Student perceptions of technological tools for flipped instruction: The case of Padlet, Kahoot! and Cirrus

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Abstract

Technological tools used in teaching and learning have been reported to influence their satisfaction, engagement and their continued effort in learning (Roach, 2014). The present study, therefore, investigated students' perceptions of technological use in a flipped classroom at university level through evaluation of three different web-based tools, using the lens of the Technology Acceptance Model (TAM) (Davis, 1989; Venkatesh & Davis, 2000). These tools include a collaborative canvas tool (*Padlet*), a live polling platform (*Kahoot!*) and an annotation tool (*Cirrus*). Results from focus group interviews show that most of the students had positive perceptions of the three technological tools targeted in this study. Nevertheless, using the TAM model that draws on two indexes, namely usefulness and perceived ease of use, the findings revealed students' mixed perceptions towards the three tools. Particularly, *Padle*t was perceived to be useful for both independent and colloborative learning, but less easy to use when there was too much content. *Kahoot!* was considered the most useful and easy to use for revision of learnt concepts. Finally, *Cirrus* was easy to use, but less useful for creative tasks. The results are discussed in terms of the role of technological tools in flipped learning, and implications for technologically enhanced flipped instruction are suggested.

Keywords: *student perceptions, technologies in learning and teaching, flipped classroom, Kahoot!, Padlet, Cirrus*

Introduction

In order to tailor to students' differences in their learning and harness the benefits of technogical use, higher education institutions have been increasingly employing a variety of technologies to support learning and teaching activities. The use of various technological tools has been reported by students to influence their satisfaction, engagement and their continued effort in learning (Roach, 2014). However, this body of research has focused mainly on the general effectiveness of technological use, without examining the benefits of specific technologies in a specific learning and teaching context as well as identifying issues associated with these tools. In this study, we focused on three tools: a collaborative canvas tool (*Padlet*), a live polling platform (*Kahoot!*) and an annotation tool (*Cirrus*). In particular, we explored students' perceptions of technological use in a flipped classroom at university level through evaluation of the three different web-based tools as mentioned above, using the lens of the Technology Acceptance Model (TAM) (Davis, 1989; Venkatesh & Davis, 2000). The three tools chosen in this study have different curriculum purposes. *Padlet*, for example, is a collaborative online tool that helps students engage using virtual sticky notes. *Kahoot*, one of the largest educational polling tools, is used to engage students while providing ongoing formative assessment for students. Lastly, *Cirrus*, which is an online annotation tool and a website development tool that allows students to develop websites. Although research in student perceptions are becoming more common in the field of educational technology, little has been done to shed light on how the three selected digital tools can support the implementation of flipped instruction, a blended learning mode that is becoming increasingly prevalent. The current study, therefore, aims to explore how students perceive certain technologies selected to serve a pedagogical purpose (i.e., support the flipped learning mode) and identify factors affecting their perceptions.

The flipped classroom and technology use

The flipped classroom started in the K-12 environment in the United States a decade ago and was popularised by two teachers in Colorado, who coined the term 'flipped' (Bergmann & Sams, 2012). It is a blended learning instructional method that engages students by having them watch classroom lectures at home and doing application activities in class (Carbaugh & Doubet, 2016). The flipped classroom is the inversion of the teaching cycle with formal instruction which is normally conducted in class being shifted to prior-class homework (Chen et al., 2017). One of the flip classroom's key characteristics is its ability to develop student-centred, self-regulated learning, whereby the student self-paces their learning experiences (McLaughlin et al., 2014). A second characteristic is its ability to promote active learning, offering the perfect breeding ground for collaborative learning (Roehl et al., 2013; Zayapragassarazan & Kumar, 2012). Another feature of the flipped model is that it gives teachers spaces to offer an authentic assessment that is related to practical real-world problems, with students being active participants in evaluating their learning (Herreid & Schiller, 2013).

To execute and sustain these potential benefits of the flipped classroom, various types of technological tools can be used in flipped learning activities (O'Flaherty & Phillips, 2015). Consistent in many flipped classroom models are pre-recorded short videos used as pre-class activities (Bishop & Verleger 2013; Lo & Hew, 2017; Jaramillo Cherrez & Jahren 2018). In-class activities are facilitated by various synchronous and asynchronous technologies, such as online quizzes and live polling tools (O'Flaherty & Phillips, 2015; Waldrop & Bowdon, 2015). In the post-class stage, students in the flipped classroom are also encouraged to utilise technological tools to complete their assessments and self-study. Despite this wide range of technologies, studies

on the effectiveness of technology use in flipped learning have mainly focused on documenting attitudes toward the pre-class video lectures. Student participants of these studies mostly held positive perceptions of the video lectures as they allow them to access lecture content flexibly (Tune et al., 2013; Lo & Hew, 2017). There are, however, concerns about the breadth and depth of information provided in these short lectures, as some students felt that these materials were more suitable for practicing lower than higher-order thinking skills (Prunuske, et al., 2012). Other aspects of the technologically enhanced flipped classroom (i.e., in-class and post-class tools), on the other hand, are much less examined. This study, therefore, chose to focus on student perceptions toward three specific web-based tools (i.e., *Padlets, Kahoot!* and *Cirrus*) used in the in- and post-class stages of a flipped classroom.

Student perceptions of technology use

Existing research on student perceptions has provided insights into the usefulness of technologies for enhancing several aspects of students' learning experience. When students have positive perceptions of the technologies used to support their learning, they are more likely to be satisfied with their learning experience (Drennan et al., 2005). This is consistent with Bolliger and Martindale (2004) who found that online student satisfaction was linked to three components: the teacher, the interactivity and the technology. Butt (2014) and Gilboy et al., (2015) also reported that students' favourable attitudes towards learning in a flipped mode increased their engagement with the course itself. It is for this reason that perceptions of students were considered important to this research as it offers a useful avenue for understanding student satisfaction and engagement.

Despite their comprehensiveness, this line of research tends to focus on student perceptions of general technology use without focusing on specific types of technologies. Little is known as to whether student perceptions would vary according to types of technologies. Besides, there has also been little research investigating whether students' positive or negative perceptions of technologies are due to the characteristics of technologies, students' individual differences or the context in which the technologies are used. The present study focuses its attention on three specific technological tools, including a multimedia sharing collaboration canvas tool (*Padlet*), a live polling tool *(Kahoot!*) and a web-based annotation tool (*Cirru*s) that were used in a technology-enabled flipped classroom.

A live Polling Tool: Kahoot!

Kahoot! is a website interface that allows educators to create game-based quizzes, surveys, and discussions to be carried out in the classroom. Students use their internet-connected devices to login to https://kahoot.it/ and enter the polling station using a series of unique numbers that allow entry into the private polling window on their device. As a result of its interactive and immediate nature, *Kahoot!* has been considered as a useful and easy-to-use tool to enhance students' engagement in-class activities (Yuruk, 2020). It has also been shown to be useful to measure students' comprehension of key learning content (Wang & Lieberoth, 2016); increase motivation and enjoyment through game-based learning (Dellos, 2015); and promote engagement through formative assessment (Johns, 2015; Wang & Lieberoth, 2016; Zarzycka-Piskorz, 2016). However, like many games, the enjoyment may wear off after continual use, although Wang (2015) found that Kahoot! was able to "boost students' engagement, motivation and learning after using it repeatedly [in every lecture] for five months" (p. 1).

Multimedia Collaborative Canvas Tools: Padlet

Padlet is a freemium online collaboration-based software that allows for posts to be displayed on a virtual wall (https://padlet.com). Any number of posts can be made in a Padlet wall, with collaborators being able to comment, share and make posts for a wide variety of activities without the need of creating an account. Padlet has been found to promote greater student engagement by decreasing the latency time between students' discussion responses, both individually or in groups (Fisher, 2017). Furthermore, in a flipped classroom environment, it is important to provide alternative avenues for students to ask questions both at home and in-class, with *Padlet* offering a means to do so. Fisher (2017) also suggests that *Padlet* offers a more responsive alternative to oral input in the classroom, especially for students who may not feel comfortable contributing verbally. Similarly, Pollock (2016) added that *Padlet* gives every student a voice. Padlet has shown to increase engagement through continual use (Baida, 2014; De Berg, 2016).

Web-based Annotation Tools: Cirrus

Cirrus, a web annotation tool, allows users to annotate over text, images or video either individually or collaboratively (https://cirrus.austlit.edu.au). It is developed under the Auslit platform, which is a teaching resource platform in Australian literature, film, theatre and art (https://www.austlit.edu.au). *Cirrus*, described by its developers, is a platform that "allows academics to embed into their courses technology-enhanced learning activities such as text, image and video annotation to develop close reading and interpretation skills, or online exhibition and illustrated long form writing options" (Doherty et al., 2017, p. 2).

In sum, previous research on the three tools (i.e., *Padlets, Kahoot!*, and *Cirrus*) has reported their positive impacts in promoting students' participation and facilitating learning. However, this body of work has mainly focused on the tools themselves without considering the context in which they were used. As stated earlier, the three tools investigated in this study were used based on the purpose of pedagogically serving the flipped learning model. Thus, it is important to investigate their effectiveness and usefulness within the context of the flipped classroom to explore whether they were perceived differently by students in this type of learning mode. To assess the effectiveness of the use of these technologies, this study adopted the Technology Acceptance Model (TAM) as a framework to assess students' perceptions.

The Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM) helps to understand, explain and predict an individual's acceptance of the technology. Davis (1989) incorporated two key factors in his original model: *Perceived Usefulness* (PU) and *Perceived Ease of Use* (PEU). These two constructs help predict usage intentions and adoption behaviours concerning the acceptance of the technology. *Perceived Usefulness* relates to the degree to which an individual believes using a particular technology is useful in their role. Usefulness can be understood in various ways. It can relate to whether the technology increases the quality of work through greater control and/or support, increased productivity, or as increased effectiveness or efficiency in their role.

Meanwhile, *Perceived Ease of Use* relates to the degree that an individual believes using a particular technology would be free from effort. More simply, it relates to how easy the technology is to use. Ease of use, therefore, relates to skilful effort, mental effort, remembering key actions, level of frustration, cumbersome, interactivity, and flexibility required to meet specific user needs (Davis, 1993).

Moreover, *Perceived Usefulness* is influenced by *Perceived Ease of Use* as the easier it is to use, the more useful the technology (Venkatesh & Davis, 2000). For instance, Venkatesh and Davis (1996) outlined that the specific determinants of an individual's *Perceived Ease of Use* relate to their computer self-efficacy at any time and objective usability after a direct experience with the system (Venkatesh & Davis 1996). Interestingly, *Perceived Usefulness* was found to be more influential than ease of use in determining the usage of technology in different contexts (Davis, 1993). Underpinning usefulness is the individual's reactions to using the technology, their intentions to use and their actual use of the technology.

Recently, there has been an extension to the TAM model to conceptualise TAM2. TAM2 incorporates social influence processes (i.e., subjective norms, image and voluntariness) and cognitive instrumental processes (i.e., job relevance, output quality, and result demonstrability) to help explain PU and PEU (Venkatesh & Davis, 2000). The origin of the model could be traced back to its underpinnings of Decomposed Theory of Planned Behaviour (DTPB), which involves attitudinal and subjective norms to help explain behavioural intent to use. In particular, subjective norms relate to the degree of importance the technology has for the individual and its importance in their social group; image relates to positive group and individual status; while voluntariness refers to whether the technology is compulsory or not (Venkatesh & Davis, 2000). Additionally, TAM2 theorises that cognitive instrumental processes such as job relevance (how well an individual thinks the technology is applicable to their job), output quality (how well the technology performs required tasks), and result demonstrability (how easy it is for a user to be able to explain the benefits of the technology) are also important factors mediating PU and PEU. As it explains up to 60% of the variance of the usefulness of a given tool, the current study adopts TAM2 as the framework to explore and interpret student perceptions of the three investigated technological tools used in the context of an undergraduate flipped classroom.

Research Questions

The study addresses two primary research questions:

RQ1) What are students' perceptions of the ease of use and usefulness of the three technological tools used in a flipped classroom setting (i.e., *Padlet, Kahoot!* and *Cirrus*)?
RQ2) What factors mediate students' perceptions of *the ease of use* and *usefulness* of these tools?

Methods

Context of the study

Following a flipped learning model, a second-year undergraduate course in second language learning at a large public Australian university was transformed from an on-campus traditional teaching model to a completely flipped classroom. The aim of the course was to develop students' understanding of second language learning processes and teaching methods. Despite its popularity, some discerning problems identified with the course included students' lack of engagement with the reading materials and low levels of active participation in in-class activities. To tackle these problems, the flipped classroom model was deployed, which engaged students in pre-class online learning in preparation for in-class and post-class active learning. This was commonly conducted through a series of short video lectures delivered prior to class in conjunction with in-class collaborative activities and complimented by assessment or reflection activities after class. A wide range of technologies was used in this flipped classroom, including video lectures, online quizzes,

YouTube videos, *Padlet, Kahoot!,* and *Cirrus*. This study focused on the three technological tools *Padlet, Kahoot!,* and *Cirrus* as they were used frequently across the in- and post-class stages of this flipped classroom.

In the current flipped course, *Padlet* was used as a collaborative platform for in-class group activities where students freely shared their comments/discussion points, and a resource and support guide that linked the different weeks' learning objectives and collated course-related materials (see Appendix for examples of how *Padlet* was used in the course). Additionally, *Kahoot!* quizzes were organised at the beginning of several classes to review key concepts learned in a previous lesson. During these games, students were asked to either team up with a partner or play individually against other classmates. Finally, *Cirrus* was employed as a platform for students to collaboratively create a website/exhibition about second language learning theories as part of one compulsory course assessment component. While there are different exhibition tools available online, *Cirrus* was adopted in this study as it was developed and designed for seamless integration of assessments and authentication with the Learning Management System used in the studied context. It should be noted that prior to the course, all students reported having very little to no prior experience with these three technological tools in their previous learning experience.

Participants and data collection instruments

To understand students' perceptions of the three tools, two focus group interviews were conducted with ten students, divided into two groups of five. The majority of them were female (n = 8) with ages ranging between 18 and 25. They are from different first language backgrounds, including six native speakers of Australian English, two Chinese, one French, and one Japanese. Their study majors varied, including Education, Languages, Tourism, and Computer Science. These two groups of participants were randomly selected from a pool of students in the course who had expressed their willingness to participate in the interviews. In this report, letter pseudonyms (Participant A-J) were used to refer to each student. The focus group interviews lasted between 60-70 minutes and sought to elicit students' views of the usefulness and ease of use *Padlet, Kahoot!* and *Cirrus*. The interview questions were adapted from Venkatesh and Davies' (2000) TAM2 survey items. Specifically, the first set of questions asked about the extent that using these tools was easy and helped to improve participants' learning experience (PU and PEU); while TAM2 questions regarding other social, contextual and mediating factors further aided the discussion. The interviews were audio-recorded and then transcribed verbatim.

Data Analysis

The interview responses were first read to gain a general understanding (e.g., benefits and challenges) of the three tools under investigation as well as wider student perceptions of technology. Next, the responses were coded into themes, then each theme was labelled (Dörnyei, 2007). Axial coding method was used in an effort to assign and reference each theme to a specific code that encompassed the data in a few simple words, and then the frequency of themes was used to measure its importance (Scott & Medaugh, 2017). Those with higher frequencies were further interrogated as a theme. Noteworthy quotes from each theme were highlighted to stress the importance of each theme.

Findings

Insights into Students' Perceptions: Advantages and Disadvantages of Padlet, Kahoot! and Cirrus

Analyses of focus group interviews showed that students held different perceptions towards *Padlet, Kahoot!*, and *Cirrus* because of the diverse experience they had while using these tools frequently in in-class and post-class learning activities. This section will provide insights into what the student participants considered as more or less useful and easy to use about *Padlet, Kahoot!*, and *Cirrus*.

Padlet: Facilitating the sharing of opinions and information

As previously described, *Padlet* was used for two purposes in the present flipped course as (i) an online interactive whiteboard to facilitate in-class discussions (i.e., *discussion Padlet*), and (ii) a platform where additional resources were added for after-class activities for further exploration of weekly topics introduced in the course (i.e., *resource Padlet*). Student comments revealed that both types of *Padlet* were well-received and highly accepted both for its usefulness and its ease of use. Regarding usefulness, the most commonly cited advantage of the *discussion Padlets* is they helped to engage the students in-class activities as they felt a greater need to share their responses when class discussions were moderated through *Padlet*. Student A's comment reverberates this: "It makes me engage in the class because I have to put up my answers". Also, it was encouraging for students to post answers on the *Padlet* wall as it was less intimidating than providing answers orally in front of the class, as noted by Student D: "It's much less face-threatening to share an answer on *Padlet*, especially when I wasn't sure about the answer but still wanted to contribute". Another useful aspect of the *discussion Padlets* was that they could function as a record of in-class notes for later revision. Student C explained, "I think [Padlet] is good to go back on at the end when you're studying [reviewing] to know the answers [to discussion questions]". As for the *resource Padlets*, which functioned as a summary board of weekly learning contents, the students liked how the padlets brought together different-related resources in one place, making it easy for them to go through these materials: "It has all the resources that I need in class and additional links for further reference" (Student J).

Several students also commented on the ease of use of both *Padlet* types. They liked the fact that all students worked on the same *discussion Padlet* in each task and the steps involved for individual students or groups to add their responses were very straightforward and intuitive. Student E remarked, "I like how it [each *Padlet* post] displays on the screen, just nice and easy". The perceived ease of use of the *resource Padlets*, however, generated some concerns among students. Specifically, they pointed out weaknesses in the layout and organisation of these *Padlets*. For example, Student G observed that the inclusion of a large amount of information in a single *Padlet* was not stimulating: "I clicked on the Padlet links and there was so much content. I'm not engaged so I just quit". Student I added, "Sometimes there are too many links and colours. I don't know where to look as there is too much going on". These design features prevented students from revisiting the *resource Padlets* again in later weeks.

These findings highlight that the perceived usefulness of multimedia collaborative canvas tools like *Padlet* aligns with the main intended purpose of this technology, that is it facilitates sharing of opinions and information among students and between students and the teacher (Baida, 2014; De Berg, 2016; Sundararajan & Maquivar, 2017). Noticeably, for the present study, this sense of usefulness seems to be enhanced by the ease of use of the discussion Padlets, further confirming TAM2's theorisation that perceived ease of use has a positive effect on perceived usefulness (Venkatesh & Davies, 2000). However, when Padlet was used as a site to collate information (i.e., *resource Padlets*), its perceived usefulness was negatively affected by its low level of ease of use.

This could be because Padlet is originally designed and thus is more suited for collaboration-oriented than resource-storing tasks. This finding suggests that when considering technologies for use in a flipped classroom, lecturers should aim to strike a balance between pedagogical purposes and technological intentions in order for a technology to gain acceptance from learner users (Justus, 2017).

Kahoot!: Enlivening learning activities

The students who were interviewed seemed overwhelmingly positive about the features of *Kahoot!*. Concerning perceived usefulness, they commented that *Kahoot!* was a useful tool for reviewing course concepts. They found it beneficial to do *Kahoot! quizzes* in class, where they were presented with a set of review questions and asked to respond within a limited time, and received immediate feedback. Apart from this educational value, several students also acknowledged the entertaining value of *Kahoot!*, especially when they were asked to compete against each other in the quizzes. Student J commented, "I found *Kahoot!* fun. We had fun keeping track of how many points we got from the correct answers".

Additionally, *Kahoot! quizzes* demonstrated to be an efficient technique to draw students' attention during class activities. Student D's response elaborates this, "[*Kahoot!* is] just an easy way to get attention. Whenever a *Kahoot! quiz* was started, we needed to concentrate and give up other things to focus on the game". *Kahoot!* was also viewed as effective to increase student participation, as shown in Student I's comment, "For people who don't have the chance to talk or express themselves, it was good because they can put their answers there". A recurring theme that emerged from the interviews was *Kahoot!* increased participation, engagement and active learning by making learning fun and interactive (Plum & LaRosa, 2017; Wang & Lieberoth, 2016; Zarzycka-Piskorz, 2016).

Concerning ease of use, students' most common remark was that *Kahoot!* was an easy tool to use. In particular, all interviewed students highly valued that they all could access the quiz at the same time using their own devices, and the teacher could easily track the number of participants in each *Kahoot!* activity. Student F's comment highlights this: "*Kahoot!* was good because it got all the class to participate. Although the teacher didn't have time to go around the class, she could still make sure everyone was involved". These findings reveal students' high level of acceptance for *Kahoot!*, which seems to have augmented over time through the increased experience of use. This is consistent with TAM2's theorisation that experience of use has a positive effect on perceived usefulness (Venkatesh & Davies, 2000).

Cirrus: Enabling group exhibitions

The final technological tool under investigation is *Cirrus*, which is featured as one of the post-class activities. As described in the methodology section, in the current flipped course, *Cirrus* was used as a platform for students to design their exhibitions/websites on second language learning theories. In terms of usefulness, students perceived *Cirrus* as facilitative of their presentation of content. Specifically, they considered the website format an effective way for them to demonstrate and share their knowledge of the subject matter with a broader audience. Moreover, they were positive about being able to work collaboratively with other classmates on the same group site on *Cirrus*. For example, Student F noted, "Group work was made easy with *Cirrus*. All of us was given access to the same site via our own personal accounts, so we could easily share our workload".

Most importantly, what most students were content about *Cirrus* was its ease of use. A common theme across their responses was that the steps for creating an exhibition/website on *Cirrus* were simple, clear, and visually straightforward. As Student G put it, "It [*Cirrus*] works very well and is easy to use. All the functions were quite intuitive. We had one training session, and after that, we were almost familiar with all the functions available on the site".

Although perceived as useful for completing the assignment, the simplicity of *Cirrus*, interestingly, was a factor that reduced its usefulness. While the limited number of design functions in *Cirrus* made it easy for some students to navigate across the site and carry out basic commands, others found their creativity was limited because of this. In particular, its inability to be customised left little room for imagination, and was seen as restricting. For some, not being able to change the background or colours of their websites decreased active engagement. Student H stated, "It's like a menu. All you do is copy and paste information. There is not much you can do to change the layout or anything". Student C supported this point, further commenting that "it was not visually appealing that all the groups' websites looked quite similar to each other". However, the restricted functions could still allow for an opportunity to be creative. To elaborate, Student I explained how she tried to present information in a creative way when given a set of restricted design functions: "If you have a restricted format you have to think more creatively about having the content come across interestingly. Perhaps this applies to Cirrus". It should be noted that Student I majored in Computer Science; her study background might have therefore influenced her views toward Cirrus.

These findings again confirm the interaction between the two TAM constructs: perceived ease of use and usefulness (Marangunic & Granic, 2014). More significantly, it suggests that a high level of ease of use does not always lead to usefulness or a high acceptance level. It is therefore vital for technological designers, particularly for designers of website development tools such as *Cirrus*, to strike a balance between these two factors, so that ease of use is not synonymous with simplification, and would not adversely influence the usefulness level of technology.

Discussion

Factors Contributing to the Usefulness of the Technologies Used in a Flipped Classroom

The results showed that students generally held positive attitudes towards the use of the three web-based tools under investigation. Although *Cirrus* was viewed more critically than the other two, possibly because it was made the only platform for one of the course assessments, all the participants found each of the tools useful in several aspects. Specifically, a common feature across the three tools that made them useful for (flipped) learning was that the technologies helped to promote *interactiveness* in learning. This means sharing ideas flexibly as in the case of the discussion *Padlets*, competing with/helping each other using *Kahoot!*, or facilitating group collaboration by means of *Cirrus*. Another factor that makes these technologies useful, as seen from the students' perspective, was their ability to enhance students' *participation* in-class activities. In fact, in the interviews, the students repeatedly commented on how these tools helped to keep them engaged in learning tasks, especially with synchronous technologies such as *Padlet* and *Kahoot!* These findings support previous research on the effect of multimedia collaborative canvas tools (e.g., *Padlet*) and live polling tools (e.g., *Kahoot!*) on enhancing student learning (Baida, 2014; Goria et al., 2016; Sundararajan & Maquivar, 2017).

More interestingly, the two aspects cited as contributing to the perceived usefulness of these tools strongly correspond with the key characteristics and also the ultimate goals of a flipped classroom: to promote interactive and engaging learning experiences (Roehl et al., 2013; Zayapragassarazan & Kumar, 2012). This demonstrates the close connection between technologies and flipped learning. In other words, flipped classrooms allow time and space for technological implementation than is often the case with traditional lecture-based learning, and these technologies, in turn, help to enhance the effectiveness of flipped classroom implementation (Butt, 2014). These findings suggest that instructors who look for technological tools to use in their flipped classroom, especially in in-class activities, should prioritise those that allow for a high level of interactivity and engagement among students, such as online multimedia collaborative canvas tools (e.g., *Padlet*) and live polling tools (e.g., *Kahoot!*).

What Makes These Technological Tools Easy to Use?

Findings of the present study highlight that the ease of use of these tools was largely dependent on both their design features (i.e., the steps it took for the students to access the tool and the kind of functions available with the tool) and their actual usage, which was sometimes determined by course instructors. To elaborate, while *Kahoot!* and the discussion *Padlets* were considered easy to use because of their features of being synchronous and requiring no login (Fisher, 2017; Pollock, 2016); the resource Padlets was rated less favourably as some students found the way the learning resources were organised in these *Padlets* not very structured. Interestingly, this usage feature had a detrimental impact on their perceived usefulness of the resource *Padlets*. This finding attaches importance to the role of the instructor when adopting a technological tool to serve certain pedagogical purposes. While it is essential to base decisions regarding what technologies to use for teaching and learning on pedagogical incentives, not just for the sake of technology (Flynn et al., 2005), it is equally important that instructors be sensible in the way they implement the technology so that its inherent ease of use is maintained.

Factors mediating the perceived usefulness of the three technologies

Apart from perceived ease of use, findings of the present study also show the influences of social and cognitive processes on students' perceived usefulness of the three technologies under investigation. First, all these tools were introduced to the students and promoted by the course instructors. This influence from the teachers as significant referents of the technologies (*subjective norms*) arguably explains why they were generally well-accepted by students. Second, *job relevance* was found to be conducive to perceived usefulness and intention to use, as the student participants were in agreement that the three tools were appropriate to help them conduct their learning tasks. *Voluntariness* is another important factor that mediates perceptions. While the use of *Padlet* and *Kahoot*! was voluntary, *Cirrus* was made a compulsory tool to complete a required course assessment. Students' views toward Cirrus were therefore reportedly more critical than the other two tools. Similarly, the quality of the output obtained from using *Cirrus* was considered more critically than in the case of Padlet and Kahoot!. These findings indicate that whether a technology is voluntary or mandatory is likely to significantly influence its acceptance and intention to use (Sharif Abbasi et al., 2011). These mediating factors from TAM2 theorisations could, therefore, form a helpful basis for flipped classroom instructors when choosing and also implementing technologies to assist with flipped learning.

While students may have positive perceptions of certain technologies, it often comes for the sake of technology, rather than deeper pedagogical motivations (Flynn et al., 2005). A caveat to this research and others in the field of educational technologies is they are developed with a financial,

pedagogical or socio-political interest in mind. Hence, it should be considered that technology itself cannot be seen as unbiased, neutral or deterministic and that the implementation of any new technologies must be tempered with sound pedagogical motivations to do so.

Conclusion

This study investigated student's perceptions of the use of technologies in a flipped learning classroom following the Technology Acceptance Model (TAM), focusing specifically on three web-based tools: *Padlet, Kahoot!* and *Cirru*s. The results showed that students perceived these technologies as useful mainly because of their interactive and engaging characteristics. Their ease of use, additionally, also impacted on their perceptions and to a certain extent strongly influenced their perceived usefulness (as in case of the *resource Padlets*). Findings of the current study confirm the role of synchronous collaborative technological tools (e.g., *Kahoot!* and *Padlet*) in enhancing the effectiveness of flipped instruction, and provide useful suggestions for instructors who are considering several technological options for use in their flipped classroom. It is also important to note that the applications of these tools extend beyond the flipped classroom, and the relevance of these tools will become ever more prominent as we move towards online modes of delivery. Outside the flipped classroom, these tools can be used to foster immediate feedback, promote collaboration in synchronous online environments and offer engaging annotation forms of assessment.

Despite its significance, the study has some limitations that leave space for further research. Specifically, it did not consider factors that might have influenced students' perceptions of the chosen technologies, such as their digital literacy or prior experience in using technology for learning. While not all digital 'natives' are digitally proficient, students in this study did seem comfortable continually using the three tools. Classroom dynamics, social influences and social norms may have also positively contributed to their perceptions (Betihavas et al., 2016). Additionally, the specific topic being taught (i.e., an applied linguistics course) might have influenced the applicability of the findings. Future research could therefore benefit from a more robust survey and interview methods with students studying other subject matters and take into consideration a wider range of individual learner factors as well as social factors that can potentially influence the students' technology acceptance levels.

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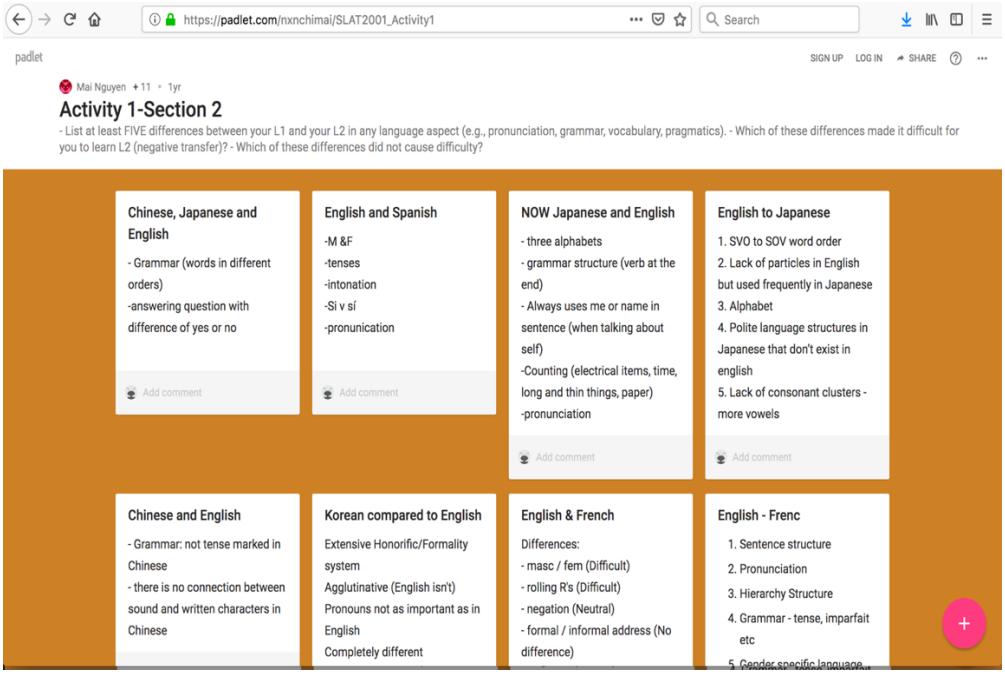
Appendix

Example of a *discussion Padlet* used as a collaborative platform for students to share their ideas in an in-class discussion



Example of a *resource Padlet*