# Partial Flipped Classroom Approach and Student Engagement in the Classroom: Evidence from a UK University

Oluwaseun Osituyo [1]

John Kalimilo Malagila [2]

Widin Bongasu Sha'ven  [3]

**ABSTRACT**

We explore the association between students' pre-class online learning and their perceptions of in-person class engagement preparedness at a UK University. The introduction of a partial-flipped classroom (PFC) approach in a second-year intermediate management accounting module provided the research setting. We used a questionnaire to collect data and employed statistical and qualitative data analysis techniques. We find that students who engaged with the pre-class online learning tended to engage more with the in-person learning materials/activities, and perceived a significant link between learning content and outcomes. We also find that students' perception of the PFC may be influenced by the nature/extent of their engagement with the approach, fee status, and less likely to be influenced by age or gender. Our paper contributes to the PFC literature by providing exploratory evidence on the association between pre-class online learning and student engagement in subsequent in-person class learning.

**Keywords:** Student Engagement, Partial Flipped Classroom, Higher Education, Learning design, UK.

---

[1] Lecturer in Accounting, Department of Accounting and Finance, University of Sussex, Brighton, BN1 9SL, UK. Email: o.osituyo@sussex.ac.uk
[2] Senior Lecturer in Accounting, Essex Business School, University of Essex, Wivenhoe Park, Colchester, CO4 3SQ, UK. Email: j.k.malagila@essex.ac.uk
[3] Lecturer, Department of Economics, Finance and Accounting, University of Leicester LE2 1RQ, UK. Email: wbsv1@leicester.ac.uk

# 1 INTRODUCTION

The recent COVID-19 pandemic revealed several problems in higher education institutions (HEIs). Divjak *et al.* (2022), for example, explains some of the problems that resurfaced because of the pandemic included the use of teacher-centred approach to teaching and learning, and HEI lacking digital education strategy and digital competences in both teachers and students. A survey by the Organization for Economic Co-operation and Development (OECD) shows that early at the start of the pandemic in 2020, many HEIs in most countries closed their physical campuses (OECD, 2021). Consequently, HEI had to adopt and adapt in ways that would help them to continue the provision of education to their students. Although flipped class approach (and it's variant the partial flipped classroom – PFC) is not a new teaching strategy, it has received a lot of attention and usage in recent years, and more since the COVID-19 pandemic (Divjak *et al.,* 2022).

Specifically, in this paper we define PFC approach as a method where part of the teaching is delivered asynchronously with embedded interactive activities, and part of the in person face-to-face (F2F) classroom time is used to provide feedback to student after they have engaged with the out-of-classroom learning materials and activities. For example, students are required to engage with the pre-lecture materials by watching pre-recorded, pre-lecture videos (PLVs), playing games, and reading textbook chapters. This is intended to cover certain learning outcomes and the materials, and sometimes serves as a prerequisite for the next traditional F2F class where more learning outcomes are covered. This provides more room for students to actively engage with the learning materials than in a typical lecture-based module (Burgoyne & Eaton, 2018).

Many studies found improvement of students' academic performance and skill levels (see Burgoyne & Eaton, 2018) as well as an increase in student motivation and engagement (see Sherrow *et al.,* 2016) with the module when full flipped classroom (FC) approach was adopted. Even though there seems to be some evidence to support the use of flipped learning, some concerns have been raised; the main one being that it requires instructors to invest a significant amount of time especially when adopting it for the first time (Al-Naabi, 2022).

We suggest using the alternative to flipping the whole module and, for example, only flipping some module contents (learning outcomes). Preferably, and as pointed out by Burgoyne & Eaton (2018), flipping the most introductory content only might help address the above noted difficulties of a fully FC approach. An added advantage of PFC approach is to open room for variety in the planning and delivery of a module which can serve as a motivation for students (Poon, 2013). Burgoyne & Eaton (2018) added that using a PFC approach with large classes might be better and the approach has the potential to positively impact student engagement and performance (Asiksoy & Canbolat, 2021) by creating room for more interactive sessions between instructors and students and between students (Fulton, 2012). Accordingly, with PFC approach, the instructor can spare more time to fulfil the learning and emotional demands of students (Goodwin & Miller, 2013). PFC approach is considered an active, student-centred approach that is formed to increase the quality of learning within classroom and tends to be less strict of traditional FC approach (Bataineh & Al-Sakal, 2021). The above may explain its recent growing adoption in HEIs.

There was significant shift from the traditional in-person to the innovative teaching approach such as the use of PFC with online delivery at the centre during the main period of the COVID-19 pandemic in the UK (particularly from 2020). Even now with the traditional in-person-on-campus teaching with

less on-line delivery resuming in most UK universities, some module convenors have retained the PFC approach. This study aims to address the research gap and very limited existing knowledge on exploring students' perception of PFC in HEIs. Students' perception on engagement can be flawed (Fisher *et al.,* 2018) but this helps to understand what works for students and how to better suit learning to student needs considering challenges faced by the tutors who engage with this approach in teaching.

Specifically, we investigate the association between students' participation in a PFC and their perception of preparedness to engage with F2F lectures. We investigate students' learning experience where PFC approach has been adopted. We also explore the differences in perceptions and experiences based on students' demographics and the extent and nature of their participation in the PFC.

A questionnaire was administered to second year undergraduate students studying an intermediate management accounting module (hereafter, Module-IMA) for the academic year 2021-2022. Students on the module were taught using the PFC approach consisting of weekly pre-lecture videos (PLVs) to watch prior to attending in-person lecture and seminar sessions. We received 77 responses out of 167 students that were registered on the module (46% response rate).

The findings suggest that in a PFC setting, students perceive pre-lecture learning materials as an important learning tool that prepares them to engage more with the in-class learning materials. However, we found a significant difference in the experiences and perception particularly between domestic and international students and based on level of engagement with PFC. Our findings emphasise the usefulness of PFC approach as an engagement tool to check understanding of concepts covered and help learners achieve both topic and module learning outcomes. Our findings also suggest that the design and alignment of pre-class material to the learning outcomes are important for learners to identify and improve their engagement with PFC approach. To the best of our knowledge, our study is the first to conduct students' perception of PFC approach with specific focus on the usefulness of the pre-class material in the accounting field.

The rest of this paper is organised as follows. Section 2 provides the literature review and develops the exploratory research questions addressed in the current study. We present the research methodology in Section 3, followed by results and discussion in Section 4, while Section 5 summarises and concludes the study.


## 2 LITERATURE REVIEW
### 2.1 PFC approach and student preparedness to engage in class

Pre-class learning materials include pre-recorded online videos prepared by the module convenor or other authors, book reading, other online reading materials, and interactive tutorials (Lage *et al.,* 2000; Cilli-Turner, 2015; Long *et al.,* 2016; Mohamed & Lamia, 2018; Jensen *et al.,* 2018; Or *et al.,* 2022). Pre-class materials with the right structure have been identified as being instrumental in improving student motivation for and engagement with subsequent in-person class related learning activities such as F2F lectures and seminars. Mortensen & Nicholson (2015) found that students engaged more with pre-class study materials when there were quizzes attached to the online materials online or administered at the beginning of the in-person lecture. Further, Cilli-Turner (2015) recommended that activities based on the pre-class materials should form part of the student's (module) grade to improve

engagement with both pre-class materials and in-class learning activities. Asiksoy & Canbolat (2021) and Huang *et al.* (2019) found that including gamification in pre-class materials motivates and improves engagement with the material and therefore prepares students for the in-class learning activities. Studies have also been conducted to investigate assessment modes that are effective to check students' understanding of pre-class materials. For example, Moravec *et al.* (2010) found that replacing several lecture PowerPoint slides with pre-class worksheets or narrative videos where students were required to make a submission based on content covered improved students' performance. These findings suggest that pre-class materials with accompanying activities improve in-class engagement.

It is expected that when online quizzes are attached to pre-class videos, more students will study the pre-class materials to understand how to attempt the quizzes (Persky & Hogg, 2017). Rodgers *et al.* (2020)'s findings evidence that students who watch the assigned pre-laboratory videos feel more prepared for the in-class activities and increase their performance. Awidi & Paynter (2019)'s study and Fadol *et al.* (2018)'s findings also suggest that students who study the pre-class learning materials feel more prepared to attend class and more prepared for their assessments. Hamlin *et al.* (2014) in their study of the impact of pre-lesson videos on engineering students' preparation for class and overall performance found that students spent more time preparing for the class when pre-lesson videos and exercises were used in a module. They also found that students felt more prepared for the class and performed better than the group where pre-lesson videos were not introduced, although the difference was not statistically significant. It can be deduced from Hamlin *et al.* (2014) and Vazquez & Chiang (2015)'s studies that other pre-class materials (such as assigned readings, module outline) are mostly not as effective in preparing students for class compared to the assigned videos with accompanying exercises for the lecture. It is also important to note that although it has been found that the study of pre-class materials motivates students to spend more time preparing for the in-class learning activities, the students' level of confidence could have an impact on their level of preparedness (Harjoto, 2016; Rodgers *et al.,* 2020).

Other studies have found little or no evidence that flipped learning improves in-class quality (e.g., He *et al.,* 2016). Although these prior studies investigated students in different fields of study including engineering, information science, biology, economics, and management, we argue that these findings can be replicable in an undergraduate management accounting module where PFC approach has been introduced. We argue that PFC approach will improve students' preparedness for in-class activities and online practice quizzes as higher level of engagement is required compared to the traditional approach. Consequently, and largely consistent with the findings and conclusions of the above literature, we state and set to answer the following exploratory research questions (ERQs):

**ERQ-1:** To what extent do students enrolled in Module-IMA agree or disagree that they feel more prepared for synchronous/F2F lecture after watching a related PLV?

**ERQ-2:** To what extent do students enrolled in Module-IMA agree or disagree that they feel more prepared to answer practice quizzes on canvas after watching a related PLV?

**ERQ-3:** To what extent do students enrolled in Module-IMA agree or disagree that they learn better when quizzes are embedded in the PLV?

**ERQ-4:** To what extent do students enrolled in Module-IMA agree or disagree that they enjoy watching the PLV before attending the synchronous/F2F lecture?

## 2.2 PFC approach and learning content-outcomes connection

Teaching methods can have an impact on student engagement and their learning outcomes. There is an argument that traditional lectures are preferable to students as they are more familiar and require little engagement from students (Çubukçu, 2012). Furthermore, when students have limited knowledge about a topic, tutors argue that traditional lectures are preferable to cover knowledge, comprehension and application which are considered lower-order learning outcomes. However, Rambocas & Sastry (2017) found that students felt that traditional lectures are less explicit in conveying the class expectations and learning outcomes. Correspondingly, assessment requirements and module materials were less clearly understood when traditional lecture format was used (Rambocas & Sastry, 2017). We argue that contemporary teaching methods such as PFC learning can provide a clearer link between the lecture content and topic and module learning outcomes as these methods require a higher level of engagement from students than the traditional method.

Öncel & Kara (2019) found that there was an improvement in undergraduate students' achievement of module learning outcomes when flipped learning was used compared to the traditional learning method suggesting that flipped learning improves student performance through improving clarity of the connection between learning content and what needs to be achieved or demonstrated by students in assessments (i.e., the learning outcomes). However, very few studies have specifically investigated the relationship between pre-class learning and achievement of module learning outcomes and the results have been mixed. Lee & Choi (2019) argued that students have distinctive characteristics including their learning style which could have an impact on their perceived readiness and achievement of learning outcomes. They specifically found a positive correlation between pre-class learning and student's achievement of learning outcomes. In contrast, Zawilinski *et al*. (2020) in their study of benefits and challenges of flipped learning suggested that instructors who use flipped learning should consider the alignment of their out of class learning materials (such as pre-class pre-recorded lecture videos) with the module learning outcomes as they found that a higher percentage of students felt that in-class activities helped them to better understand their course concepts than out of class materials. They also found in the study that only 44-45% of students agreed that they felt that they would achieve a better grade in a flipped module compared to a non-flipped module. We argue that while students may have different learning styles which could have an impact on how they engage with a PFC approach, it is important to establish the impact of flipped learning on students' perception of the learning materials being related to the topic learning outcomes and module learning outcomes as this will provide further evidence of students' perception on the benefit of PFC learning.

Following from the above discussion, we state and set to answer the following ERQs:

**ERQ-5a:** To what extent do students enrolled in Module-IMA agree or disagree that they could see the connection between PLV and topic learning outcomes?

**ERQ-5b:** To what extent do students enrolled in Module-IMA agree or disagree that they could see the connection between PLV and module learning outcomes?

Finally, and as part of our exploratory investigation, we aim to explore the differences in perceptions based on participants' demographics and the extent and nature of their participation in the adopted PFC approach. Hence, we pose our sixth ERQ as follows:

**ERQ-6:** To what extent are Module-IMA students' perceptions different because of their demographics and the extent and nature of their participation in the PFC?

The next section discusses the research design and methods adopted.

# 3 METHODOLOGY

## 3.1 The setting of the study context

The PFC approach was introduced to students studying a management accounting module in a UK university in the academic year 2021-22[4]. This is a core module for 2nd year undergraduate BSc Accounting and Finance students in this university. The adopted PFC approach was initially introduced in 2020, during the COVID-19 lockdown in the UK. The approach aimed at allowing some flexibility to students' learning to enable them cope with the issues that came with COVID-19 pandemic (Nerantzi, 2020). It was important to check that learning was taking place behind the 'black screens' when teaching moved online. Therefore, part of the weekly lecture materials was covered in PLVs (recorded by the module convenor), with questions assessing students' understanding of what was covered before the synchronous/F2F lecture took place. The PLVs covered one or two of four learning outcomes of a module topic. The purpose was to allow students build their confidence and check their understanding of usually the basic aspects of the topic and feel prepared for the in-person F2F synchronous lecture.

To implement the PFC approach, weekly PLVs and quizzes were made available for students to watch and attempt, respectively, before attending the weekly synchronous/F2F lectures. Watching the PLVs and attempting the related quiz demanded a maximum of one-hour of a student out-of-class study time per week. The PLVs were followed by a related one-hour synchronous/F2F lecture and one-hour synchronous/F2F seminar. During the first five to ten minutes of a weekly F2F lecture, the lecturer would give verbal feedback on students' attempt on the respective weekly quiz based on the PLV content of the same week. The quizzes were either embedded in the PLVs or provided as a separate quiz on Canvas[5]. In some weeks, there were additional exercises based on the PLVs given to students during the lecture. The lecturer will then cover the other lecture material for the week followed by the weekly seminars. The seminar activities were based on what was covered in the PLVs and the F2F lectures.

Students were informed on the module Canvas site, in the first PLV and the first F2F lecture about and the importance of the above teaching approach. It was emphasised and made clear to the students that the PLVs and F2F lectures were not a supplement or a substitute of each other.

## 3.2 Data collection and ethical considerations

We developed and administered an online questionnaire **(see Appendix 1)** to collect data. The questionnaire was administered to students enrolled in Module-IMA for the academic year 2021-22. The link to the questionnaire was made available for the sampled students to complete and remained open for three months, from March to May 2022. In the end, 77 responses were received out of 167 students enrolled in the module, which is a 46% response rate.

---

[4] Intermediate Management Accounting module was convened by one of the authors in 21-22 academic year.
[5] The university uses Canvas, a web-based learning management system (LMS) that supports online learning and teaching.

The questionnaire comprised five parts. The first part of the questionnaire, Question 1 (SQ-1), is on the study introduction and ethical considerations. SQ-1 provided students with the research brief including the research aim and the purpose of the questionnaire in this study. Students were asked to read the research brief before indicating their consent to participate in the study. The authors obtained ethical approval from the university in which the study was conducted. To maintain anonymity, unique identification codes were generated for each questionnaire responding participant (i.e., student) using Qualtrics[6].

Second, the questionnaire contained several demographic questions to identify a participant's age group (SQ-2) and gender identity (SQ-3 and SQ-4), an indication of whether the participant is a direct or non-direct entry student (SQ-5), and their tuition fee classification based on whether the participant is an international or a domestic student (SQ-6)[7]. Third, to capture the nature and extent of students' participation in the PFC, we included several questions (SQ-7, SQ-8, SQ-10, Q11 and Q12, SQ-14, and SQ-15), which acted as our independent variables. For example, SQ-7 asked students to indicate how often, on average, they watched the PLVs before attending the related lecture and SQ-8 captured how close to the lecture, on average, students watched the PLVs. Fourth, questions SQ-9 and SQ-13 quantified students' perception of their learning experience and engagement in the PFC. For example, their perceived preparedness for the F2F lecture (SQ-9A), and whether they saw the connection between the PLVs and topic and module learning outcomes (SQ-13A and SQ-13B) after watching the PLVs. These acted as the dependent variables in our analysis. Finally, the questionnaire included some open-ended questions intended to capture the qualitative data by providing additional space for the participating students to provide additional explanation of their responses to the above questionnaire questions (SQ-16), suggest the best aspects of the PLVs, and how the PLVs can be improved.

### 3.3 Data analysis techniques

We employ several statistical techniques to conduct data analysis and answer the exploratory research questions (ERQs) presented in the Literature Review section. **Table 1** presents a summary of these techniques and linked to the relevant ERQs and survey questions (SQ). We also performed the Cronbach's alpha test to measure the internal reliability of the responses to our questionnaire, which showed a scale reliability coefficient of 0.7796 which is within the range of commonly acceptable Cronbach's alpha values (Field, 2018; Taber, 2018).

**Table 1: Statistical Techniques Employed**

---

[6] Qualtrics (https://www.qualtrics.com/uk/) is a web-based tool for creating and conducting online surveys, which the university in this study subscribes.
[7] Domestic students' tuition fees are set by the UK Government's Department for Education. These fees are relatively lower than international students' tuition fees.

| Exploratory Research Question (ERQ) | Survey Question (SQ) | Statistical Technique Employed |
|---|---|---|
| **ERQ-1:** To what extent do students agree or disagree that they **feel more prepared** for F2F lecture after watching PLV? | SQ-9A | *Binomial test* |
| **ERQ-2:** To what extent do students agree or disagree that they **feel more prepared** to answer quizzes after watching PLV? | SQ-9B | |
| **ERQ-3:** To what extent do students agree or disagree that they **learn better** when quizzes are embedded in the PLV? | SQ-9C | |
| **ERQ-4:** To what extent do students agree or disagree that they **enjoy watching** PLV before attending F2F lecture? | SQ-9D | |
| **ERQ-5a:** To what extent do students agree or disagree that they could **see the connection** between PLV and topic learning outcomes? | SQ-13A | *Binomial test* |
| **ERQ-5b:** To what extent do students agree or disagree that they could **see the connection** between PLV and module learning outcomes? | SQ-13B | |
| **ERQ-6:** To what extent are students' perceptions of their learning experience/engagement in the PFC different because of:<br>(a) their demographics and<br>(b) the extent and nature of their participation in the PFC? | As appropriate | *Mann–Whitney U test*<br>• Comparison of two groups<br>*Kruskal–Wallis test*<br>• Initial comparison of more than two groups<br>*Dunn's test*<br>• Follow up pairwise group comparison after the *Kruskal–Wallis test* |

In addition to the above statistical analysis techniques, and in relation to the qualitative data collected from responses to questions SQ12, and SQ-16 to SQ-18, we conducted qualitative analysis to further understand the reasons for students' preference for either PFC approach or traditional classroom approach, the strengths of PFC approach and suggestions for improving the adopted PFC approach.

The initial coding process was inductive where the text responses to SQ-16 to SQ-18 were coded in sub-categories based on the context (Braun & Clarke, 2006). These categories were then merged into positive, negative, and neutral (indifferent) comments to the PFC approach as main themes. An example of the coding process is shown in Figure 1 below.
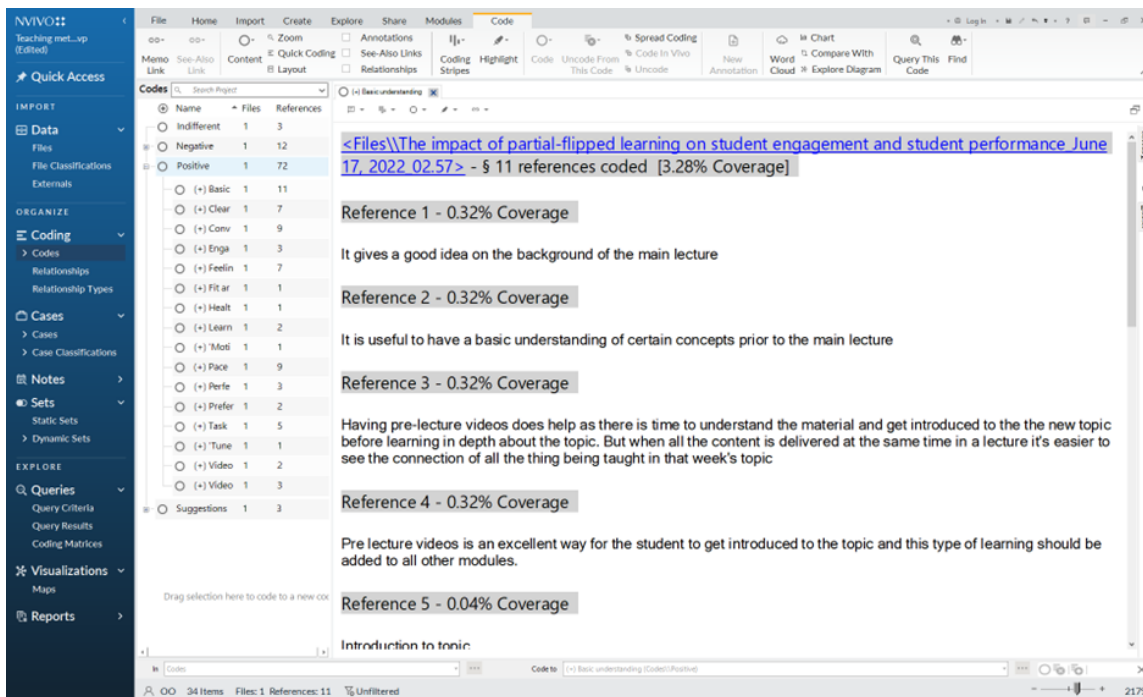
**Figure 1: Screenshot from analysis process in Nvivo Pro.**

The next section presents the study results and discusses the findings.

## 4  RESULTS AND DISCUSSION

### 4.1 Descriptive results and discussion

Based on **Table 2,** most participants were between the age of 18 and 20 years old, representing 52.86% of our sample while the least represented were students who were 26 years old and above. On gender identity, 39 (55.71%) were female, 28 (40.00%) were male while three (4.29%) students preferred not to identify their gender. Most students that completed the questionnaire were direct entry students, representing 95.52% of the students responding to the questionnaire. In terms of fee status classification, 33 (49.25%) were international students while 34 (50.75%) were domestic students.

**Table 2: Frequencies – Age Range, Gender Identity, Entry Type, and Domestic/International**

| | | Freq. | Percent | Valid | Cum. |
|---|---|---|---|---|---|
| **Student Age Range** | | | | | |
| *Valid* | 18-20 years | 37 | 48.05 | 52.86 | 52.86 |
| | 21-25 years | 31 | 40.26 | 44.29 | 97.14 |
| | 26 & above years | 2 | 2.60 | 2.86 | **100.00** |
| | **Total** | **70** | **90.91** | **100.00** | |
| *Missing* | | 7 | 9.09 | | |
| **Total** | | **77** | **100.00** | | |
| **Student Gender Identity** | | | | | |
| *Valid* | Male | 28 | 36.36 | 40.00 | 40.00 |
| | Female | 39 | 50.65 | 55.71 | 95.71 |

| | | Freq. | Percent | Valid | Cum. |
|---|---|---|---|---|---|
| | Prefer not to say | 3 | 3.90 | 4.29 | **100.00** |
| | **Total** | **70** | **90.91** | **100.00** | |
| *Missing* | | 7 | 9.09 | | |
| **Total** | | **77** | **100.00** | | |
| **Student Entry Type** | | | | | |
| *Valid* | Non-direct | 3 | 3.90 | 4.48 | 4.48 |
| | Direct | 64 | 83.12 | 95.52 | **100.00** |
| | **Total** | **67** | **87.01** | **100.00** | |
| *Missing* | | 10 | 12.99 | | |
| **Total** | | **77** | **100.00** | | |
| **International/Domestic Student** | | | | | |
| *Valid* | International | 33 | 42.86 | 49.25 | 49.25 |
| | Domestic | 34 | 44.16 | 50.75 | **100.00** |
| | **Total** | **67** | **87.01** | **100.00** | |
| *Missing* | | 10 | 12.99 | | |
| **Total** | | **77** | **100.00** | | |

**Figure 2** shows an example of a usual trend of students' weekly engagement with the PLVs. Representing the key summary description of all the weekly students' engagement is **Table 3**, which indicates the highest, average, and lowest students' engagement with the PLVs for the period of the study.[8] The relatively good engagement with the PLVs as demonstrated in **Figure 2** and **Table 3** indicates that students responding to our questionnaire were significantly the ones engaged with and experienced the PLVs.
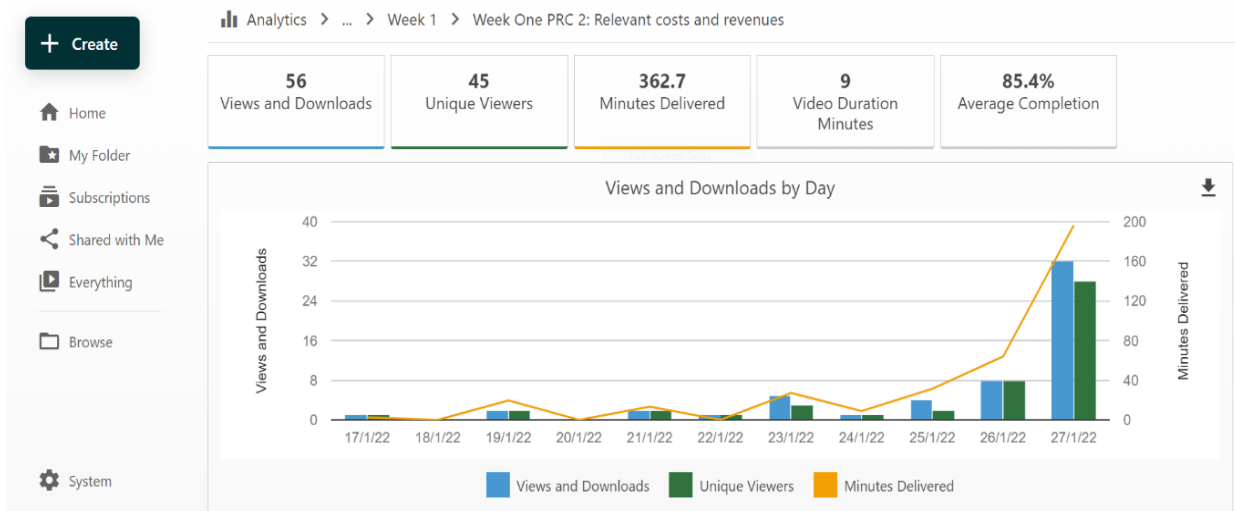


**Figure 2: A screenshot showing a typical trend of student weekly engagement with pre-lecture videos.**

---

[8] Students' engagement presented in **Figure 2** and **Table 3** are the minimum of the number of minutes taken to view and/or download the PLVs as captured by the Panopto system of the Blackboard VLE. Consequently, the students' engagement with the PLVs is likely to be more than the one captured by the Panopto system because students are allowed to download the PLVs and view them off-line at their own time.

**Table 3: Students' weekly engagement (Views & Downloads) with PLVs**

| Sample Size = 77 Students | Highest | Average | Lowest |
|---|---|---|---|
| Number of students engaged | 56 | 39 | 29 |
| Percentage of students engaged | 72% | 51% | 38% |
| Minutes engaged per student | 63.96 | 23.70 | 7.01 |
| Weekly total minutes engaged | 1,300.94 | 715.61 | 342.62 |
| Weekly total hours engaged | 21.68 | 11.93 | 5.71 |

## 4.2 PFC approach and preparedness to engage in class

To answer the exploratory research questions **(ERQs 1-4)** related to the association between participating in the PFC and student perceived preparedness to engage with the learning materials and activities, we performed four Binomial tests on four survey questions **(SQ-9A-D)**, respectively. We tested the extent to which students agreed or disagreed on whether watching the PLVs (a component of the PFC approach) before attending the in-class F2F lectures made them feel more prepared for lecture sessions **(SQ-9A)**, more prepared to answer practice quizzes **(SQ-9B)**, learn better when quizzes are embedded in the PLVs **(SQ-9C)** and enjoy watching the PLVs **(SQ-9D)**. **Table 4** summarizes the relevant Binomial tests results.

**Table 4: Binomial tests for ERQs 1 – 4**

| | N | Observed k | Expected k | Assumed P | Observed p |
|---|---|---|---|---|---|
| **SQ-9A:** I feel more prepared for the synchronous/f2f-lecture when I watch the related PLV before attending class | 59 | 38 | 29.5 | 0.500 | 0.644 |
| **Pr(k >= 38)                 = 0.018172* (one-sided test)**<br>Pr(k <= 21 or k >= 38)        = 0.036343 (two-sided test) | | | | | |
| **SQ-9B:** I feel more prepared to answer practice quizzes on canvas when I watch related PLV | 59 | 42 | 29.9 | 0.500 | 0.712 |
| **Pr(k >= 42)                 = 0.000774*** (one-sided test)**<br>Pr(k <= 17 or k >= 42)        = 0.001547 (two-sided test) | | | | | |

| | N | Observed k | Expected k | Assumed P | Observed p |
|---|---|---|---|---|---|
| **SQ-9C:** I learn better when quizzes are embedded in PLV | 59 | 39 | 29.9 | 0.500 | 0.661 |
| **Pr(k >= 39) = 0.009169\*\* (one-sided test)** <br> Pr(k <= 20 or k >= 39) = 0.018337 (two-sided test) | | | | | |
| **SQ-9D:** I enjoy watching PLV before attending synchronous lecture | 59 | 36 | 29.9 | 0.500 | 0.610 |
| **Pr(k >= 36) = 0.058739† (one-sided test)** <br> Pr(k <= 23 or k >= 36) = 0.117477 (two-sided test) | | | | | |

**Level of significance:** $†p \leq 0.100$, $*p \leq 0.050$, $**p \leq 0.010$, $***p \leq 0.005$

**ERQ-1:** *To what extent do students agree/disagree that they feel more prepared for synchronous/F2F lecture after watching a related PLV?*

To answer **ERQ-1** we tested students' response to **SQ-9A**, and the Binomial test result in **Table 4** indicates that the observed proportion (0.644) of students agreeing that they felt more prepared for the synchronous/F2F-lecture after watching the PLV before attending class is significantly higher than the expected proportion (0.500), with *p-value* = 0.018172 (one-sided). This result suggests that students in our study generally perceived PLVs as an important learning tool that helped to prepare them for the synchronous/F2F-lecture. Student preparedness to learn improves student's motivation to effectively engage with the learning materials and activities during F2F-lecture sessions. This feeling of preparedness after watching PLVs is consistent with the findings of Awidi & Paynter (2019) and Rodgers *et al.* (2020).

**ERQ-2:** *To what extent do students agree/disagree that they feel more prepared to answer practice quizzes after watching a related PLV?*

To answer **ERQ-2** we tested students' response to **SQ-9B**, and the result of the Binomial test in **Table 4** indicates that the observed proportion (0.712) of students agreeing that they felt more prepared to answer practice quizzes after watching a related PLV is significantly higher than the expected proportion (0.500), with p-value = 0.000774 (one-sided). This result is consistent with Persky & Hogg (2017)'s study suggesting that pre-class materials with embedded quizzes improve student engagement. This suggests that students who engage with the pre-lecture materials before an in-class lecture session may potentially do better (than not) in their attempt of the practice quizzes, and potentially enhance their chances of achieving the intended topic learning outcomes.

**ERQ-3:** *To what extent do students agree/disagree that they learn better when quizzes are embedded in the PLV?*

To answer **ERQ-3** we tested students' response to **SQ-9C**, and the result of the Binomial test in **Table 4** indicates that the observed proportion (0.661) of students agreeing that they learn better when

quizzes are embedded in PLV is significantly higher than the expected proportion (0.500), with p-value = 0.009169 (one-sided). This supports the findings of Mortensen & Nicholson, (2015), Huang *et al.* (2019) and Asiksoy & Canbolat (2021) that gamification in pre-class materials improves the quality of learning experience. When asked what aspects to improve in the PLVs (open-ended questions part of the questionnaire), a student indicated that they would have preferred to have more quizzes to accompany the PLVs. The student stated:

> *"I wish there were more exercises to accompany the pre-course [pre-lecture] videos."* [Female, 18-20, International student].

**ERQ-4:** *To what extent do students agree/disagree that they enjoy watching the PLV before attending the synchronous/F2F lecture?*

To answer **ERQ-4** we tested students' response to **SQ-9D**, and the result of the Binomial test in **Table 4** indicates that the observed proportion (0.610) of students agreeing that they enjoyed watching the PLV before attending the lecture is significantly higher than the expected proportion (0.500), with p-value = 0.058739 (one-sided). The results are marginally significant and seem to be consistent with the mixed responses to the open-ended questions regarding their preference to the PFC approach. While some students have indicated that they enjoy watching the PLVs, some students felt helpless when watching the PLVs because they were unable to immediately ask questions. This mixed result is reflected in the following quotes from students' responses:

> *"PLVs is an excellent way for the student to get introduced to the topic and this type of learning should be added to all other modules."* [Male, 18-20, International student].

> *"I love the pre-lectures. they are thoroughly taught, and everything is clear and concise."* [Female, 18-20, International student].

> *"I enjoy that the PLVs are in short easily categorised videos. It makes it easy to fit around my schedule and directly connect each sub video to the subject."* [Male, 26 and above, Domestic student].

> *"I find it confusing sometimes when watching the pre-recorded lecture as I am unable to ask questions"* [Female, 18-20, International student].

**4.3 PFC approach and learning content-outcomes connection**

To answer the exploratory research questions **(ERQs 5a and 5b)** related to the association between participating in the PFC and student perceived connection between the learning content and outcomes, we also performed two Binomial tests. We tested the extent to which students agreed or disagreed on whether watching the PLV helped them to see the connection between the learning content in the PLVs and the topic **(SQ-13A)** and module **(SQ-13B)** learning outcomes. **Table 5** summarizes the relevant Binomial tests results.

**Table 5: Binomial tests for ERQs 5a and 5b**

| | N | Observed K | Expected k | Assumed p | Observed p |
|---|---|---|---|---|---|
| **SQ-13A:** I could see the connection between the PLV and the topic learning outcomes | 48 | 36 | 24 | 0.500 | 0.750 |

|  | N | Observed K | Expected k | Assumed p | Observed p |
|---|---|---|---|---|---|
| **Pr(k >= 36)              = 0.000359\*\*\*** **(one-sided test)** Pr(k <= 12 or k >= 36)    = 0.000717 (two-sided test) |  |  |  |  |  |
| SQ-13B: I could see the connection between the PLV and the module learning outcomes | 48 | 37 | 24 | 0.500 | 0.771 |
| **Pr(k >= 37)              = 0.000111\*\*\*** **(one-sided test)** Pr(k <= 11 or k >= 37)    = 0.000222 (two-sided test) |  |  |  |  |  |

**Level of significance:** $^{\dagger}p \leq 0.100$, *$p \leq 0.050$, \*\*$p \leq 0.010$, \*\*\*$p \leq 0.005$

 **ERQ-5a:** *To what extent students agree or disagree that they could see the connection between PLVs and topic learning outcomes?*

To answer **ERQ-5a** we tested students' response to **SQ-13A**, and the result of the Binomial test in **Table 5** indicates that the observed proportion (0.750) of students agreeing that they could see the connection between the PLVs, and topic learning outcomes is significantly higher than the expected proportion (0.500), with p-value = 0.000359 (one-sided). This result suggests that students in our study identified the alignment of the pre-class materials with the topic learning outcomes. Quizzes that accompanied the PLVs helped the module convenor to check that learning had taken place, but it was important for the learners to also see the connection between these materials and formative assessments and how they help in preparation for their summative assessments. Following Zawilinski *et al.* (2020), alignment of out of class materials to learning outcomes encourages students to engage with those materials. Comments supporting the PLVs and by extension the PFC approach from participants include the following:

> *"Having PLVs does help as there is time to understand the material and get introduced to the new topic before learning in depth about the topic. ..."* [Female, 18-20, Domestic student].

> *"They (i.e., PLVs) were informative and helped begin the learning for the upcoming lecture."* [Male, 18-20, Domestic student].

**ERQ-5b:** *To what extent students agree or disagree that they could see the connection between PLVs and module learning outcomes?*

To answer **ERQ-5b** we tested students' response to **SQ-13B**, and the result of the Binomial test in **Table 5** indicates that the observed proportion (0.771) of students agreeing that they could see the connection between PLVs and module learning outcomes is significantly higher than the expected proportion (0.500), with p-value = 0.000111 (one-sided). This also suggests that students identified that the pre-class materials were designed to help students achieve the module learning outcomes. This re-emphasises the argument of Zawilinski *et al.* (2020) on alignment of out of class materials with learning outcomes to improve engagement.

## 4.4 Exploring the differences of perceptions and experiences with the PFC

As additional analysis, we explored the differences in the students' perceptions of and experiences with the PFC. We tested the differences by students' demographics and the extent and the nature of their participation in the PFC.

In **ERQ-6** we asked, *to what extent are students' perceptions and experiences of the PFC different because of (a) their demographics and (b) the extent and nature of their participation in the PFC?*

We performed the Mann–Whitney test, Kruskal–Wallis test and Dunn's test (Dinno, 2015), as is appropriate[9] to explore this question. We analysed whether there are significant differences in students' perceptions and experiences of the PFC based on students' age-range **(SQ-2)**, gender **(SQ-3)**, university direct or non-direct entry **(SQ-5)**, whether a student is classified as international or domestic **(SQ-6)**, how often a student watched the PLV **(SQ-7)**, how close to the related lecture a student watched the PLV **(SQ-8)**, student preference on PLV embedded quizzes **(SQ-10)**, students perceived ideal length of PLV **(SQ-14)**, and student preference of fully traditional learning approach **(SQ-15)**.

### 4.4.1 Differences in students' perceptions and experiences of the PFC based on student demographics

*Differences based on age-range, gender, and university entry type*

The differences in students' perceptions and experiences of the PFC between students' groups based on age-ranges, gender and university entry type were all statistically insignificant (Kruskal–Wallis tests, all *p-values* are more than 0.1000)[10]. This implies that the median response rates are the same for all the student groupings, and that the students' perceptions and experiences of the PFC approach, and other related findings are less likely to be significantly influenced because of students' age, gender, or university entry type groups.

*International or domestic-based differences*

The differences in perception of the PLVs based on fee status classification (i.e., international or domestic) are shown in **Table 6**. The results show that students' responses on feeling prepared for the in-class session may be influenced by their fee status classification (p-value 0.0484). The results also show that students' responses on seeing the connection between the PLVs content, and the module and topic learning outcomes may be influenced by their fee status classification (p-values, 0.0001 and 0.0210, respectively). Differences in perception of the PLVs was insignificant for feeling prepared, learning better when quizzes are embedded in the videos, and enjoyment in watching the PLVs. Further comments provided by respondents in their responses to the open-ended questions buttress

---

[9] For differences based on two independent groups (e.g., **SQ-3**: student gender) we performed the Mann–Whitney test. For differences based on more than two independent groups (e.g., **SQ-7**: how often a student watched the PLVs) we first employed the Kruskal–Wallis test to determine if at least one of the groups does not have the same median response rate as the other groups in the test. Then, for the Kruskal–Wallis test results that indicated responses from at least one group were significantly different from the other group, we performed a follow-up test using the Dunn's test, a nonparametric pairwise multiple comparison statistical technique, to determine which pairs of the independent groups contribute significantly to the overall groups' differences indicated by the Kruskal–Wallis test (Dinno, 2015).

[10] For purpose of brevity, the tables presenting the statistical results of the respective tests are not included in this paper, but they are available if requested.

these results as more domestic students in our sample were in favour of PLVs than international students and more international students seemed not to be in favour of the PLVs.

**Table 6: Mann–Whitney test on international/domestic student-based differences (SQ-6)**

| *Hypothesis:* There are significant differences in responses based on whether students are international or domestic | | Student Type | N | Mean Rate | Rank Sum | Expected | *p-value* |
|---|---|---|---|---|---|---|---|
| **SQ-9A** | Watching PLV improves class preparedness | International | 26 | 3.46 | 660 | 780 | *0.0484\** |
| | | Domestic | 33 | 3.94 | 1110 | 990 | |
| **SQ-9B** | Watching PLV improves quizzes practice preparedness | International | 26 | 3.85 | 728 | 780 | *0.4183* |
| | | Domestic | 33 | 4.06 | 1042 | 990 | |
| **SQ-9C** | Learn better when quizzes are embedded in PLV | International | 26 | 3.77 | 755.5 | 780 | *0.7356* |
| | | Domestic | 33 | 3.85 | 1014.5 | 990 | |
| **SQ-9D** | Enjoyed watching PLV | International | 26 | 3.65 | 736.5 | 780 | *0.4932* |
| | | Domestic | 33 | 3.85 | 1033.5 | 990 | |
| **SQ-13A** | There is connection between PLV and topic LO | International | 22 | 3.50 | 364 | 539 | *0.0001\*\*\** |
| | | Domestic | 26 | 4.35 | 812 | 637 | |
| **SQ-13B** | There is connection between PLV and module LO | International | 22 | 3.68 | 433.5 | 539 | *0.0210\** |
| | | Domestic | 26 | 4.19 | 742.5 | 637 | |

**Level of significance:** $^{\dagger}p \leq 0.100$, **\****$p \leq 0.050$, **\*\****$p \leq 0.010$, **\*\*\****$p \leq 0.005$

**Figure 3** also shows the split in open-ended responses provided by international and domestic students in favour of PLVs. This supports the findings of Hodkiewicz (2014) and Singh *et al.* (2021) that flipped learning may worsen the learning process of international students who struggle with English and who might be unfamiliar with autonomous learning methods. However, some studies have found that flipped learning is beneficial to international students as it provides these students who may struggle with the country's learning culture or not fluent in English language with the

opportunity to prepare well in advance before the in-class activities (Zainuddin & Attaran, 2016; McCarthy, 2016; Walsh & Risquez, 2020).
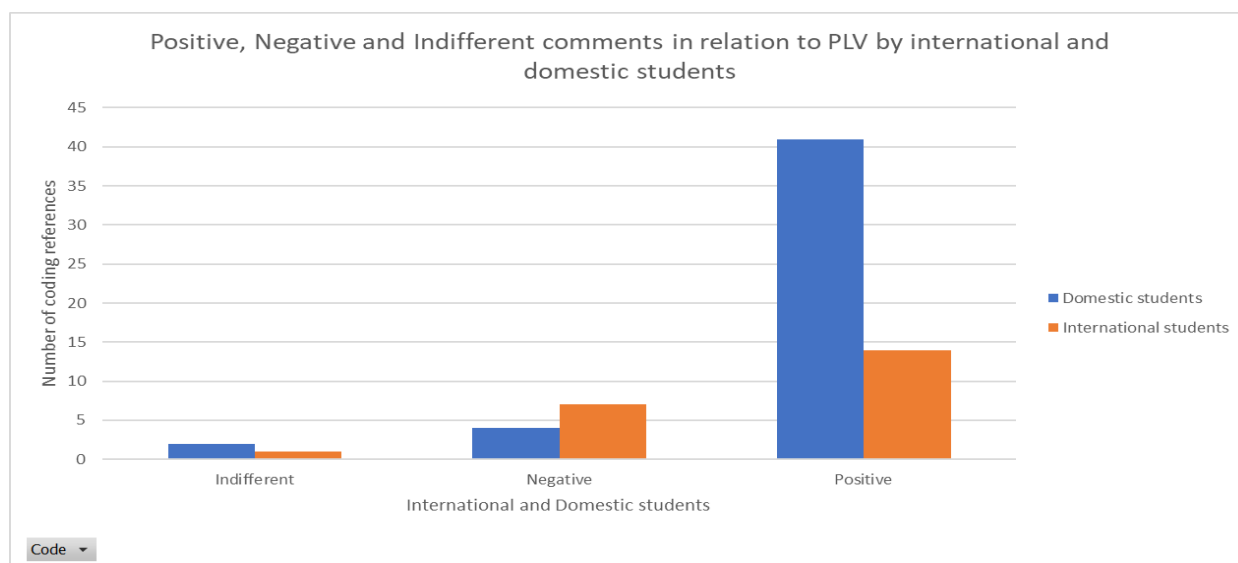


**Figure 3:** Split between home and international responses in favour of PLV.

**4.4.2 Differences in the perceived learning experiences based on student's extent and nature of participation in the PFC approach.**

In response to **SQ-11** and **SQ-12**, two of three international students who did not engage with the pre-lecture material before the related in-class lecture indicated that they engaged with it afterwards while one participant indicated that they did not engage at all with the pre-lecture material. Students provided reasons for this nature of engagement as shown below in the quotes from their open-ended responses:

> *"I allocate every day of the week to a specific module. For this module I watch the pre-lecture and lecture synchronously and then attempt the seminar questions straight after. It works best that way."* [Female, 18-20, International student].

> *"Sometimes I forgot about this."* [Female, 21-25, International student].

> *"I don't care."* [Male, 21-25, International student].

***Differences based on how often a student watched the PLV (SQ-7):***

The differences in perceptions and experiences based on "how often" students watched the PLV before attending the related synchronous/F2F lecture is shown in **Table 7**. The Kruskal–Wallis test results for the responses to **SQ-9A** and **SQ-9D** show that at least one pair of groupings has statistically significant differences between the groups based on how often students watched the PLV (chi2-statistic = 7.602, p-value = 0.0550 and chi2-statistic = 13.378, p-value = 0.0039, respectively). As a follow up analysis to reveal the specific group pairing(s) with these significant differences between them, we conducted the Dunn's test.

**Table 7: Kruskal–Wallis test on differences based on how often student watched the PLV (SQ-7)**

| *Hypothesis: At least one of the "how often" groups does not have the same median response rate as the other groups.* | | How Often | Obs. | Mean | Median | Rank Sum | chi2(3/4) with ties | *p-value* |
|---|---|---|---|---|---|---|---|---|
| **SQ-9A** | Watching PLV improves class preparedness | Sometimes | 5 | 3.80 | 4.00 | 151.0 | **7.602** | ***0.0550*** † |
| | | About half the time | 15 | 3.47 | 3.00 | 338.0 | | |
| | | Most of the time | 21 | 3.57 | 4.00 | 605.0 | | |
| | | Always | 18 | 4.11 | 4.00 | 676.0 | | |
| **SQ-9B** | Watching PLV improves quizzes practice preparedness | Sometimes | 5 | 4.00 | 4.00 | 149.5 | 1.767 | *0.6222* |
| | | About half the time | 15 | 3.87 | 4.00 | 425.0 | | |
| | | Most of the time | 21 | 3.86 | 4.00 | 581.0 | | |
| | | Always | 18 | 4.17 | 4.00 | 614.5 | | |
| **SQ-9C** | Learn better when quizzes are embedded in PLV | Sometimes | 5 | 3.20 | 3.00 | 104.5 | 4.023 | *0.2590* |
| | | About half the time | 15 | 3.73 | 4.00 | 423.5 | | |
| | | Most of the time | 21 | 3.76 | 4.00 | 601.5 | | |
| | | Always | 18 | 4.11 | 4.00 | 640.5 | | |
| **SQ-9D** | Enjoyed watching PLV | Sometimes | 5 | 3.60 | 3.00 | 128.5 | **13.378** | ***0.0039*****\*** |
| | | About half the time | 15 | 3.40 | 3.00 | 338.5 | | |
| | | Most of the time | 21 | 3.52 | 4.00 | 557.5 | | |
| | | Always | 18 | 4.39 | 5.00 | 745.5 | | |
| **SQ-13A** | There is connection between PLV and topic LO | Never | 2 | 4.00 | 4.00 | 50.0 | 1.791 | *0.7741* |
| | | Sometimes | 2 | 3.50 | 3.50 | 32.0 | | |
| | | About half the time | 14 | 3.93 | 4.00 | 332.0 | | |
| | | Most of the time | 12 | 3.83 | 4.00 | 276.0 | | |
| | | Always | 18 | 4.11 | 4.00 | 486.0 | | |

| Hypothesis: At least one of the "how often" groups does not have the same median response rate as the other groups. | | How Often | Obs. | Mean | Median | Rank Sum | chi2(3/4) with ties | p-value |
|---|---|---|---|---|---|---|---|---|
| **SQ-13B** | There is connection between PLV and module LO | Never | 2 | 4.00 | 4.00 | 50.0 | 4.666 | *0.3234* |
| | | Sometimes | 2 | 3.50 | 3.50 | 31.5 | | |
| | | About half the time | 14 | 3.71 | 4.00 | 276.0 | | |
| | | Most of the time | 12 | 4.00 | 4.00 | 313.0 | | |
| | | Always | 18 | 4.17 | 4.00 | 505.5 | | |

**Level of significance:** †$p \leq 0.100$, *$p \leq 0.050$, **$p \leq 0.010$, ***$p \leq 0.005$

**Table 8** shows the follow-up test using the Dunn's test to determine which pairs of the "how often" groups of students significantly contributed to the differences observed in the above Kruskal–Wallis test **(Table 7)** on student perception and experience regarding whether "watching PLV improves class preparedness" **(SQ-9A)** and whether students "enjoyed watching the PLV" **(SQ-9D)**.

**Table 8: Dunn's pairwise comparison of SQ-9A and SQ-9D by SQ-7**

| Col Mean-Row Mean | SQ-9A by SQ-7 | | | SQ-9D by SQ-7 | | |
|---|---|---|---|---|---|---|
| | Sometimes | About half the time | Most of the time | Sometimes | About half the time | Most of the time |
| About half the time | 0.940610[a] 1.0000[b, c] | | | 0.374192 1.0000 | | |
| Most of the time | 0.177035 1.0000 | -1.176218 0.7185 | | -0.105046 1.0000 | -0.726211 1.0000 | |
| Always | -0.921850 1.0000 | -2.722367 **0.0194** | -1.725092 0.2535 | -1.917299 0.1656 | -3.325127 **0.0027** | -2.854754 **0.0129** |

[a] Pairwise z-test statistic

[b] p-value, adjusted for multiple comparisons using the Bonferroni adjustment (Field, 2018, Dinno, 2015)

[c] **Test reject rule:** Family-wise Error Rate (FWER) = 0.05, Reject Ho if p = P(Z <= |z|) <= FWER/2

The results indicate that of the six pairwise comparisons of **SQ-9A** by **SQ-7**, only one pair comparison (students who "Always" watched the PLV and those who watched "About half the time") shows a significant difference (z-test-stat. = -2.722367, p-value = 0.0194). This implies that students who "Always" watched the PLV were more likely to agree that "watching PLV improves class

preparedness" compared to those who watched the PLV "About half of the time". Further, **Table 8** reveals that of the six pairwise comparisons of **SQ-9D** by **SQ-7**, two pair-comparisons (students who "Always" watched the PLV and those who watched "About half the time" and "Most of the time") show significant differences (z-test-stat. = -3.325127, p-value = 0.0027 and z-test-stat. = -2.854754, p-value = 0.0129, respectively). This implies that students who "Always" watched the PLV were more likely to agree that they "enjoyed watching the PLV" compared to those who watched the PLV "About half of the time" or "Most of the time".

The above results support the argument that the level of engagement with pre-class materials is associated with feeling of preparedness for in-class activities. The results are also consistent with the findings of Fadol *et al.* (2018) and Kim *et al.* (2014) that students who covered the learning materials before in-class sessions felt more confident and confirmed that they had a better understanding of the concepts delivered. Our study provides new findings that suggest that regular engagement with the PFC approach, if the learning material (content) is sufficiently aligned with the learning outcomes, enables students to understand the module content better. However, it is unclear if regular engagement with PFC approach improves enjoyment of watching the videos or if students in our study engaged with PFC approach because they 'enjoy' watching the videos. Further research is needed to understand how the two concepts are related.

*Differences based on how close to the related lecture a student watched the PLV (SQ-8):*

The results from Kruskal-Wallis in **Table 9** indicate that only responses to **SQ-9A** (watching PLV improves class preparedness) show significant differences between the groups based on how close to the related lecture students engaged with the pre-class material (chi2-statistic = 10.883, p-value = 0.0279). However, further checks with the Dunn's test results in **Table 10** show that the differences are insignificant. We therefore conclude that students' perception of preparedness for in-class sessions after watching the PLV are less likely to be affected by how close to the related lecture students engaged with the pre-class material.

**Table 9: Kruskal–Wallis test on differences based on how close to the related lecture a student watched the PLV (SQ-8)**

| **Hypothesis:** *At least one of the "how close" groups does not have the same median response rate as the other groups.* | | **How Close** | **Obs.** | **Mean** | **Median** | **Rank Sum** | **chi2(4) with ties** | ***p-value*** |
|---|---|---|---|---|---|---|---|---|
| **SQ-9A** | Watching PLV improves class preparedness | Same day | 17 | 3.35 | 3.00 | 385.5 | **10.883** | *0.0279** |
| | | 24hrs **BL^** | 28 | 3.96 | 4.00 | 959.0 | | |
| | | 48hrs BL | 11 | 3.91 | 4.00 | 389.5 | | |
| | | 72hrs BL | 2 | 3.00 | 3.00 | 24.0 | | |
| | | ≥ 4 days BL | 1 | 3.00 | 3.00 | 12.0 | | |
| **SQ-9B** | Watching PLV improves quizzes practice preparedness | Same day | 17 | 4.00 | 4.00 | 511.5 | 4.684 | *0.3213* |
| | | 24hrs BL | 28 | 4.04 | 4.00 | 873.5 | | |
| | | 48hrs BL | 11 | 4.00 | 4.00 | 353.5 | | |
| | | 72hrs BL | 2 | 3.00 | 3.00 | 21.0 | | |
| | | ≥ 4 days BL | 1 | 3.00 | 3.00 | 10.5 | | |
| **SQ-9C** | Learn better when quizzes are embedded in PLV | Same day | 17 | 3.53 | 4.00 | 410.5 | 7.592 | *0.1077* |
| | | 24hrs BL | 28 | 3.79 | 4.00 | 830.5 | | |
| | | 48hrs BL | 11 | 4.36 | 5.00 | 450.0 | | |
| | | 72hrs BL | 2 | 3.50 | 3.50 | 46.0 | | |
| | | ≥ 4 days BL | 1 | 4.00 | 4.00 | 33.0 | | |
| **SQ-9D** | Enjoyed watching PLV | Same day | 17 | 3.53 | 3.00 | 430.0 | 4.667 | *0.3232* |
| | | 24hrs BL | 28 | 3.86 | 4.00 | 876.5 | | |
| | | 48hrs BL | 11 | 4.00 | 4.00 | 401.5 | | |
| | | 72hrs BL | 2 | 3.50 | 3.50 | 48.5 | | |

| Hypothesis: At least one of the "how close" groups does not have the same median response rate as the other groups. | How Close | Obs. | Mean | Median | Rank Sum | chi2(4) with ties | p-value |
|---|---|---|---|---|---|---|---|
| | ≥ 4 days BL | 1 | 3.00 | 3.00 | 13.5 | | |
| **SQ-13A** | There is connection between PLV and topic LO | Same day | 14 | 3.93 | 4.00 | 319.0 | 3.538 | 0.4720 |
| | 24hrs BL | 21 | 4.00 | 4.00 | 504.0 | | |
| | 48hrs BL | 8 | 4.13 | 4.00 | 220.0 | | |
| | 72hrs BL | 2 | 3.50 | 3.50 | 31.0 | | |
| | ≥ 4 days BL | 1 | 3.00 | 3.00 | 7.0 | | |
| **SQ-13B** | There is connection between PLV and module LO | Same day | 14 | 4.00 | 4.00 | 336.0 | 2.092 | 0.7189 |
| | 24hrs BL | 21 | 3.90 | 4.00 | 469.0 | | |
| | 48hrs BL | 8 | 4.13 | 4.00 | 221.5 | | |
| | 72hrs BL | 2 | 3.50 | 3.50 | 30.5 | | |
| | ≥ 4 days BL | 1 | 4.00 | 4.00 | 24.0 | | |

**Level of significance:** $^{\dagger}p \le 0.100$, $*p \le 0.050$, $**p \le 0.010$, $***p \le 0.005$

^**BL** = Before the related 2F2-lecture

**Table 10: Dunn's pairwise comparison test of SQ-9A by SQ-8**

| Col Mean-Row Mean | SQ-9A by SQ-8 | | | |
|---|---|---|---|---|
| | Same day | 24hrs BL | 48hrs BL | 72hrs BL |
| 24hrs BL | -2.384793[a] 0.0854[b, c] | | | |
| 48hrs BL | -2.084717 0.1855 | -0.206371 1.0000 | | |
| 72hrs BL | 0.904853 1.0000 | 1.925977 0.2705 | 1.929353 0.2684 | |
| ≥ 4 days BL | 0.657360 1.0000 | 1.385153 0.8300 | 1.419966 0.7781 | 0.000000 1.0000 |

[a] Pairwise z-test statistic

[b] p-value, adjusted for multiple comparisons using the Bonferroni adjustment (Field, 2018, Dinno, 2015)

[c] **Test reject rule:** Family-wise Error Rate (FWER) = 0.05, Reject Ho if $p = P(Z <= |z|) <= FWER/2$

***Differences based on student preference of PLV embedded quizzes (SQ-10):***

The results in **Table 11** indicate that students' perception of PLV as a useful tool that improves class preparedness, helps them learn better when quizzes are embedded in the PLV and seeing the connection between PLV and topic learning outcomes may be influenced by their preference for PLV embedded quizzes (chi2-statistic = 4.611, p-value = 0.0997, chi2-statistic = 10.892, p-value = 0.0043 and chi2-statistic = 6.582, p-value = 0.0372, respectively). However, the follow-up Dunn's test in **Table 12** shows no significant differences for all except for one pairwise comparison of **SQ-9C** by **SQ-10.** This shows students who "Disagree" with preference to separate quizzes from PLV are more likely to agree that they learn better when quizzes are embedded in PLV than those who "Disagree" (z-test-stat. = -3.296601, p-value = 0.0015). Therefore, and apart from this one pairwise comparison, we conclude that differences in perception of learning better with PLV embedded quizzes and seeing the connection between PLV and topic learning outcomes are less likely to be influenced by preference of PLV embedded quizzes.

**Table 11: Kruskal–Wallis test on differences based on student preference of PLV embedded quizzes (SQ-10)**

| *Hypothesis: At least one of the "preference" groups does not have the same median response rate as the other groups.* | **Prefer Quiz Separately** | **Obs.** | **Mean** | **Median** | **Rank Sum** | **chi2(2) with ties** | *p-value* |
|---|---|---|---|---|---|---|---|
| **SQ-9A** | Watching PLV improves class preparedness | Agree | 24 | 3.79 | 4.00 | 761.5 | **4.611** | *0.0997†* |
| | | Neutral | 24 | 3.50 | 3.50 | 603.5 | | |
| | | Disagree | 11 | 4.09 | 4.00 | 405.0 | | |
| **SQ-9B** | Watching PLV improves quizzes practice preparedness | Agree | 24 | 3.92 | 4.00 | 690.5 | 1.197 | *0.5496* |
| | | Neutral | 24 | 3.92 | 4.00 | 696.5 | | |
| | | Disagree | 11 | 3.18 | 4.00 | 383.0 | | |
| **SQ-9C** | Learn better when quizzes are embedded in PLV | Agree | 24 | 3.46 | 3.00 | 579.5 | **10.892** | *0.0043\*\*\** |
| | | Neutral | 24 | 3.83 | 4.00 | 710.5 | | |
| | | Disagree | 11 | 4.55 | 5.00 | 480.0 | | |
| **SQ-9D** | Enjoyed watching PLV | Agree | 24 | 3.79 | 4.00 | 752.5 | 2.948 | *0.2290* |
| | | Neutral | 24 | 3.58 | 3.50 | 625.0 | | |
| | | Disagree | 11 | 4.09 | 4.00 | 392.5 | | |
| **SQ-13A** | There is connection between PLV and topic LO | Agree | 17 | 4.00 | 4.00 | 419 | **6.582** | *0.0372\** |
| | | Neutral | 19 | 3.68 | 4.00 | 354 | | |
| | | Disagree | 10 | 4.40 | 4.50 | 308 | | |
| **SQ-13B** | There is connection between PLV and module LO | Agree | 17 | 4.00 | 4.00 | 420.0 | 2.556 | *0.2785* |
| | | Neutral | 19 | 3.79 | 4.00 | 386.0 | | |
| | | Disagree | 10 | 4.20 | 4.00 | 275.0 | | |

**Level of significance:** †$p \leq 0.100$, **\***$p \leq 0.050$, **\*\***$p \leq 0.010$, **\*\*\***$p \leq 0.005$

**Table 12: Dunn's pairwise comparison test of SQ-9A, SQ-9C and SQ-13A by SQ-10**

| Col Mean-Row Mean | SQ-9A by SQ-10 | | SQ-9C by SQ-10 | | SQ-13A by SQ-10 | |
|---|---|---|---|---|---|---|
| | Agree | Neutral | Agree | Neutral | Agree | Neutral |
| Neutral | 1.444854[a] 0.2227[b, c] | | -1.164462 0.3664 | | 0.898196 0.5536 | |
| Disagree | -0.885501 0.5638 | -2.031018 0.0634 | -3.296601 **0.0015** | -2.373386 0.0264 | -0.764674 0.6667 | -1.547567 0.1826 |

[a] Pairwise z-test statistic

[b] p-value, adjusted for multiple comparisons using the Bonferroni adjustment (Field, 2018, Dinno, 2015)

[c] **Test reject rule:** Family-wise Error Rate (FWER) = 0.05, Reject Ho if p = P(Z <= |z|) <= FWER/2

*Differences based on students perceived ideal length of PLV:*

All the tests of the differences based on students perceived ideal length did not show any statistically significant results (Kruskal–Wallis tests, all p-values are more than 0.1000)[11]. This implies that students' responses are less likely to be influenced by their preference of the length of PLVs. **Figure 4** shows the variation in the preference of the 'ideal' length of the videos. This further supports Lee and Choi (2019)'s argument that students have different learning styles which could have an impact on their perceived readiness and achievement of their learning outcomes.
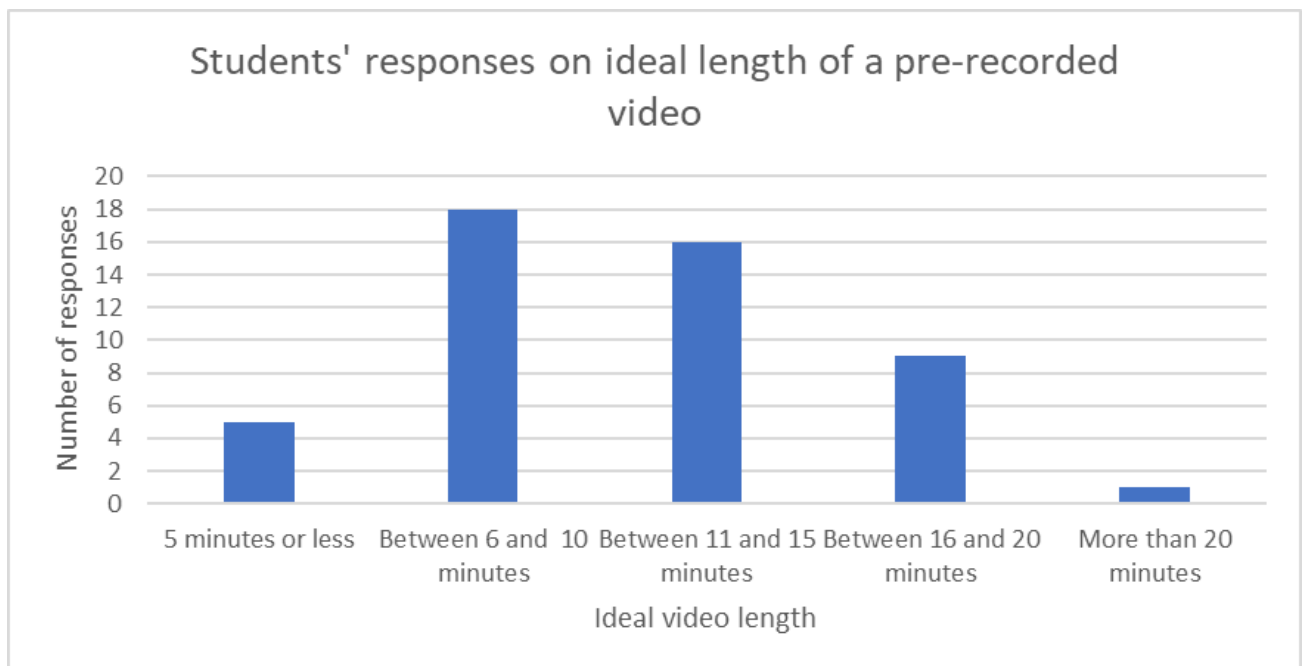


**Figure 4: Nvivo chart showing variation in preference of a pre-recorded video length.**

---

[11] For purpose of brevity, the table presenting the statistical results of the respective tests is not included in this paper, the table is available if requested.

*Differences based on student preference of fully traditional learning approach (SQ-15)*

**Table 13** indicates that differences in responses by students on learning better when quizzes are embedded in the PLV, enjoying the PLV and seeing the connection between the PLV and the topic learning outcomes might be influenced by their preference for fully traditional learning approach, however the results are marginally significant (chi2-statistic = 5.458, p-value = 0.0653, chi2-statistic = 5.442, p-value = 0.0658 and chi2-statistic = 5.546, 0.0625, respectively). Because the results are marginally significant, it is not surprising that the follow up Dunn's test results in **Table 14** reveal that there is no pairwise comparison with statistically significant differences. Therefore, we conclude that students' responses to these questions are less likely to be influenced by their preference for the traditional learning approach.

**Table 13: Kruskal–Wallis test on differences based traditional learning approach preference (SQ-15)**

| *Hypothesis: At least one of the "preference" groups does not have the same median response rate as the other groups.* | **Prefer Traditional Learning** | **Obs.** | **Mean** | **Median** | **Rank Sum** | **chi2(2) with ties** | ***p-value*** |
|---|---|---|---|---|---|---|---|
| **SQ-9A** | Watching PLV improves class preparedness | Agree | 7 | 3.57 | 4.00 | 140.5 | 4.574 | *0.1016* |
| | | Neutral | 13 | 3.38 | 3.00 | 241.5 | | |
| | | Disagree | 26 | 3.92 | 4.00 | 699.0 | | |
| **SQ-9B** | Watching PLV improves quizzes practice preparedness | Agree | 7 | 3.71 | 4.00 | 126.0 | 4.072 | *0.1305* |
| | | Neutral | 13 | 3.77 | 4.00 | 259.0 | | |
| | | Disagree | 26 | 4.23 | 4.50 | 696.0 | | |
| **SQ-9C** | Learn better when quizzes are embedded in PLV | Agree | 7 | 3.29 | 3.00 | 109.0 | **5.458** | *0.0653†* |
| | | Neutral | 13 | 3.62 | 4.00 | 267.0 | | |
| | | Disagree | 26 | 4.12 | 4.00 | 705.0 | | |
| **SQ-9D** | Enjoyed watching PLV | Agree | 7 | 3.29 | 3.00 | 107.0 | **5.442** | *0.0658†* |
| | | Neutral | 13 | 3.62 | 4.00 | 272.0 | | |
| | | Disagree | 26 | 4.12 | 4.00 | 702.0 | | |
| **SQ-13A** | There is connection between PLV and topic LO | Agree | 7 | 3.71 | 4.00 | 139.0 | **5.546** | *0.0625†* |
| | | Neutral | 14 | 3.64 | 4.00 | 272.0 | | |
| | | Disagree | 27 | 4.19 | 4.00 | 765.0 | | |
| **SQ-13B** | There is connection between PLV and module LO | Agree | 7 | 3.71 | 4.00 | 138.0 | 1.747 | *0.4175* |
| | | Neutral | 14 | 3.86 | 4.00 | 326.0 | | |
| | | Disagree | 27 | 4.07 | 4.00 | 712.0 | | |

**Level of significance:** $^†p \leq 0.100$, **\***$p \leq 0.050$, **\*\***$p \leq 0.010$, **\*\*\***$p \leq 0.005$

**Table 14: Dunn's pairwise comparison test of SQ-9C, SQ-9D and SQ-13A by SQ-15**

| Col Mean- | **SQ-9C by SQ-15** | **SQ-9D by SQ-15** | **SQ-13A by SQ-15** |
|---|---|---|---|

| Row Mean | Agree | Neutral | Agree | Neutral | Agree | Neutral |
|---|---|---|---|---|---|---|
| Neutral | -0.827923[a] 0.6116[b, c] | | -0.947205 0.5153 | | 0.072370 1.0000 | |
| Disagree | -2.118462 0.0512 | -1.512990 0.1954 | -2.166990 0.0454 | -1.409199 0.2382 | -1.562145 0.1774 | -2.113516 0.0518 |

[a] Pairwise z-test statistic

[b] p-value, adjusted for multiple comparisons using the Bonferroni adjustment (Field, 2018, Dinno, 2015)

[c] **Test reject rule:** Family-wise Error Rate (FWER) = 0.05, Reject Ho if p = P(Z <= |z|) <= FWER/2

## 4.5 Further analysis of qualitative responses

**Figure 5** shows NVivo coding references grouped into positive, negative, and neutral (indifferent) comments in response to preference for the PFC. Positive comments were mainly in reference to convenience, pace, conciseness, providing basic understanding, improving preparedness to in-class session, video length and video quality.
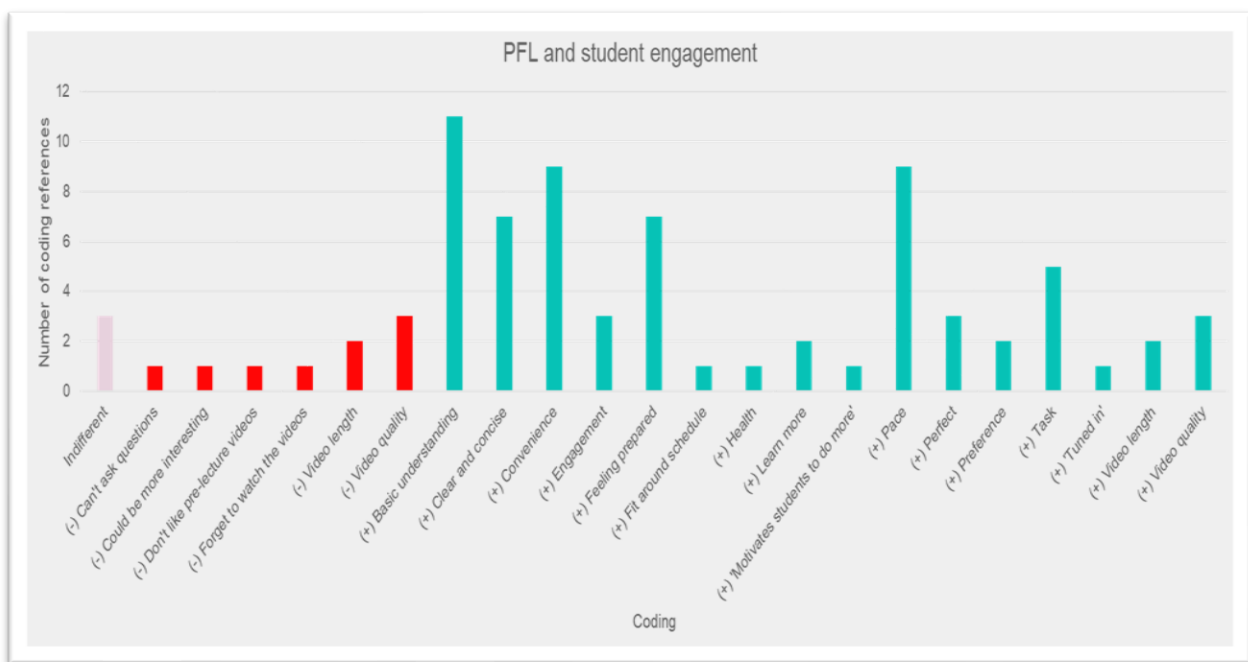


**Figure 5: Students' responses in relation to preference for PLVs**

There were more positive comments in favour of the PFC approach than negative and neutral comments. When asked about the best aspects of the PLV, the responses indicated an appreciation of tasks that accompanied the videos as shown below:

> *"Introduction to topic. Good way to encourage the student in engaging during lectures. Allows the student a time to practice quizzes after watching them which will motivate the student to do more."* [Male, 18-20, International student]

> *"Going through exercises."* [Female, 18-20, Domestic student]

> *"I like the embedded quizzes as it encourages me to really take in all aspects of the lecture in case the quiz question is about it."* [Male, 18-20, Domestic student]

A response also indicated the benefit of the PLV as a support tool that helps improve their learning considering their health condition as shown below:

> *"As a student with dyslexia I often struggle to keep up with the pace in the live lectures. It enables me to take my time in the pre-recorded videos, to pause, make efficient notes, and make sure my knowledge is sufficient [before] heading into the live lectures."* [Female, 18-20, Domestic student]

More domestic students seemed to find this PFC approach more useful than international students. Most negative comments that were not in favour of PLV came from international students. The comments were mainly about not liking the video format, finding it confusing as they are unable to ask questions and forgetting to see the videos. These views are consistent with the argument of existing literature that international students may find the flipped classroom method difficult to adapt to compared to home students who would have been introduced to this method of learning from high school (Singh *et al.,* 2021).

We also found diverse views on the quality of the videos and preference for quiz embedded videos. For example, on video quality we collected the following responses:

> *"They are low quality and quite honestly most of the time I don't understand them."* [Male, 18-20, International student]

> *"They are recorded to a high quality and are precise and have subtitles. they are very clear and include quizzes."* [Female, 18-20, International student]

On preference for quiz embedded videos, the below are examples of contrasting comments received:

> *"Making it mandatory by adding embedded questions in order to complete the session."* [Female, 18-20, International student]

> *"Perhaps some optional embedded quizzes inside the pre lecture video at the end to test concepts."* [Male, 26 and above, Domestic student]

> *"If they were shorter and there wasn't any embedded questions within the videos."* [Male, 18-20, Domestic student]

The above provides further evidence on our argument that students may have different learning styles which may affect how they engage in a PFC. While the benefits of PFC approach are evident in our study, it is important to highlight that PFC approach cannot be regarded as a one-size-fits all model.

# 5 CONCLUSION

This study explored the association between students' pre-class online learning and their perceptions of in-person class engagement preparedness in a partial-flipped classroom. Overall, we found that students perceive pre-lecture videos in the PFC approach as an important learning tool that prepares them for in-class sessions and practice quizzes. We also found that by watching the pre-lecture videos, students could see the connection between the pre-lecture videos and the topic and module learning outcomes. However, the differences in perception of identifying alignment of pre-class material and the topic and module learning outcomes were more likely to be influenced by their fee status classification (i.e., domestic or international) rather than age group or gender identity.

We also found that the differences in students' perception of pre-lecture videos as a preparatory tool for lectures were more likely to be influenced by their level of engagement with the pre-lecture video as students who "always" watched the pre-lecture video were more likely to agree that pre-lecture video improves class preparedness compared to those who watched the pre-lecture video "about half the time". Students who always watched the pre-lecture video were also more likely to agree that they enjoyed watching the pre-lecture video. From our findings, it is unclear if regular engagement with pre-lecture video (or the PFC approach in general) improves enjoyment of watching the pre-lecture video and of the PFC approach or if this is associated by students' learning style. We believe this part merits further investigation.

Finally, there were contrasting recommendations provided by the same cohort; for example, a student recommended video embedded quizzes so as to make it compulsory for students to attempt them while another student suggested that there should be no quizzes embedded in the videos. The differences might indicate their learning preferences and exposure to flipped classroom approach amongst other factors. Future research could be conducted to understand reasons for differences in perceptions highlighted in our study. Due to change in module content from previous years, it was difficult to compare the effect of the PFC approach on performance on the same module. It was also impossible to compare the cohort's performance on Intermediate Management Accounting module to another module taken in the same academic year as the assessment modes were not the same. Future research could investigate students' perception of PFC approach and its impact on students' academic performance.

**Disclosure statement:** The authors report there are no competing interests to declare.

**Data availability statement:** The data that support the findings of this study are available from the corresponding author, [O.O], upon request.

# 6 REFERENCES

Al-Naabi, I. (2022). Lessons learned from implementing a virtual flipped classroom during COVID-19: An autoethnography. *Journal of Applied Learning and Teaching*, *5*(2), 31-41.

Asiksoy, G., & Canbolat, S. (2021). The effects of the gamified flipped classroom method on petroleum engineering students' pre-class online behavioural engagement and achievement. *International Journal of Engineering Pedagogy*, 11(5), 19–36. https://doi.org/10.3991/ijep.v11i5.21957

Awidi, I. T., & Paynter, M. (2019). The impact of a flipped classroom approach on student learning experience. *Computers and Education*, 128, 269-283. https://doi.org/10.1016/j.compedu.2018.09.013

Bataineh, R. F., & Al-Sakal, R. M. I. (2021). To flip or not to flip: potential effects on EFL reading comprehension. *International Journal of Curriculum and Instruction*, *13*(2), 1091-1108.

Burgoyne, S., & Eaton, J. (2018). The partially flipped classroom: The effects of flipping a module on "junk science" in a large methods course. *Teaching of Psychology*, *45*(2), 154-157. https://doi.org/10.1177/0098628318762894

Cilli-Turner, E. (2015). Measuring learning outcomes and attitudes in a flipped introductory statistics course. *Primus*, 25(9-10), 833-846. https://doi.org/10.1080/10511970.2015.1046004

Çubukçu, Z. (2012). Teachers' evaluation of student-centered learning environments. *Education*, 133(1), 49-66.

Dinno, A. 2015. Nonparametric Pairwise Multiple Comparisons in Independent Groups using Dunn's Test. *The Stata Journal*, 15, 292-300. https://doi.org/10.1177/1536867X1501500117

Divjak, B., Rienties, B., Iniesto, F., Vondra, P., & Žižak, M. (2022). Flipped classrooms in higher education during the COVID-19 pandemic: Findings and future research recommendations. *International Journal of Educational Technology in Higher Education*, *19*(1), 1-24. 22) https://doi.org/10.1186/s41239-021-00316-4

Fadol, Y., Aldamen, H., & Saadullah, S. (2018). A comparative analysis of flipped, online and traditional teaching: a case of female middle eastern management students. *The International Journal of Management Education*, 16(2), 266-280. https://doi.org/10.1016/j.ijme.2018.04.003

Field, A. (2018). *Discovering Statistics Using IBM SPSS Statistics*, Los Angeles, London, New Delhi, Washington DC, Melbourne, SAGE.

Fisher, R., Perényi, A., & Birdthistle, N. (2021). The positive relationship between flipped and blended learning and student engagement, performance and satisfaction. *Active Learning in Higher Education*, 22(2), 97-113. https://doi.org/10.1177/1469787418801702

Fulton, K. (2012). Upside down and inside out: Flip your classroom to improve student learning. *Learning & Leading with Technology*, *39*(8), 12-17.

Goodwin, B., & Miller, K. (2013). Evidence on flipped classrooms is still coming in. *Educational Leadership*, 70, 78–79.

Hamlin, A., Kemppainen, A., & Fraley, M. (2014, August 7-8). Extended Abstract–Is Student Preparedness and Performance Improved by Using Pre-Lesson Videos. In *Proceedings of the First Year Engineering Experience (FYEE) Conference, College Station, TX*.

Harjoto, M. A. (2016). MBA students' perceptions on pre-lecture videos for corporate finance core course. *Journal of Financial Education*, 42(1-2), 81-101.

He, W., Holton, A., Farkas, G., & Warschauer, M. (2016). The effects of flipped instruction on out-of-class study time, exam performance, and student perceptions. *Learning and Instruction*, 45, 61-71. https://doi.org/10.1016/j.learninstruc.2016.07.001

Hodkiewicz, M. R. (2014). Insights gained from analysis of performance and participation in a flipped classroom. *Education Research and Perspectives*, *41*, 254-284.

Huang, B., Hew, K. F., & Lo, C. K. (2019). Investigating the effects of gamification-enhanced flipped learning on undergraduate students' behavioural and cognitive engagement. *Interactive Learning Environments*, 27(8), 1106-1126. https://doi.org/10.1080/10494820.2018.1495653

Jensen, J. L., Holt, E. A., Sowards, J. B., Heath Ogden, T., & West, R. E. (2018). Investigating strategies for pre-class content learning in a flipped classroom. *Journal of Science Education and Technology*, 27(6), 523-535. https://doi.org/10.1007/s10956-018-9740-6

Kim, M. K., Kim, S. M., Khera, O., & Getman, J. (2014). The experience of three flipped classrooms in an urban university: An exploration of design principles. *The Internet and Higher Education*, 22, 37-50. https://doi.org/10.1016/j.iheduc.2014.04.003

Lage, M. J., Platt, G. J., & Treglia, M. (2000). Inverting the classroom: A gateway to creating an inclusive learning environment. *The Journal of Economic Education*, 31(1), 30-43. https://doi.org/10.2307/1183338

Lee, J., & Choi, H. (2019). Rethinking the flipped learning pre-class: Its influence on the success of flipped learning and related factors. *British Journal of Educational Technology,* 50(2), 934-945. https://doi.org/10.1111/bjet.12618

Long, T., Logan, J., & Waugh, M. (2016). Students' perceptions of the value of using videos as a pre-class learning experience in the flipped classroom. *Tec Trends*, *60*, 245-252. https://doi.org/10.1007/s11528-016-0045-4

McCarthy, J. (2016). Reflections on a flipped classroom in first year higher education. *Issues in Educational Research*, 26(2), 332-350.

Mohamed, H., & Lamia, M. (2018). Implementing flipped classroom that used an intelligent tutoring system into learning process. *Computers & Education*, 124, 62-76. https://doi.org/10.1016/j.compedu.2018.05.011

Moravec, M., Williams, A., Aguilar-Roca, N., & O'Dowd, D. K. (2010). Learn before lecture: a strategy that improves learning outcomes in a large introductory biology class. *CBE—Life Sciences Education*, 9(4), 473-481. https://doi.org/10.1187/cbe.10-04-0063

Mortensen, C. J., & Nicholson, A. M. (2015). The flipped classroom stimulates greater learning and is a modern 21st century approach to teaching today's undergraduates. *Journal of Animal Science*, *93*(7), 3722-3731. https://doi.org/10.2527/jas.2015-9087

Nerantzi, C. (2020). The use of peer instruction and flipped learning to support flexible blended learning during and after the COVID-19 Pandemic. *International Journal of Management and Applied Research*, *7*(2), 184-195.

Organisation for Economic Co-operation and Development. (2021). *The state of global education: 18 months into the pandemic.* OECD Publishing, Paris. https://www.oecd-ilibrary.org/education/the-state-of-global-education_1a23bb23-en

Öncel, A. F., & Kara, A. (2019). A flipped classroom in communication systems: Student perception and performance assessments. *The International Journal of Electrical Engineering & Education*, 56(3), 208-221. https://doi.org/10.1177/0020720918788718

Or, C., Leong, H., & Ng, X. H. (2022). Lecturers' perceptions of flipped learning in higher education: A case study on flipped classroom implementation in Singapore Polytechnic. *Journal of Applied Learning and Teaching*, *5*(2), 62-71.

Persky, A. M., & Hogg, A. (2017). Influence of reading material characteristics on study time for pre-class quizzes in a flipped classroom. *American Journal of Pharmaceutical Education*, *81*(6). https://doi.org/10.5688/ajpe816103

Poon, J. (2013). Blended learning: An institutional approach for enhancing students' learning experiences. *Journal of Online Learning and Teaching*, *9*(2), 271-289.

Rambocas, M., & Sastry, M. K. (2017). Teaching business management to engineers: The impact of interactive lectures. *IEEE Transactions on Education*, 60(3), 212-220. https://doi.org/10.1109/TE.2016.2637327

Rodgers, T. L., Cheema, N., Vasanth, S., Jamshed, A., Alfutimie, A., & Scully, P. J. (2020). Developing pre-laboratory videos for enhancing student preparedness. *European Journal of Engineering Education*, 45(2), 292-304. https://doi.org/10.1080/03043797.2019.1593322

Sherrow, T., Lang, B., & Corbett, R. (2016). The flipped class: Experience in a university business communication course. *Business and professional communication quarterly*, *79*(2), 207-216. https://doi.org/10.1177/2329490615614840

Singh, J. K. N., Jacob-John, J., Nagpal, S., & Inglis, S. (2021). Undergraduate international students' challenges in a flipped classroom environment: an Australian perspective. *Innovations in Education and Teaching International*, 1-12. https://doi.org/10.1080/14703297.2021.1948888

Taber, K. S. (2018). The Use of Cronbach's Alpha When Developing and Reporting Research Instruments in Science Education. *Research in Science Education*, 48(6), 1273-1296. https://doi.org/10.1007/s11165-016-9602-2

Vazquez, J. J., & Chiang, E. P. (2016). Preparing students for class: A clinical trial testing the efficacy between multimedia pre-lectures and textbooks in an economics course. *Journal of College Teaching & Learning* (TLC), 13(2), 37-46. https://doi.org/10.19030/tlc.v13i2.9631

Walsh, J. N., & Rísquez, A. (2020). Using cluster analysis to explore the engagement with a flipped classroom of native and non-native English-speaking management students. *The International Journal of Management Education*, 18(2), 100381. https://doi.org/10.1016/j.ijme.2020.100381

Zainuddin, Z., & Attaran, M. (2016). Malaysian students' perceptions of flipped classroom: A case study. *Innovations in Education and Teaching International*, 53(6), 660-670. https://doi.org/10.1080/14703297.2015.1102079

Zawilinski, L., Shattuck, J., & Hansen, D. (2020). Professional development to promote active learning in the flipped classroom: a faculty perspective. *College Teaching,* 68(2), 87-102. https://doi.org/10.1080/87567555.2020.1753643

# 7. Appendix 1 - QUESTIONNAIRE

**Study Title:** Partial Flipped Classroom (PFC) Approach and Student Engagement in the classroom: evidence from a UK university

**SQ-1:**

You are being invited to take part in a research study. Before you decide whether to take part in this study, it is important for you to understand why the research is being conducted and what it will involve. Please take time to read the following information carefully.

The aim of this research is to provide insights into how asynchronous learning such as partial flipped classroom (PFC) approach to learning and teaching affects student engagement in class. Participation in this study, including the responses/answers to the questionnaire questions will help us understand students' perceptions and perspectives on asynchronous learning when combined with synchronous (either face-to-face (F2F) or live online sessions). You have been invited to take part in the study because you are registered to study the module Intermediate Management Accounting in the 2021-22 academic year. The findings of the study will contribute to the literature and our knowledge on the usefulness of combining asynchronous learning (including the use of pre-lecture videos (pre-lecture videos) and practice quizzes) with traditional teaching methods in achieving module learning outcomes. The findings of this study will be shared across the university and published across the wider Higher Education Sector.

Please note that there is no personal educational benefit if you decide to take part in this study. Whether or not you choose to take part will have no impact on your studies. If you decide to take part in the study, you will also be asked to fill out one online questionnaire about your learning experience in the PFC approach we are employing as part of this study. The questionnaire should take about 10 minutes to complete.

When you participate in this study, you are consenting for the researchers to use any results obtained in the module (such as practice quizzes on Canvas, quizzes embedded in pre-lecture videos, and results from game-based tools such as Vevox) for the purpose of this research. The responses you provide will be anonymous and generated from Qualtrics, an online data collection platform. All your responses will be kept strictly confidential only available to the researchers working on this project. The anonymous data will be stored for seven years and then destroyed. Because the data is anonymous you cannot request for your

response to be deleted. This research has been approved by University of XXX's Social Sciences and Arts C-REC. Approval number - ER/OO284/2.

Please contact the research team on XXX for more information.

Thank you for taking time to read the information sheet.

**I have read and understood the above information and:**

○ I consent to participate in the study_____(1)

○ I do not consent to participate in the study_____(2)

*Skip To: End of Survey If Q1 = I do not consent to participate in the study*

**SQ-2:** Please choose your age range.

○ 18 – 20 (1)

○ 21 – 25 (2)

○ 26 and above__(3)

**SQ-3:** What is your gender identity?

○ Male_____(1)

○ Female_____(2)

○ Non-binary_____(3)

○ Trans/Transmasculine/Transfeminine__(4)

○ Prefer to self-describe_____(5)

○ Prefer not to say_____(6)

------------------------------------------------------------------------------------------------

**SQ-4:** Please self-describe your gender

_____

**SQ-5:** Are you a direct entry student?

    ○ Yes____(1)

    ○ No____(0)

**SQ-6:** Please choose the option that best describes you.

    ○ I am an international student___(1)

    ○ I am a domestic student(2)

**SQ-7:** Did you watch the PLVs before attending the related synchronous lecture?

    ○ Always_____(5)

    ○ Most of the time_____(4)

    ○ About half the time____(3)

    ○ Sometimes_____(2)

    ○ Never_____(1)

**SQ-8:** On average, how close to the related lecture did you watch the PLVs?

○ Same day_____(1)

○ 24 hours before the lecture_____(2)

○ 48 hours before the lecture_____(3)

○ 72 hours before the lecture_____(4)

○ 4 days or more before the lecture_____(5)

**SQ-9:** On a scale of 1 (Strongly disagree) to 5 (Strongly agree), please choose the option that best describes you.

|  | Strongly disagree (1) | Disagree (2) | Neither agree nor disagree (3) | Agree (4) | Strongly agree (5) |
|---|---|---|---|---|---|
| **A:** I feel more prepared for the F2F lecture when I watch the related PLV before attending class **(ERQ-1)** | ○ | ○ | ○ | ○ | ○ |
| **B:** I feel more prepared to answer practice quizzes on Canvas when I watch the related PLV **(ERQ-2)** | ○ | ○ | ○ | ○ | ○ |
| **C:** I learn better when quizzes are embedded in the PLV **(ERQ-3)** | ○ | ○ | ○ | ○ | ○ |
| **D:** I enjoyed watching the PLV before attending the F2F lecture **(ERQ-4)** | ○ | ○ | ○ | ○ | ○ |

**SQ-10:** On a scale of 1 (Strongly disagree) to 5 (Strongly agree), please choose the option that best describes you.

| | Strongly disagree (5) | Disagree (4) | Neither agree nor disagree (3) | Agree (2) | Strongly agree (1) |
|---|---|---|---|---|---|
| I prefer attempting quizzes in a separate section on the module canvas site rather than being embedded in the pre-lecture video (1) | ○ | ○ | ○ | ○ | ○ |

**SQ-11:** Please choose the option that best describes you.

    ○ I watch the PLVs after the lecture_____(1)

    ○ I do not watch the PLVs at all_____(0)

**SQ-12:** Please comment on the reason for the answer you have chosen above.

_____

**SQ-13:** On a scale of 1 (Strongly disagree) to 5 (Strongly agree), please choose the option that best describes you.

|  | Strongly disagree (1) | Disagree (2) | Neither agree nor disagree (3) | Agree (4) | Strongly agree (5) |
|---|---|---|---|---|---|
| **A:** I could see the connection between the PLV and the topic learning outcomes **(ERQ-5a)** | ○ | ○ | ○ | ○ | ○ |
| **B:** I could see the connection between the PLV and the module learning outcomes **(ERQ-5b)** | ○ | ○ | ○ | ○ | ○ |

**SQ-14:** What is your ideal length of a pre-recorded video?

○ 5 minutes or less_____(1) = 5 ≤ minutes

○ Between 6 and 10 minutes_____(2) = 6-10 minutes

○ Between 11 and 15 minutes_____(3) = 11-15 minutes

○ Between 16 and 20 minutes_____(4) = 16-20 minutes

○ More than 20 minutes_____(5) = 20 > minutes

For purpose of analysis, **RECODED TO:**

○ 10 minutes or less_____(1) = 10 ≤ minutes

○ Between 11 and 20 minutes____(2) = 11-20 minutes

○ More than 20 minutes_____(3) = 20 > minutes

**SQ-15:** I would have preferred a fully traditional learning approach where all content is delivered during class time and there are no PLV to watch.

○ Strongly agree_____(1)

○ Agree_____(2)

○ Neither agree nor disagree_____(3)

○ Disagree_____(4)

○ Strongly disagree_____(5)

For purpose of analysis, **RECODED TO:**

○ Agree_____(1)

○ Neither agree nor disagree_____(2)

○ Disagree_____(3)

**SQ-16:** Please comment on the answer you have provided above.

_____

Display This Question:

> *If Q7 = Always*
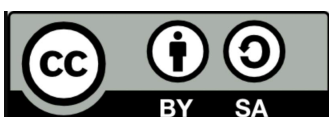>
> *Or Q7 = Most of the time*
>
> *Or Q7 = About half the time*
>
> *Or Q7 = Sometimes*
>
> *Or Q11 = I watch the pre-lecture videos after the lecture*

**SQ-17:** Please provide more text on the best aspects of the PLVs.

_____

_Display This Question:

> *If Q7 = Always*
>
> *Or Q7 = Most of the time*
>
> *Or Q7 = About half the time*
>
> *Or Q7 = Sometimes*
>
> *Or Q11 = I watch the pre-lecture videos after the lecture*

**SQ-18:** Please provide more text on how the PLVs can be improved.

_____

_

**End of Questionnaire**

---