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Flipped classroom: An investigation into learner engagement during *non*-face-to-face components

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Abstract

This paper investigated student engagement on the *non*-face-to-face component of the flipped approach in a critical thinking and writing class. Drawing from flipped approach and learner engagement literature and using an adapted version of Chi and Wylie's Interactive, Constructive, Active, Passive (ICAP) framework (2014), the study looked specifically at student engagement in *non*-face-to-face activities and tasks, namely video lectures, readings, tutorial materials, quizzes, and discussion forums. A total of 71 respondents were involved in the study. A self-perception survey designed to understand the level of student engagement was administered. Findings show that for activities of viewing e-lectures and doing assigned readings, most respondents displayed passive engagement, with a good proportion exhibiting active and constructive behaviours. However, there is an increased number of respondents who showed active and constructive engagement in going through materials in preparation for face-to-face tutorials, as well as in completing the online quizzes. Interactive engagement is not obvious. This study suggests that more strategic scaffolding provided for students could result in a higher level of effectiveness in learner engagement as well as a need to re-look at the design of the materials, activities, and tasks if the intent is to mediate interactive engagement.

Introduction

With the increased use of technology in higher education, online learning approaches such as flipped, blended, and massive open online courses (MOOCs) along with other, related online teaching and learning approaches, have gained traction in recent years. However, effective implementation relies heavily on students' access to the Internet, the design of the course, and students' engagement. This paper focuses on student engagement, in particular, how students engage with online materials.

Recent statistics on the average global internet penetration rate indicates a steady increase from 35% in 2013 to 57% in 2019, with most developing markets relying on the mobile phone for internet access (Statista, 2019). A similar trend is found, in particular, in the 'global South', defined as "developing countries located primarily in the Southern Hemisphere" (Avle, Quartey, & Hutchful, 2018:2), where there is an increase in the use of smartphones and sharing of data through creative ways by people who are hyper-connected. Avle *et al* (2018) observe that there is an upward trend, within the 'global South', of people who have access to social media platforms. Studies have shown that mobile phones with Internet access afford the masses in developing countries the opportunity to gain an education online (Grönlund & Islam, 2010) while recognising that challenges remain in terms of developing online learning materials that are effective in helping students learn (Traxler, 2018).

Despite the fact that this positive development in technology bodes well for equality of access to education, there remains concerns among scholars that affordability and disproportionate access are an issue (Clarke, 2018). It has also been pointed out that while digital technology has brought advantages and advances to developing economies, it has also widened the digital divide between countries in the 'global South' and those in the 'global North', and hence there is a gap that 'global South' countries need to fill in order to narrow this divide (Curiak & Ptashkina, 2019).

This may apply not only to the 'global South', as defined by Avle *et al* (2018), but also those that Mahler terms "Souths in the geographic North and Norths in the geographic South" (Mahler, 2017:1) referring to individuals and communities negatively impacted by advances in developed societies. Nonetheless, regardless of the speed and breadth of access to technology across societies, the fact remains that, whether in the 'global North' or South, there is a consistent upward trend in the penetration rate of technology, especially mobile technology.

In addition, Hill and Lawton (2018), in discussing the digital divide and inequality in the context of higher education, assert that universities play a key role in driving positive changes in the communities in which they are situated. We therefore argue that students in higher education are considered as 'North-ern' based on Mahler's (2017) interpretation; in that, regardless of geographical location, efforts have been made for students to have access to technology.

More importantly, we contend that the effectiveness of online or technology-enhanced learning is more contingent upon *how* technology is used for teaching and learning, and not so much on *which* technological or technical features are used. Teachers who use technology for teaching should therefore be cognizant of designing online learning that encourages inclusivity instead of exclusivity, and of providing necessary support for students in ensuring equity. As noted by Rye and Stokken (2012), it is through addressing the peculiarities of a local context that the inequality presented by

online learning spaces can be viewed as a resource for learning instead of as a problem. One could further argue that a design approach that is inclusive applies to curriculum design in general. In addition, with the increased ubiquity of technology, online learning may present the possibility of bringing education to, and thus enhancing equality for, the masses in diverse contexts, overcoming the ways that the physical face-to-face classroom is constrained.

Aside from the debate on equality, we contend that, for effective learning to take place, face-to-face and online learning approaches should ensure that materials and activities mediate student learning meaningfully. This is especially important in the blended and flipped approaches where there are two dimensions to the learning environment, namely *non*-face-to-face (or online) and face-to-face elements, where the connection and coherence between these two environments needs careful design to ensure optimal learning.

As such, this paper asks: How do materials and activities in the *non*-face-to-face flipped classroom mediate learning? What does engagement look like in the *non*-face-to-face component of a flipped approach? What characterises the engagement patterns of students in the *non*-face-to-face component of the flipped classroom? The next section situates these research questions in the current literature that explores the notions of learner engagement and flipped classrooms.

Literature Review

In this section, we examine the two key concepts of learner engagement and the flipped classroom approach. We first explore the definition and various levels of learner engagement, as well as its impacts on student learning. We then look at the potential of the flipped classroom approach to enhance educational opportunities, in addition to discussing the advantages and disadvantages of this approach for student learning.

Learner engagement

Learner engagement has long been acknowledged as a key criterion for effective learning and for the attainment of intended learning outcomes. Hu and Kuh (2001:3) define engagement as "the quality of effort students themselves devote to educationally purposeful activities that contribute directly to desired outcomes". Educationally purposeful activities refer not only to academic pursuits but also to non-academic social interactions that inform learning experiences and development (Coates, 2006). In recent decades, there have been large scale inquiries into student engagement in the context of undergraduate education, such as the United States' National Student Survey on Engagement (NSSE) (2003) and the Australasian Survey of Student Engagement (AUSSE) (Coates, 2010). These are frameworks built on the work of Astin (1985), Pace (1979), and Chickering and Gamson (1987).

The two key aspects of learner engagement that are relevant to our discussion are content mastery (Hackman, 2005) or academic pursuits, and participation (Klette, Sahlström, Blikstaf-Balas, Luoto, Tanner, & Tengberg *et al*, 2018) including non-academic social interactions. Hackman (2005) proposes that content mastery is essential for effective social education because *acquiring information* is one of the key bases for learning. Klette *et al* (2018:58) highlight that student participation in "discursive practices and learning activities" in the classroom impacts their understanding of the content. They also note that student participation in whole-class interactions involves power relations (as do all

interactions within the context of social relations, as espoused by Pierre Bourdieu, 1989) that present challenges to the emergence of student voices. In other words, learner engagement closely relates to the issue of social justice in education.

Research into student engagement is predicated on the assumption that it is possible to identify activities and conditions that promote effective learning. The identification of such activities and conditions has emerged from many years of inquiry into student learning and development (Astin, 1985; Chickering & Gamson, 1987; Pace, 1979; Pascarella & Terenzini, 1991; Ewell & Jones, 1993; Tinto, 1993; Kuh, Branch, Lunf & Ramin-Gyurnek, 1994). In one of the most comprehensive interpretations, developed for the US National Survey of Student Engagement (NSSE, 2003), engagement is seen to comprise: active and collaborative learning, participation in challenging academic activities, formative communication with academic staff, involvement in enriching educational experiences, and feeling legitimated and supported by university learning communities. As this list suggests, engagement is a broad construct intended to encompass salient academic, as well as non-academic, aspects of the student experience.

Research has also shown that learners who are engaged shape and take ownership of their own learning; they exhibit confidence as well as a high degree of motivation (Davies & Yamashita, 2007). As a result of their involvement in learning, engaged learners tend to experience a greater sense of achievement. They also tend to accomplish more than their less-engaged counterparts, in particular, in terms of what is learned, how much learning takes place, and how much progress is made.

Engaged learning occurs at various levels such as cognitive, metacognitive, linguistic, and social-cultural. Engaged learning is also contextualized depending on the learning environment or situation, such as access to content and opportunities for participation which are contingent on power structures in place that shape the learning experience in the classroom. Additionally, there are different platforms – face-to-face, multi-media, and online through social networking sites – that may facilitate and encourage engagement in learning with varying efficacy. Nonetheless, what seems important is that "for engaged learning to happen, the [learning space] must be conceived of as first, a knowledge-building learning community" (NCREL, 1997:33); and second, it should contribute to the "whole student experience" (Coates, 2006:29).

A number of scholars (Bruffee, 1993; Scardamalia & Bereiter, 1987; Scardamalia, 2009) have identified and established conditions and factors that encourage a knowledge-building community and environment. One of the key factors is collaborative learning through discussion. According to social constructivist theory, ideas are created from one's interaction with the community and the context in which one is situated (Vygotsky, 1978). The socio-cultural community in which learners are located, therefore, has a significant influence on what and how they think about issues as well as how they respond to them. As such, the value of any discussion depends largely on its ability to stimulate learners' thinking in service of co-construction of knowledge within a community (Scardamalia & Bereiter, 1987).

Furthermore, the "whole student experience" perspective, as proposed by Coates (2006), postulates that, in the current higher educational scene, a student's learning experience extends beyond his/her academic pursuit. It involves non-academic and social experiences; both in-class and out-of-class. Thus

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academic and non-academic experiences both contribute to achieving an expected learning outcome (Coates, 2006). Learning, therefore, is seen as a knowledge construction or meaning making process involving iterative dialogue and conversation among members within a particular community. It follows that learner engagement involves construction and co-construction of meaning aimed both at the intellectual or conceptual level as well as at the practical or application level. This implies transfer of knowledge.

There seems to be consensus that there is a connection between engagement and learning. However, of interest in this paper is how engagement is ascertained, and what indicators – of its link to direct and indirect learning – can be perceived. In measuring engagement, Hu and Kuh (2001:3) note that while earlier scholarship of engagement tried to establish students' level of engagement by looking at their time on task, more recently, the emphasis has shifted to the "quality of effort [that] students themselves devote to educationally purposeful activities that contribute directly to desired outcomes". Engagement entails a certain level of individual involvement and participation in activities, conversations as well as any piece of work the individual is doing. It has implications for learners' cognition as well as the time and physical energy that they put into their studies (Jacobi, Astin & Ayala, 1987). In other words, even though it is still useful to measure the number of hours students expend on a particular task, as observed in previous studies, research that queries what students *do* when they perform a task (rather than how much time they spend doing it) may bring about more insight on how learning occurs and on key characteristics demonstrating engagement or disengagement.

In further addressing indicators of engagement, Chi and Wylie (2014) developed a framework to identify student engagement through overt behaviours. The four modes of engagement they identify are interactive, constructive, active, and passive (ICAP) with each specifying measurable behaviours that can be used as evidence of the level of engagement. This is the framework deployed in this study, and it is discussed in greater depth in the methodology section of this paper.

Flipped classrooms

The flipped classroom approach essentially involves providing content material to students via various modes and platforms – usually through online multimedia lectures that students can access in their own time – before students and teachers meet face-to-face in a classroom setting which is focused on student-centred synchronous learning activities (Alvarez, 2012; Ash, 2012). This implies that learner engagement occurs not only in the face-to-face classroom, but also on e-platforms.

Given the way knowledge is presented through e-lectures, classroom teaching that is brought online in a one-directional, non-interactive manner levels the playing field for all students, in terms of both content mastery and student participation. Since whole-class teaching may be replaced with e-lectures, all students have the same access to the content, assuming all have the same technological access. Similarly, with e-platform tools (such as online discussion forums), all students would also have the same opportunity to participate in discussion. While we acknowledge that one-directional, non-interactive online presence addresses equality of access, this may not necessarily lead to student engagement with learning.

With technology for online teaching and learning made more available, not only have countries in the 'global North' actively implemented the use of technology to develop blended/flipped classrooms, but schools and universities in the 'global South' have also begun incorporating technology into their classrooms. For instance, mobile technology was implemented in an English programme for school children in Bangladesh (Shohel & Power, 2010), and online social networking has been used for teaching and learning at the tertiary level in South Africa (Bosch, 2009).

In the past few decades, the exponential advancement in technology has been a catalyst for the expansion of online learning. Situated in the spectrum of mode of learning between fully face-to-face classroom and fully online learning are blended and flipped classroom approaches, especially the flipped classroom approach implemented at universities around the world. As a country notionally located in the 'global South', Singapore[1] – the site of this research – is no exception when it comes to introducing technology for teaching and learning purposes (Yang, 2015).

At the National University of Singapore (NUS), faculty members are encouraged to leverage technology in order to make the learning process relevant and engaging. As early as September 2012, then NUS Provost, Professor Tan Eng Chye, reflected on the value of technology-enhanced education (Tan, 2012). He notes that while technology should not be used just because it exists, faculty members should keep an open mind to its possibilities, citing the success of the Duke-NUS Graduate Medical School's (Duke-NUS) flipped classroom approach, called TeamLEAD (Learn, Engage, Apply and Develop).

Since 2012, there has been an increase in the number of flipped modules implemented at NUS. One of the reasons for this trend is the time and space constraint on mounting modules on the online platform used by NUS as it increases its enrolment to fulfil the government's mandated 40% increase by 2020 (Davie, 2017). Other motivating reasons for the increased implementation include the learning preferences of millennials, the push toward experiential learning, and encouragement of use of technology for enhanced learning. The growth of the flipped classroom approach is also evident in other Singapore universities (Yang, 2015) and universities worldwide (Fahs & Wood, 2015; Schaffhauser, 2015).

Lage, Platt and Tregila (2000) note that the flipped classroom approach has risen in popularity, and it seems to be an effective response to the need to engage millennial students who prefer interactive approaches that promote experiential learning. Phillips and Trainor (2014) attribute its effectiveness to the fact that it encourages student-faculty contact, cooperation among students, and active learning:

> Frequent student-faculty interaction motivates students to engage with their class work, as does collaboration and sharing of ideas with other students. Active learning improves student understanding as they talk about their work and make what they are learning part of themselves (Phillips & Trainor, 2014:106).

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[1] Editor's note: *SOTL in the South* takes an expanded view of the term 'global South'. It seeks to go beyond simplistic geographic and economic considerations and includes for example 'global South' epistemics, histories, cultures, and identities. The journal's working definition of 'global South' is available here: https://sotl-south-journal.net/?journal=sotls&page=aimAndScope.

Pluta, Richards & Mutnick (2013) propose that class time in higher education courses should the focus on the application of knowledge and should allow teachers the opportunity to detect errors in thinking, a directive that the flipped classroom supports. Furthermore, advanced digital technologies that are now easily available provide opportunities for dynamic and innovative ways to enhance student learning through the flipped classroom approach.

While the flipped classroom approach is still relatively new, research to investigate it has not been lacking. This is affirmed by a search of databases in the ProQuest platform and ERIC that indicates that there have been numerous studies done to investigate the flipped classroom approach. However, the literature is scant regarding learner engagement, specifically during the *non*-face-to-face, online component.

In a scoping review conducted by O'Flaherty and Phillips (2015), it was found that many research studies report increased student satisfaction with the flipped classroom approach, with several showing increased academic performance. Similarly, qualitative feedback reported in these studies supports the view that the flipped classroom model enhances the learning experience and promotes student empowerment, development, and engagement. In other words, the flipped classroom approach, when implemented well, promotes active learning (e.g. Ferreri & O'Connor, 2013; Hung, 2014), and thus increases student engagement (Hall & DuFrene, 2016).

Other reported benefits of the flipped classroom approach include promotion of independent learning and increased group collaboration (O'Flaherty & Phillips, 2015). Similarly, in their review of current literature on the flipped classroom approach, Uzunboylu and Karagozlu (2015) cite positive responses by students, enhanced learning in relation to higher order thinking based on Bloom's taxonomy, and the cultivation of independent learning. In addition, they highlight good management as a key aspect of successful implementation of the flipped classroom approach. In Hall and DuFrene's (2016) review of studies on the flipped classroom approach, they find that it strengthens team-based skills (Millard, 2012), offers more personalised student guidance (Sams & Bergmann, 2013), helps to focus classroom discussion (Herreid & Schiller, 2013), and provides more time for meaningful application of course content within class time (Ash, 2012). Furthermore, online lectures afford students the convenience of studying at their own pace, allowing them to review the lectures as often as they wish (Frydenberg, 2012).

However, the effectiveness of the flipped classroom in engaging students has been brought into question because there is evidence to suggest that such an approach may not work with less-motivated and less-engaged students, who do not complete their out-of-class assignments and are thus ill prepared for the face-to-face component of the course (Hall & DuFrene, 2016). For example, it has been suggested that the flipped classroom approach may not be the best option for introductory courses (Strayer, 2012). Phillips and Trainor (2014) also note that students may not watch the required videos before class. Ash (2012) suggests that online lectures that are as unengaging as face-to-face lectures render the flipped classroom approach ineffective. In addition, Phillips and Trainor (2014) opine that not all students thrive in a collaborative learning environment.

Berrett (2012) observes other disadvantages of the flipped classroom approach, which include: lack of support for the flipped approach in terms of resources, training, and technology investment;

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technical difficulties which bog lecturers down rather than enabling them to focus on how best to use class time to maximise students' learning (Bergmann & Sams, 2012); and the reluctance of students to assume responsibility for their own learning (Kovach, 2014). Phillips and Trainor (2014) also recognise the disadvantage of the absence of instructors and peers to answer questions when students view lectures on their own. Perhaps for students in environments where resources, especially technological ones, are lacking, accessibility is an issue and therefore may pose implications for social equality/inequality.

Separately, in recognizing the huge attrition rate of students enrolled in Massive Open Online Courses (MOOCs), Clow (2013) identifies four indicators of student engagement that are numeric and trackable, namely awareness, registration, participation, and progress. Clow suggests that these four indicators represent stages of engagement from superficial to in-depth. While MOOCs are not the same as flipped classrooms, Clow's indicators provide some insight into online engagement.

In light of the advantages and disadvantages of the flipped classroom approach, Uzunboylu and Karagozlu (2015) call for in-depth studies to be conducted to ascertain how the flipped approach has had an impact on student engagement, on achieving the intended learning outcomes, and on how a balance could be established between face-to-face and *non*-face-to-face components for optimal learning.

Following this line of thought, our study attempts to advance understanding of learner engagement, specifically regarding the *non*-face-to-face component within the flipped classroom approach.

Methodology

Our context is an elective flipped module on the broad theme of communication and critical thinking for community leadership offered to undergraduate students. It is a 12-week module with the theory or content part of the module presented online, which students are expected to access prior to face-to-face tutorials. Besides presentation of the content, there are online discussion forums and quizzes to check basic understanding of content. Students may also approach the instructor online if they need further help. In the face-to-face tutorial sessions, students analyse and discuss case studies in applying the theories, they debate based on prompts given, they seek feedback on their project ideas from peers, and they provide constructive feedback to peers on others' project ideas.

In designing the out-of-class component of the flipped module, we drew on the good practices shared by Hall and Dufrene (2016). In their study, lecturers who had used the flipped classroom approach report using various successful strategies to ensure that students complete their out-of-class work. These include quizzes that were done either out-of-class or at the beginning of class, participation points for in-class activities, and the use of pointed questions at the beginning of class to determine students' understanding of the topic and to identify areas that needed reinforcement and clarification. Similarly, in our module, we made use of online quizzes to assess and motivate students to access the online lectures and required readings, we implemented participation points that took into consideration participation in out-of-class activities such as discussion forums, and we included beginning-of-class activities that required students to revisit knowledge and understanding of the concepts covered in the online lectures and required readings.

Another good practice identified by Hall and Dufrene (2016) is the of use student feedback to refine the content and delivery of the course material. They argue that, since in-class activities are built on the concepts students learn out of class, the instructor needs to modify what is covered in class to address apparent deficiencies in students' understanding of these concepts. In our module, feedback is obtained via informal means, such as: unsolicited student questions or comments and instructor observations of students' participation in group discussions, as well as more structured feedback platforms, such as students' posts on discussion forums and their performance on the online quizzes and assignments. These mechanisms provide information that enabled the instructor to adapt the lesson for each class in accordance with students' learning needs. At a broader level, mid-semester and end-of-semester module surveys, and the university's student feedback channel, served as the basis for making changes to the course materials and assessments both as the module progressed during the semester and for subsequent semesters.

In terms of participants, there were 71 students in the module – a mainly a homogenous group. These students were mainly in their first and second years of study in diverse disciplines. Out of the 71 students, 37 were male and 34 female; there were 69 Singaporeans and 2 students from the People's Republic of China, all living or staying in Singapore. It was communicated to the students that participation in the study, and completion of the survey was optional, anonymous, and would have no bearing on grades.

Data were collected from a self-perception survey, which was designed to understand the level of student engagement with the *non*-face-to-face components of the module. Other than one student who had to leave early for that lesson and another who had withdrawn from the module, the other 69 students (97.2%) completed the survey form. The survey statements attempted to tease out students' responses to concrete and overt behaviours, drawing upon an adapted version of Chi and Wylie's (2014) ICAP framework. The ICAP framework categorises student engagement behaviours into four modes: Interactive, Constructive, Active and Passive (ICAP). Interactive behaviour suggests the learners are involved in "dialoguing", *interacting* meaningfully with one another in activities; students who display *constructive* behaviour 'generate' outcomes beyond the given learning materials; *active* behaviour involves 'manipulating', that is, reviewing parts of the materials like copying the problem from the text; finally, students who are categorised as showing *passive* behaviour merely receive information without doing anything overt. Chi and Wylie (2014) posit that these four modes can be used to plan the type of learning activities or tasks that best engage students in a meaningful way.

For our study, we combined 'active' and 'constructive' into one category. This is because it was difficult to differentiate between active and constructive behaviours in our online activities, which involve watching video lectures, reading the recommended articles, doing online quizzes, participating in the discussion forum, and preparing for face-to-face tutorials. For example, when students view the video lectures, they take notes and some notes might have copied sentences from the slides in the video lectures and some notes might have been generated by the students. Another example is quizzes, where a combination of both active and constructive behaviours are manifest when completing the quizzes. Table 1 gives a simplified overview of the *non*-face-to-face components of the module and their respective ICAP categories:

Table 1: Overview of non-face-to-face module components

Task	Examples			
	Passive	**Active**	**Constructive**	**Interactive**
Watch video lectures	View	View and take notes or jot down questions		View and discuss with others
Read articles	Read	Read and take notes		Read and email tutor
Do online quizzes		Complete quizzes		Complete quiz and email tutor
Participate in discussion forum		Contribute to post		Respond to someone's post

Our adapted version of this ICAP framework groups student engagement behaviour into three modes: Passive, Active & Constructive, and Interactive. The data collected were therefore analysed based on the following categories:

1. Passive (watched video-lectures, read and highlighted reading articles).
2. Active and Constructive (watched and took notes and asked questions; read articles and took notes; did quizzes; posted; completed check-for-understanding questions).
3. Interactive (talked and discussed with someone; approached instructor; responded to someone's post).

Findings and Discussion

When analyzing the data, we were particularly interested in establishing the extent to which students utilised various types of interactions with the course materials during the *non*-face-to-face components of the module. The online course materials comprised video lectures or e-lectures, YouTube videos embedded in e-lectures, readings (academic and internet articles), tutorial handouts (mainly with instructions on various tasks to be done in the face-to-face tutorials), online quizzes (comprising multiple choice questions), and a discussion forum where students could post course- and lesson-related queries and comments.

In addition to analyzing the quantitative responses, we looked at the brief qualitative comments provided by the students for further insight into the relevant quantitative findings. The qualitative comments were in response to a question asked of the respondents regarding whether they experienced any challenges affecting their participation in the online component.

In the following section, we present and discuss the findings (within the frame of the aforementioned adapted ICAP framework) according to the types of materials and activities that respondents engaged with during the *non*-face-to-face components of the module.

Viewing e-lectures

As can be seen from Table 2, a significant number of respondents (45.31%) very frequently (at least 85% of all the e-lectures) viewed the e-lectures only, without taking notes or discussing the lecture content with others (passive mode). The next highest category involved students taking notes and/or jotting down questions based on the e-lectures (active/constructive mode): 34.33% of the respondents did so for at least 85% of the e-lectures. However, another one-third (31.34%) did this for less than 50% of the e-lectures. In addition, most of the respondents (69.23%) rarely (for less than 50% of the e lectures) discussed the e-lecture content with others before the face-to-face lesson and even fewer (90.63%, for less than 50% of the e-lectures) emailed the instructor with their queries. The qualitative responses underscored students' difficulty in taking notes, which could explain why this activity was consistently done by only about one-third of respondents. One student for example commented that a reason for the difficulty was the need to keep pausing the videos, and another said that the lack of lecture notes contributed to this difficulty.

Table 2: Student engagement with e-lectures (numbers in parentheses indicate the actual number of respondents - likewise for all tables).

Throughout the module, I viewed the e-lectures:		at least 85% of the time	at least 70% of the time	at least 50% of the time	less than 50% of the time	Total
a	only (I did not take notes or discuss them with anyone before class)	**45.31%** (29)	17.19% (11)	20.31% (13)	17.19% (11)	100% (64)
b	AND took notes/jotted down questions	**34.33%** (23)	11.94% (8)	22.39% (15)	**31.34%** (21)	100% (67)
c	AND discussed with others before class	3.08% (2)	9.23% (6)	18.46% (12)	**69.23%** (45)	100% (65)
d	AND emailed the tutor my queries	1.56% (1)	1.56% (1)	6.25% (4)	**90.63%** (58)	100% (64)

In summary, findings on viewing of e-lectures show that most students viewed online content; although student engagement was primarily at the passive and active/constructive ICAP levels. This suggests that the e-lectures have been effective in presenting key content to the students, but were less effective in promoting student engagement with that content.

In order to address the need for higher engagement levels, our next iteration of e-lectures could include in-video activities that require students to interact with others. Additionally, in response to students' difficulty in taking notes, we could provide lecture slides. In terms of the length of the videos, we are mindful of keeping the duration of each clip to below 5 or 6 minutes. As implied in the literature, the average attention of viewers for online content videos ranges between 4.4 and 6 minutes for general Youtube videos as well as academic video lectures (Guo, 2013; Comscore, 2014; Olson, 2014). Therefore, pedagogically and strategically, we are mindful of presenting topics and content in bite sizes, keeping the duration of each video clip to 5 minutes or shorter.

Assigned readings

With reference to Table 3, a similar trend is seen in how students engaged with the assigned readings. Respondents were again largely passive, with the majority of them only reading the prescribed text (28.36% did so for at least 85% of readings, and another 28.36% did so for at least 70% of the assigned readings). In terms of active/constructive behaviour (taking notes/jotting down questions), 39.06% of the respondents did so for less than 50% of the assigned readings. Regarding interactive behaviour, for less than 50% of the assigned readings, 73.85% of the respondents discussed readings with others; and 89.23% of the respondents emailed the instructor with queries for less than 50% of the assigned readings. These findings show that there is little student engagement at the ICAP interactive level, as was the case regarding e-lectures. Many qualitative comments referred to the readings as lengthy and difficult to understand. One respondent elaborated that their difficulty was due to the terminology and unfamiliar concepts contained in the readings.

Table 3: Student engagement with the assigned readings

Throughout the module, I read the assigned readings:		at least 85% of the time	at least 70% of the time	at least 50% of the time	less than 50% of the time	Total
a	only (I did not take notes or discuss them with anyone before class)	**28.36%** (19)	**28.36%** (19)	25.37% (17)	17.19% (12)	100% (67)
b	AND took notes/jotted down questions	10.94% (7)	23.44% (15)	26.56% (17)	**39.06%** (25)	100% (64)
c	AND discussed with others before class	3.08% (2)	6.16% (4)	16.92% (11)	**73.85%** (48)	100% (65)
d	AND emailed the tutor my queries	1.54% (1)	1.54% (1)	7.69% (5)	**89.23%** (58)	100% (65)

In addressing this, we would like to try a scaffolded approach to reading academic texts, as shared by D. Bernstein (personal communication, May 21, 2019), to enculturate students into the practice of reading. This could be done through introducing less academically demanding articles, such as those from scholarly magazines and newspapers, and progressing incrementally to more academically demanding articles. Similarly, the length of articles could be gradually increased. Each reading assignment could be followed up by discussion both on the online platform and in face-to-face meetings.

Completing online quizzes

There were five online quizzes for which students were awarded participation marks as long as they completed the quizzes, and a sixth quiz for which they were awarded marks based on the number of correct answers. The quiz questions were based on both the e-lectures and assigned readings. Students were given unlimited attempts for the first five quizzes and informed that they could work collaboratively on the quizzes. Using a bank of quiz questions, the questions and the response options for each question were randomized.

As shown in Table 5, at least 85% of the quizzes were attempted. In particular, the majority of the respondents (73.13%) completed the vast majority of the quizzes (at least 85%), while 58.46% of respondents seldom discussed the quizzes with their friends (ie. for less than 50% of the quizzes). For less than 50% of the quizzes, 82.81% of respondents emailed the instructor with queries.

Table 5: Student engagement with the online quizzes

For the online quizzes, I:		at least 85% of the time	at least 70% of the time	at least 50% of the time	less than 50% of the time	Total
a	completed the quizzes only (I did not discuss them with anyone)	**73.13%** (49)	11.94% (8)	7.46% (5)	7.46% (5)	100% (67)
b	discussed with my friends before/during/ after completing them	13.85% (9)	9.23% (6)	18.46% (12)	**58.46%** (38)	100% (65)
c	completed the quizzes AND emailed my tutor my queries	3.13% (2)	1.56% (1)	12.50% (8)	**82.81%** (53)	100% (64)

In terms of qualitative feedback, respondents highlighted challenges faced with regard to completing the quizzes, namely that they had to plough through the readings to find the answers to the quizzes. One respondent noted that sometimes answers could not be found. Another stated that in-depth understanding of the readings needed to be acquired before being able to do the quizzes.

By making most of the quizzes a formative exercise, we had wanted the students to discuss the answers with one another. However, as observed in Table 5, interaction was not a significant experience. In fact, both the quantitative and qualitative findings suggest that the respondents were active in completing the quizzes, but that the majority did not interact with others (neither peers not tutors) in discussing the quizzes. The module could therefore benefit from enhanced integration of these quizzes with e-lectures, readings, face-to-face tutorials, and discussion forums to facilitate clarity and coherence. One way this could be achieved is through a reflective exercise based on a case study which Rajaram (2019) found effective in monitoring student understanding and performance for *non*-face-to-face components of a flipped classroom approach.

Participation in discussion forums

The discussion forum platform was made available to students to post their questions, reflections on course tasks/materials, or comments on any course-related ideas. Despite references made by the instructor to this platform at various points throughout the course, the majority of respondents did not contribute posts. Table 6 shows that the majority of the students were largely inactive on the discussion forum. Specifically, 61.76% of the respondents posted on the discussion forum for less than 50% of the time, while 80.3% responded to other posts less than 50% of the time.

Table 6: Student engagement with the discussion forum

For the discussion forum, I		at least 85% of the time	at least 70% of the time	at least 50% of the time	less than 50% of the time	Total
a	contributed posts	13.24% (9)	8.82% (6)	16.18% (11)	**61.76%** (42)	100% (67)
b	Responded to other student(s)' posts	6.06% (4)	4.55% (3)	9.09% (6)	**80.30%** (53)	100% (65)

This is supported by the discussion forum participation figures (see Table 7), which show that only 35.21% (25 out of 71 students) participated in the discussion forum, with 8.45% both contributing posts and responding to others' posts, 16.9% only contributing posts, and 9.86% only responding to other students' posts without contributing any posts themselves.

Table 7: Discussion forum participation figures

	Posted and responded	Only posted	Only responded	Total
Percentage (number) of students	8.45% (6)	16.9% (12)	9.86% (7)	35.21% (25)

The key reasons for the lack of participation on the discussion forum were volunteered through students' qualitative comments which cited a lack of time and lack of incentive. Participation on the discussion forum was not seen to be important as there was no mark awarded and there seemed to be few who responded to one another's posts. One respondent noted that s/he did not know what to post, while another stated that this habit was lacking as other modules did not have discussion forums.

This task set out to motivate interaction among students but the findings seem to indicate a lack of appropriate use. To set the tone at the beginning of the semester, instructors might have to make a conscious effort to initiate discussion. Alternatively, students could be assigned to start a discussion. Instructors may also have to form smaller groups within each tutorial class to promote more online interaction. Perhaps a stronger instructor presence on the discussion forum, at least at the initial stage, would be necessary for students to display interactive behavior. This is because students may expect the instructor to provide feedback on issues pertaining to content.

Summary of findings

In summary, we share three observations from this small study. First, based on the ICAP framework (Chi & Wylie, 2014), the findings indicate that engagement behaviours in the *non*-face-to-face components of a flipped classroom approach are primarily 'passive' and 'active and constructive' regarding viewing of e-lectures, and are predominantly 'active and constructive' regarding completion of quizzes. Interactive engagement does not seem apparent. Karabulut-Ilgu, Cherrez and Jahren (2018) found, in a systematic review of 62 articles in engineering education, that: online materials that

do not interest students, issues with technology, resistance, and insufficient understanding of the approach are key challenges facing a flipped classroom approach. They also found that many studies indicate that engagement in the face-to-face session, in the form of application of what is learned, is a key benefit of the flipped approach. This suggests that more strategic scaffolding could result in a higher level of engagement, as evident in Rajaram's study (2019). Second, if we would like students to be (more) interactive during *non*-face-to-face components, we would need to re-look at the design of the materials, activities, and tasks so that they actively mediate such engagement. Considering this from another perspective, this means that greater emphasis should be placed on face-to-face tutorial sessions to promote active student-student and student-instructor interaction in discussing questions, solving problems, collaborating with peers, and providing feedback (Criss, 2014). Third, perhaps not discussed explicitly but definitely an important lesson learned is the criticality of ensuring coherence between *non*-face-to-face and face-to-face components of the flipped classroom so that there is optimal learning drawn from the affordances of both learning environments, especially in the context of unequal access to internet resources as encountered in some countries in the 'global South'.

Conclusion

We sought to uncover the engagement patterns of students during the e-learning components of a flipped classroom module. Such an understanding informs curriculum design for greater student engagement. With the availability of digital technologies in higher education that afford access to content knowledge on the part of students regardless of their geographical locations, the flipped classroom approach allows the teacher to design activities that range from passive receiving of information to constructive, active, and interactive student engagement (Chi & Wylie, 2014). Due to the scope of our study, we have yet to explore the extent to which that which is learned during *non*-face-to-face components is transferred to the face-to-face tutorial. Future research may look into this so that design of curriculum could better facilitate the integration of *non*-face-to-face and face-to-face components within a flipped classroom approach to increase student engagement and learning.

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