of the two sections. The students in the two section are also similar in their academic characteristics. There are no significant differences between the two sections in terms of number of absences from class, the average time devoted to independent studying, taking economics at A level and working part-time during the semester. This shows that the two sections are relatively homogenous in terms of their observable characteristics.

Table 1: Summary Statistics and the difference between the partial flipped classroom section and the traditional lecture based section

	Partial Flipped Section (n=104)		**Traditional Section (n=113)**		**Difference**		
	Mean	Std Error	Mean	Std Error	Mean	Std Error	t-stat
Standardized assignment score	0.18	0.24	-0.1	0.16	0.28	0.23	1.8

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Standardized exam score	0.33	0.23	-0.12	0.16	0.49	0.23	2.09*
Absences	1.46	0.38	1.05	0.26	0.41	0.38	0.79
Studied A level economics	0.16	0.09	0.14	0.06	0.02	0.09	0.21
Works part time during the semester	0.19	0.09	0.11	0.06	0.08	0.09	0.89
Average weekly time spent on independent studying (mins)	82.8	10.4	93	7.1	-10.2	10.4	-0.98
Female (=1)	0.26	0.12	0.43	0.08	-0.17	0.12	-1.45
Age (years)	18.19	0.19	18.29	0.12	-0.1	0.18	0.6
White (=1)	0.84	0.1	0.74	0.07	0.1	0.1	0.94
Black (=1)	0.03	0.05	0.06	0.04	-0.03	0.05	-0.48
Asian (=1)	0.06	0.04	0.01	0.03	0.05	0.04	1.53
Chinese (=1)	0.01	0.04	0.06	0.04	-0.05	0.04	-1.24
Mixed (=1)	0.02	0.12	0.01	0.06	0.01	0.17	0.12
Other (=1)	0.02	0.04	0.05	0.01	-0.03	0.12	-1.45
Mother's Highest education (graduate and above=1)	0.61	0.12	0.43	0.08	0.18	0.12	1.5
Mother's Highest education (secondary school=1)	0.32	0.12	0.42	-0.1	0.11	0.18	-0.88
Mother's Highest education (less than secondary school=1)	0.06	0.08	0.04	0.05	0.02	0.08	-1.02
Mother's Highest education (unknown=1)	0.23	0.1	0.17	0.07	0.06	0.05	0.55
Father's Highest education (graduate and above=1)	0.58	0.12	0.43	0.08	0.15	0.12	1.23
Father's Highest education (secondary school=1)	0.06	0.08	0.14	0.05	-0.08	0.12	-0.6
Father's Highest education (less than secondary school=1)	0.52	0.12	0.46	0.09	0.06	0.12	0.47
Father's Highest education (unknown=1)	0.19	0.11	0.28	0.07	-0.09	0.11	-0.86

The results of the OLS regression analysis are presented in Table 2. We find that the partial flipped classroom does not have a significant impact on the grades for the inquiry-based assignment. However, it has a positive and a significant impact on the grades for the final exam and the overall grades for the module. This may be partly attributed to the fact that the assignment was submitted in Week 6 (mid-semester), while the final exam took place in Week 12 (end of the semester). A number of studies have shown that there is a negative adjustment period associated with the 'flipped' classroom format. Students have to adjust their learning tactics to suit a 'flipped' classroom format [42, 43]. This may

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also be attributed to the fact that students started putting in more work and watching the videos carefully only when the final exam drew closer.

Table 2: OLS Analysis of the Partial Flipped Classroom on Student Performance in the Final Exam and Assignment

	End Semester Exam	Assignment	Aggregate Score
Partial Flipped Classroom	0.5674**	0.2986	0.6413***
Absences	-0.206	-0.165*	-0.229
Taken A level Economics (Yes=1)	0.0052**	0.0059***	0.0067***
Part time work (Yes=1)	-0.1915	-0.2563	-0.3759
Time spent on independent study	0.067***	0.079	0.049***
Age	-0.268	-0.213	-0.219
Female (=1)	0.4678	0.163*	0.125
White (=1)	-0.223	-0.215	-0.191
Mother's highest education level (Graduate and above=1)	0.264	0.275	0.344*
Father's highest education level (Graduate and above=1)	0.258	0.293	0.296
Constant	-9.11*	-4.965	-7.745
Observations	217	217	217
Adjusted R squared	0.384	0.32	0.404
*p<0.1; **p<0.05; ***p<0.01			

Of all the academic control variables, I found that absences from class had a negative impact on student's performance. However, this was significant only in the case of the final exam at 10% significant level. According to a priori expectations, studying A level economics and the time spent on independent study had a significant and positive impact on student's academic performance. In contrast, working part time during the semester had a negative impact on student's performance in the module. However, this result was not statistically significant. Of all the demographic controls, the results reveal that ethnicity, age and parental education do not have a significant impact on the student's academic performance. Female students performed better than the male students. But the result was significant only for the grades in the assignment at 10% significance level.

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The effect of gender on student's academic performance remains ambiguous in literature. Some studies have shown that female students perform better at university, as compared to males [44]. However, other studies reveal that in quantitative courses like Economics and Finance, the performance of male students tends to be better [45].

The results of the binary logistic regression analysis are presented in Table 3. The odds ratio is 0.621, while the inverse odds ratio (1/odds ratio) is 1.61. This shows that students in the 'flipped' classroom are 1.61 times less likely to fail as compared to students in a traditional based classroom. Equivalently, the odds of failing in the exam are reduced by 39% for students in the partial-flipped format. The results reveal that demographic and household characteristics are not statistically significant. As far as the academic controls are concerned, absences from one class increase the odds of failing in the exam by 5% [odds ratio=1.051]; while an additional hour of independent studying reduces the odds of failing in the module by 4% [odds ratio=1.041].

Table 3: Summary of Binary Logistic Regression Analysis for predicting the odds of failing in the module

Predictors	B	Std Error	Chi Square Ratio	df	p	Odds Ratio	Inverse Odds Ratio
Partial Flipped=1	-0.476	0.253	3.53	1	**0.06**	**0.621***	**1.61**
Absences	0.05	0.053	0.858	1	**0.035**	**1.051**	**0.95**
Taken A level Economics (Yes=1)	0.24	0.289	0.65	1	0.041	1.281	
Part time work (Yes=1)	0.343	0.202	2.67	1	0.11	1.42	
Time spent on independent study	-0.052	0.053	2.93	1	**0.086**	**1.041****	**0.96**
Age	0.62	0.295	4.33	1	0.037	1.052	
Female (=1)	0.332	0.119	2.575	1	0.101	1.302	
White (=1)	0.081	0.054	2.97	1	0.002	0.178	
Mother's highest education level (Graduate and above=1)	0.87	0.153	3.53	1	0.001	1.409	
Father's highest education level (Graduate and above=1)	0.92	0.153	3.53	1	0.001	1.409	
Constant	-1.753	0.3	9.375	1	0.004	0.177	

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R square= 0.067;-2 Log Likelihood=546.812; N=250

5. Student Perceptions of the Partial Flipped Classroom Design

	Table 4: Student Perception of the "Partial" Flipped Classroom, Percentage of Students Responding					
		Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1	I found the partial flipped classroom to be more engaging than a lecture	58%	40%	14%	5%	0%
2	I found the video lectures helpful in understanding the content	40%	42%	12%	2%	4%
3	I was able to watch the lectures at my own pace and time that was convenient.	33%	47%	13%	6%	0%
4	I found it useful to re-watch portions of the lecture multiple times.	21%	28%	31%	14%	6%
5	The pre class works takes too much time	20%	35%	8%	27%	10%
6	I benefited from the classroom activities that allowed me to interact with my peers	32%	48%	13%	6%	0%
7	I learnt new ways of solving the problems by observing my peers	22%	56%	13%	9%	0%
8	I found it easier to ask questions in class	29%	47%	24%	0%	0%
9	My interaction with the tutor improved in the partial flipped classroom format.	38%	44%	14%	1%	1%
10	Overall I am satisfied with the partial flipped classroom format	62%	28%	8%	2%	0%

The student evaluation of the flipped classroom experience was largely positive as seen in Table 4 above. Overall 90% of the student cohort expressed satisfaction with the partial 'flipped' classroom model. 58 per cent of the students 'strongly agreed' and 40 per cent 'agreed' to the statement that the partial 'flipped' classroom was more engaging than a traditional classroom. 82% of the surveyed students 'agreed' that the video lectures enabled them to understand the content better than the traditional classroom lecture. The positive evaluation of the partial flipped classroom design came forth in the open ended question as well.

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'I enjoyed the structure of the module and gained a lot from the class.'

A key desirable feature of the online lectures was that they offered greater flexibility to students. 80% of the students 'agreed' or 'strongly agreed' with the statement that 'flipped' learning helped them to pace learning as per their own requirements. 49% students also 'agreed' or 'strongly agreed' that they watched portions of the recorded lectures multiple times, which helped to enhance their understanding of the materials.

'I could watch the videos and read at the time I felt most productive. I could follow along at my own pace and go back to the bits I found difficult. After watching the videos, the readings made more sense to me and I got a lot more from the whole process.'

One contested area in the flipped design was with respect to the time taken to do the pre-class work. 20% of the students 'strongly agreed' and 35% 'agreed' with the statement that the 'flipped' classroom took too much time.

'It took me a lot of time, nearly 2-3 hours to watch the videos and do the readings before the class each week. It left me with little time to prepare for other modules.'

This problem with the flipped classroom format has been highlighted in other studies as well [13, 46]. Although, the partial-flipped format had been designed in such a way that the workload was in consonance with a first year module, students deemed it too high in comparison to other modules they were studying. In view of this, the weekly workload will be reviewed and updated.

One of the main advantages of the flipped classroom design is that it helps to promote peer learning. 80% of the surveyed students strongly agreed or agreed that they benefitted from increased student interaction within the classroom. Also 22% students "strongly

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agreed" and 56% "agreed" that they learnt new ways of solving problems by observing their peers. The partial flipped classroom format also resulted in better student-tutor interaction within the classroom. 82% of the students stated their interaction with the tutor had improved during this process. 76% of students also contended that they found it easier to ask questions in the 'flipped' classroom model.

'While working on the data in class, I could receive comments from the tutor at each stage. This 'hands on' approach helped to improve my understanding of the course material.'

'I really enjoyed the pair and share activities. When the problems were hard, we helped each other until we got it right.'

'The micro lecture helped to reinforce the key points each week. I got much more from it, since I had already watched the full lecture video in class. Also, my attention did not waver in a micro-lecture format.'

The results mirror other studies such as Lage et al [21] , Calimeris [45] and McLean and Attardi [22]. These studies demonstrate that students valued increased peer interaction and the role of the tutor as a facilitator rather than an information deliverer in the flipped classroom format.

6. Discussions and Conclusion

This study demonstrated how a 'partial' flipped classroom design can help to combine the benefits of the traditional lecture based approach and a flipped class design. The micro-lectures delivered in the flipped classroom format enabled me to exercise some control over the learning process. On the other hand, the various classroom activities which were instituted in the partial flipped classroom format promoted greater peer interaction and also encouraged students to become active learners in this process. The

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online video based lectures offered increased flexibility and motivated students to learn independently and at their own pace. The in-class problem solving enabled me to give 'hands on' support to students. The research also demonstrated that the "partial" flipped classroom format resulted in the better scores in the final exam, as well as the overall assessment for the module. In addition to this, the partial flipped classroom design benefitted academically weaker students and was associated with lower odds of students failing in the final exam, as compared to a traditional lecture based format.

In terms of the theoretical framework, one can conclude that the reversal of the Bloom's taxonomy helped in improving student's performance. Since the students were doing lower order cognitive tasks, comprising of understanding the material at home; more time could be devoted to higher order cognitive tasks like application of theories to issues. Also, peer and group learning further helped to improve student performance within the course. One can also see that the 'flipped' classroom helped to reduce extraneous loads, as characterised in the cognitive load theory. When traditional lectures were replaced with online videos and readings, students were able to take ownership of their learning process. They were thus able to concentrate better on the intrinsic load or the core concepts in economics, while reducing extraneous loads associated with the traditional lecturing approach, which do not translate into learning. On the other hand, the micro-lectures delivered in the partial flipped format helped to reinforce on the germane load through recapitulation of the key theories and principles.

However, the study suffers from certain limitations as well. Although, the student's performance in the final exam was better in the partial flipped classroom model was better than the traditional lecture-based format, there were no significant differences in the grades for the mid-term assignment. In consonance with other studies, I

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hypothesized that this may be attributed to the fact that students take time to adjust their learning style to a partial flipped format. Nevertheless, more research is needed into this subject and how to provide students with a "scaffolding' approach so that they may adjust better to a flipped classroom format. Another limitation of this study that this study was conducted in a first year Economics classroom in a single classroom where the focus was on basic theories and principles. Questions remain on the suitability and scalability of this model in more advanced higher education settings, as well as other disciplines. The results from this study cannot be simply extrapolated to other higher education settings. This will require more empirical research in a variety of higher educational contexts and disciplines. Also, in this analysis I attempted to quantify the demographic and personal/household characteristics that influences student performance in a classroom setting. However, the student's performance may be influenced by other psychological and cultural contexts as well. These need to be captured through future work on the partial flipped classroom format.

To conclude it can be said that overall the merits of this approach outweigh its potential drawbacks and it can provide an enabling classroom environment. This is especially, so in areas pertaining to problem solving, and development of critical thinking and quantitative skills. However, the research revealed that contestation remains with respect to student's adjustment to the partial flipped classroom design and the amount of pre-class work assigned within this format. A flipped classroom design cannot be implemented effectively as a 'one size fits all' in all areas of higher education. It needs to be collaborated with other blended learning pedagogies, to create an enabling classroom environment.

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