

Educational Technology Tools: Longitudinal Views of Students

Completed Research

Shadi Esnaashari
University of Auckland
S.esnaashari@auckland.ac.nz

Lesley Gardner
University of Auckland
L.gardner@auckland.ac.nz

Michael Rehm
University of Auckland
M.rehm@auckland.ac.nz

Abstract

Although electronic educational tools have become popular, few studies have considered their effectiveness. Some studies have investigated the effectiveness of the tools' "game" aspects. We investigated students' perceptions of the classroom tools that they used and their perceived effect on learning, and examine the effect of features such as competition and gamification, on their perceptions and motivation. Despite individual differences in motivation, students had similar perceptions of the usefulness of the tools but used them differently according to their motivation and personal conditions. Outcomes for students were generally perceived as positive, including satisfaction with the tools, improved engagement, facilitation of learning, valued classroom interactivity, anonymity, and immediate feedback. The findings of the study also showed that the tools' features of gamification and competition facilitated and motivated increased participation.

Keywords

Electronic educational tools, competition, gamification, students' perceptions.

Introduction

Higher education deploys different electronic educational tools. Such software are sometimes distributed through Learning Management Systems for fully online learning or partly in a blended learning course (Dabbagh and Kitsantas 2005). Teachers differ in how they deploy tools. For example, video lectures can be used as a primary source of information or as a replication. Sometimes some part or core concept will be recorded and provided as supplementary materials (O'Bannon et al. 2011). Electronic educational tools enable teachers to deliver content to large numbers of students, and students to actively use the information. Dabbagh and Kitsantas (2005) stated that providing various toolkits help students to choose the tool that supported their learning and stimulated self-regulated learning. Thus, from the self-regulated learning (SRL) perspective, students have an agency and decide for themselves whether or not to use tools (Winne 2006). Self-regulated learning focuses on the students as agents, bringing our attention to the importance of their beliefs about the electronic educational tools. Shuell and Farber (2001) identified student perception as a factor in understanding the relationship between technology and the learning process. Perception is under-examined in the educational tool use literature. Only a few studies have focused on students' perceptions and competition aspects of the tools and their learning effectiveness.

Moreover, previous research has only employed a questionnaire methodology. We investigated these variables using time-sequenced interviews. To remove the effect of "technology novelty", we interviewed each student twice, before and after substantial tool experience.

To understand the motivation of students, the Motivated Strategies for Learning Questionnaire (MSLQ) (Pintrich 1991) was run three times in the course. As mentioned by Lust (2012), a questionnaire may not be an adequate measurement method for understanding the perceptions of students. Interviews will give us a

deeper understanding of students' motivation and their effect on using the tools. We aimed to diminish the effect of technology novelty on the perception of students in regards to using the tools by increasing tool experience. In this study, we focused on the contributing elements of perception, motivation, gamification, and competition on the decision of students to use or not use the tools. The following research questions guide our study: "What is the perception of students regarding the use of an electronic educational tool in their classes?" By answering this question, we contribute to both practice and theory. Understanding students' perceptions of tool use and functionality help both tool and instructional designers. The former can develop tools which will be more adaptive to students' needs. Instructional designers can understand how to embed the tools in their course and which tools are helpful for which category of students. In an environment which has the goal of producing lifelong learners, we can, by providing tools for students and looking at their tool usage and their decisions on continuing using tools, contribute to self-regulated learning theory. By considering the perception and usage of tools over time, we are also able, within this self-regulated learning process, to validate behavioral decision making. Up until now, we have explained the topic we are investigating and its contribution to the field of instructional design. In the next sections, we review extant literature, our methods, findings, and conclusions and limitations.

Literature review

In the educational setting, it is essential to increase students' engagement in class to enhance their learning experience. It is suggested that students learn more when they engage in class activities rather than staying passive in the course. Draper and Brown (2004) mentioned that if students do not become engaged in the activities, they are less likely to work hard and less likely to perform well. Vygotsky (1978) also mentioned through human interaction; knowledge construction will enhance. There are different techniques that teachers use to increase the participation of students in class activities (McKeachie 1990; Saroyan and Snell 1997). One of them is using technology tools to improve the participation of students in the class. Researchers used technologies in the classroom environment to improve the participation and engagement of students and consequently their learning (Park and Farag 2015; Ravishankar et al. 2014). Even though the studies showed the importance of using tools on students' learning, it is students' choice to choose which tool to use and decide on how much to use the tool (Scheiter and Gerjets 2007). Perkins (1985) stated that students do not always use the opportunities that are presented to them. Perkins also mentioned that students are inadequately using the instructional interventions and his study shows that providing the learning tools alone does not guarantee that students will use the tool.

Winne and Hadwin (1998) looks at self-regulated learning as an inherent part of learning. He defines self-regulated learning as meta-cognitively guided behavior which could enable students to adaptively regulate their use of cognitive tactics and strategies in the face of a task. Winne and Hadwin (1998) define SRL in a four-stage process: 1) Task definition, 2) goal setting and planning, 3) enacting tactics and strategies planned in the previous stage, and 4) adopting study techniques meta-cognitively. Winne (2006) identified three axioms, which need to be addressed in any educational psychology research about learning. The axioms were 1) learners construct knowledge, 2) learners are agents, and 3) data includes randomness. We focus on the first two axioms. Axiom 1 which is about learners who construct knowledge includes five facets referred to as the COPES (i.e. Conditions–Operations–Products–Evaluations–Standards). These five elements of COPES collectively influence the self-regulatory process of learning. Learners use tools to operate on raw materials, to construct a product which is evaluated in a formative way or summative with respect to standards of socio-cultural kinds. Axiom 2 states that learners are agents. They can exercise choice which is affected by the internal and external conditions. The external condition includes instructional design, previous learning history, and social context. Grading online is an example of instructional design. Internal conditions include motivation, achievement, goal orientation, and cognitive load.

There are different studies (Clarebout and Elen 2009; Esnaashari et al. 2018a; Esnaashari et al. 2018b; Hung et al. 2017; Romero et al. 2008) which investigate how students use the available tools. The findings revealed that students are different in terms of the amount of tool use. Winne (2004) further stated that a student's perception regarding the functionality of the tool shows whether a student will use the tool (the intervention) or not. The importance of perception has also been investigated by Salomon (1984). He showed that the students who perceive the environment as more a gaming environment would allocate less mental effort. In contrast, those who perceive the environment as more learning environment invest more

times and efforts. Struyven et al. (2008) also mentioned that the way students perceive the learning environment would affect the learning activities they employed.

Even though the importance of perception in using tools in their learning has been emphasized, not enough studies looked at this from a self-regulated learning perspective. Many studies have investigated tool use from the Technology Acceptance Model perspective (Davis 1993), but we need to dig it further to understand why tools have been neglected by the students or have not been used as we expected them to use by interviewing students (Almarashdeh et al. 2010; Sánchez and Hueros 2010). We seek to understand the effect of tool use in self-regulated learning. Even though studies show the usefulness of technology tools in the self-regulated learning environment (Winne and Hadwin 2013; Winne et al. 2006), we still need more empirical studies to improve self-regulated learning environments for the students through using different tools. Also, previous studies can be criticized due to relying only on the self-report of the students by running a survey and/or a questionnaire. More studies on how students' use the tools to self-regulate their learning are needed that rely not only on surveys but also on observation and interviews.

Methods

This paper, which focuses on student perceptions of using tools in the classroom, is part of a more extensive study. Participants were 188 first-year students from a University in New Zealand. This was a blended learning course which was run for 12 weeks. The core material was available on the course web page, and review sessions were conducted for discussion purposes. The students were required to watch all the videos and participate in the quizzes at the end of videos before coming to the review sessions. There was a review session conducted weekly for students. Students had the option of going to class in person or watch the review session online when it was streaming and participate in the quizzes run by the lecturer in class. The lecturer used an audience participation tool in class to engage the students in class activities. The lecturer used the tools to run tournaments in class. The students needed to beat other peers in class so that their name appeared on the leaderboard. The students had access to Piazza in case they needed to clarify anything among themselves or with their lecturer. We aimed to understand students' motivation change as the course progressed. From the literature, we observed that Gašević et al. (2017) ran the MSLQ once at the start of the course. However, Martin et al. (2015) mentioned that students' motivation and engagement change within a day. Therefore, we decided to run the survey three times. Even though we used MSLQ to understand the motivation and the perception of students, we conducted the interviews. Interviews give us a deep understanding of students' perceptions, motivation and their effect on using the tools. In this study, we focused on the contributing elements of perception, motivation, gamification, and competition on the decision of students to use or not use the tools. Students were invited for the interviews based on how they answered the MSLQ questionnaire. We applied the K-Means clustering algorithm on students' motivational data collected through MSLQ. Students were clustered into four groups. We sent an invitation to students from each cluster for interviews to students' emails. The first three students from each cluster who replied to us were chosen to participate in the interview. We interviewed 12 students twice in the course. We interviewed high, medium, and low motivated students to see how different their perceptions were. We conducted semi-structured interviews, during which we asked about the students' perceptions regarding using tools and understanding the factors that affect their personal tool use.

Findings and discussion

In this study, the lecturer provided students with electronic educational tools and encouraged students to design their learning environment based on the tools provided. Depending on the environment that students prepared for themselves, they had a different learning experience. The goal for the lecturer was to produce lifelong learners who could take control of their learning and be responsible for their learning. In this case, the students needed to be motivated to use the tools and participate in the activities. The lecturer tried to increase the motivation of students by giving marks for their participation, throwing chocolates for giving correct answers, and used educational gaming tools to bring entertainment to their learning. Students appreciated the learning environment that their lecturers provided them with and they believed in the functionality and usefulness of each of these tools in their learning process, but they used the tools differently. This is inconsistent with the study of Dabbagh and Kitsantas (2005) that mentioned providing diverse toolset would give students the opportunity to choose the tool that is supporting their learning. Dabbagh and Kitsantas (2005) stated that this would stimulate, self-regulate and motivate learning.

However, students in our study mentioned that they used the tools based on their level of motivation, their perceived usefulness, other assignments, and responsibilities they had.

Evans (2008) showed that irrespective of the way a podcast has been used as a preparatory, or supplementary material, students just watched the web-lecture for a short time (Green et al. 2003; Taylor 2009). In contrast to Evans (2008), our study showed that students mostly watched the video materials which acted as preparatory material for them. However, Scutter et al. (2010) identified that when the web lectures were provided as the duplication of the original lectures, only half students would watch them. We asked students about their feelings regarding their learning environment. Student 10 mentioned,

“I much prefer this online paper too, like, going into class and just sitting there. And then there’s so many breaks and I feel like I’m wasting time most of the time, yeah. This way I’m quickly doing it, quickly learning, writing down my notes and then I can carry on with something else.”(S10)

And Student 9 mentioned,

“Yeah I think it’s the flexibility, coz I really like skiing and stuff and it just means I can go down skiing and still be effectively going to the lectures. (S9)”

Students thought that this course was their best course, as such, they indicated that the competitive electronic environment using tools made learning more fun. Even though the majority of the students in our study felt that the blended method of teaching was very beneficial, there were a few students who thought that they were not as useful as going to the physical classroom. (Different method of learning). Those who were not satisfied with the tools had different reasons. These students mentioned that when they attended classes, they were forced to attend to the material and take things more seriously. They thought the class made them more attentive. Therefore, they would listen and learn. But having been provided content online, some students reported that they would leave their work until before the exam, did not learn anything during the course, and some found themselves unable to do it all at the end. Having access to this option is more controversial because it acted differently for the students. Some students (e.g. S 8) reported that since they had been reassured that they had access to the content all the time, they left studying the material to the last minute. However, many students the availability of the electronic tools made studying better, as noted by (e.g. S7),

“Yep, I do take notes when I watch the videos. I think if I were to actually go to the lectures I would probably make more notes, but I think because, like, oh it's just a click of a button away, that I can just, like, jot it down later, it's not as much of a big deal. But because, like, if you're in the lecture, you're actually having to listen to the lecturer and understand what they're saying. Like, when it's just a video, it's just like, mmm, I can re-watch it and I can rewind it and it'll still be there. But I think there's just a more sense, a better understanding when you're physically there and having to, like, engage and listen in the class.” (S8)

“It's kind of like, oh, I can wait, I can leave it kind of stuff, it's a recording, it'll always be there. Which I feel like isn't the most helpful thing.” (S7)

Also, having the option to watch the lectures online and being able to see the lecturer just once a week made it harder for students (e.g. S 6) build a rapport with the lecturer, feel comfortable to go to him and ask questions of him in person.

“I guess that’s one of the negatives of, like, having it all online. Because, like, sometimes when you have three lectures a week, after every lecture you and go and see the lecturer. But there’s only one lecture a week. But then again, he has office hours, I’m pretty sure, and we can go to office hours and email him or something like that.”(S7)

It is also shown that not all students used the tools in the way we expected them to. Students from low motivation or students with other priorities or pressures, played (e.g. S7), the video without really listening to the contents.

“I watch the whole thing because, I mean, Mark has told us that, like, oh you don’t get the participation points if you just skim it to the end. So I do, like, watch it from start to finish, but I will admit sometimes I put it on and then I’ll go and do something else and then I’ll come back. Just see where it's at and be like, oh yeah, I’ll sit down and watch it and then I’ll re-watch it again later at

some point. Which I think is, it's not helpful but, like, it's just kind of like, oh well, I've gotten the participation mark, it doesn't matter kind of stuff. But, yeah." (S7)

Bhattacharjee (2001) noted that users set their expectations before usage which influences their tool adoption. However, during usage, user develops the perceptions which influence whether the user decides whether or not to continue the usage. Having been very excited about using audience participation tool could have come from the 'novelty effect' (Clark 1983). Therefore, we asked students about their perceptions in the middle of and towards the end of the course to see if their feelings had changed. We did not want our findings to be affected by the initial tool use. Therefore, we looked at how they continued using the tool and their perceptions were after using the tool for a while. In the second round of the interviews, students (e.g. S 5), mostly mentioned that they had the same feeling and that the tools were very helpful, and they continued using the tools as shown below.

"In the beginning I'm obviously very happy, but, yeah, with the class, but then throughout I'm actually finding really, really useful. I didn't think it was going to be as useful as I thought it was gonna be, but then I realized that it's really useful."(S5)

However, other students mentioned that their perceptions have changed as the course progressed when they become aware of the importance of tool use in their learning process. At the beginning, they (e.g. S 4), thought there were too many activities, or it was more like "childish" stuff to do for each week" but when they understood the effect of the activities on their learning, they engaged with it.

"Kahoot is such a childish thing, and even though we're all 18 to 20 something-year-olds in the class, we're all like, you know, we want to do our best. Yeah, so it's good, it's a good motivator, yeah."(S4)

Videos

The value of the tools in students' learning was reported to be different among students. In regards to videos, all students reported that they liked the videos, but when it came to comparing online delivery of material with the traditional class, some students still preferred to attend class. With regards to video lectures, the students all thought that videos were the best part of the toolset which was provided for them to enhance their understanding. But they used the videos differently at different times of the course based on their motivation, other responsibilities, and priorities that they had at that time (e.g. students' conditions, limitations). Based on their other limitations, students had options of watching the review sessions online on top of coming to the class in person and participate in class activities from home and still be able to get their participation marks as students (e.g. S 4), mentioned:

"I think it affects the class coz we don't actually have to go to class, but we can still participate in the class. So, yeah, I think that's really useful and then, also goals."(S4)

They liked that they had easy access to the materials that means they had the option of deep learning that is the first step in Winne's self-regulated learning model. The students reported that they could watch the videos anytime and anywhere that suited them best and helped them to participate in the quizzes. This allowed them to exercise their agency, do things in their own time, and take control of their learning). This helped students to meet their goals not within the limited hours of the classroom but in their own time. This is choosing strategies that is the second step in self-regulated learning. In this regard, one of the students (S3) mentioned,

"The fact that I can go back and check them myself and I have access to them as a, as a revision tool is fantastic." (S1)

Students believed that video lectures are good for referencing, reviewing (watching the video again-deep learning) for digesting the materials, pausing and doing something else, stop (stop to think and digest, deep learning), writing notes (deep learning) which is less likely to happen in traditional classes Students choose strategies for their learning and help SRL as the student (e.g. S 9), mentioned,

"I really like the way the whole online lectures are integrated with the quiz at the end as well, but the fact that you can see him which makes it a bit more personable as well as all the slides. And, coz we don't have the normal lectures as such for them, I'm kind of a person who would normally go back and, at some stage during the semester, re-watch all the lectures anyway coz that way I can

pause and start and sit back, sit forward thing. So, I think that works really well for me, and I guess like any PowerPoint(y) video type thing as well, being able to screenshot graphs and stuff also really helps me."

Quizzes at the end of video lectures

At the end of each preparatory video, there was a quiz that all students needed to complete in order to test their knowledge and get their marks. Students mentioned that quizzes at the end of videos were very helpful for self-evaluation. Students evaluated their learning with quizzes (Step three in SRL- self-evaluation). They checked how much they remembered by counting the number of questions they got them right as it is mentioned by students (e.g., S 10),

"So like, when I do get them wrong, I just look at the notes again, see what was the correct answer, and then I write it down. And then I never really watch the video again, just because it's too much time." (S10)

The students used the questions to evaluate their learning and applied changes in their strategies (Writing more notes). Even students thought that repetitive questions in the quizzes helped them (deep learning). In this regard one of the students (e.g., S 1), mentioned,

"Yes, because doing the questions once at the end of the quiz is one iteration and I believe that repeated exposure is key to getting something into your long-term memory." (S1)

The student (e.g., S 9), stated that if they did not perform well, they would review their notes again and would participate in the quizzes again. If they got them right, it would be fine. Otherwise, they would re-watch the videos that are they would self-reflect to see if they needed to write more notes. This is changing strategy that is the result of self-reflection. Through self-reflection, the individuals stop doing stuff parallel that is they change strategy or review the recording that is step four of the model.

And then quizzes I think are great coz it's a great way to, kind of, re-establish knowledge and, you know, from the lecture recordings you do the quizzes." (S6)

The students (e.g., S1), mentioned that quizzes not only helped students to self-evaluate but also helped teachers to evaluate students' learning and his teaching style to see if he needed to repeat the materials.

"It is very useful, and I think [the name of lecturer] uses the quiz results at the end of the videos to identify where we as a group are weak and rehashing the concepts is useful. So propping up and acting as a support layer to the videos, which is fantastic." (S1)

Audience participation tool

We asked students about using audience participation tools in class and the effects of gamification and competition on their motivation. Students were delighted with the gamification learning using the tools.

"I feel like Top Hat and Kahoot like you actually, like, participate, so you feel like more like engaged and, like, awake." (S12)

Students (e.g., S 13) mentioned that the tool made the class more interactive so the students would not get bored.

"Yes, coz we're doing, we're actually doing something coz, like, in the lecture we're like, we like, the lecturer just keeps on speaking and, I said to, like, this is so boring. I need the information to come in, but doing, like, interactive things, like, that makes me awake coz I'm actually doing something. You are getting engaged." (S13)

Students liked the audience participation tool; the anonymity that the tool brought to the course which made it easier for them to participate. Having a tool that allowed students to participate anonymously helped them to participate more. Some students mentioned they would not answer a question otherwise. In this case, the whole class were involved. And each student had an equal share for participating in the activities. In this situation, by using the tools anonymously he helped them to actively answer questions, but no one would recognise who they were.

"I think it's a good tool giving answers, because you're able to be like, oh I'm too nervous to put my hand up and say, 'this is what the answer is.' Like, you're able to, like, anonymously submit an answer and then you're like, 'oh I got it right.' Or 'oh I didn't get it right, at least I'm not embarrassed about saying the wrong answer.'" (S8)

The student talked about how shy she was and being shy; she never participated in the activities.

"Yeah, I think so, like, I feel like nobody likes putting their hand up, well, I don't, like, putting my hand up in the lecture coz, like, there are way too many people and, like, I don't like drawing attention to myself like that. So, I feel like that is a good way to get everyone to participate because you know, like, you're not gonna be, like, singled out. And be like, you got it wrong, because it will just be, like, numbers, being like, ten people got it wrong, or something.

You also feel like everyone else actually thinks, like, the same way as I do and we all got it wrong too, so we're in the same boat, so it makes you feel better". (S12)

For Vygotsky, participation was a mandatory requirement for learning (Vygotsky 1978). To implement this, the lecturer promoted mandatory participation in class. The students stated that mandatory participation forced them to be more active which they would not do otherwise. The students believed that this mandatory participation was very helpful for their learning.

"I guess participating helps because you can explain. Like, they ask you a question, you explain it and then by explaining it you actually learn more. And then it kind of gets into your head, yeah." (S6)

"Maybe it's just me; I feel like I'm an active person, like if I participate I will, I will, like, during the exam or the test I will be like, I remember doing this in class." (S5)

For some students being anonymous did not make any difference because they would answer the question without being nervous or embarrassed.

"I'm not too worried because I tend to be one of the few people in the class that answers anyway."

"Yeah. Exactly. I find, as a mature student, sitting down the front of the class, which is traditionally where mature students sit, I have a level of comfort, and I'm not too worried about feeling embarrassed in front of the other students". (S1)

There were cases that the students thought anonymity did not help them, but after investigation, the student admitted that this feature helped them.

"Oh, I don't mind if it was anonymous or not. Because I don't really know anyone in the class.

Oh okay, so for example if you didn't have this Top Hat and [the lecturer's name] asked any question, if you know or you don't know the answer, would you raise your hand and answer the question?

Oh probably not, no, because in such a big class I'd be shy. I wouldn't want to, yeah.

So does anonymity help you answer the questions?

Yeah, it does, yeah". (S10)

The students mentioned that they learned from other peers' responses to the questions. Students reported that they constructed their answers based on existing answers by other peers. This story from the class was consistent with Vygotsky (1978) in which the role of the expert in the zone of proximal development in activity theory was to scaffold the novice (Vygotsky 1978).

Students had different ideas regarding the questions in the audience participation tool. Some students mentioned that quizzes acted as an evaluation tool for them. Once students answered the questions when they watched the videos and again in the review sessions, this again helped the students to self-evaluate their learning and apply changes to their learning strategies.

"I would say it's helpful coz you can see all the questions that you've done and you kind of look back and look at which topics you didn't do really well. And also, I think it shows answers if I'm right....I would just use it to kinda refer to the course book as well, it kinda helps me learning which one I've done well and which one I've done not so well."(S5)

We asked about students' perceptions regarding feedback through the game. Some students reported that instant feedback was very helpful. Without the need for further investigation, they could go to the link provided by the lectures that helped them to learn better. In terms of providing feedback to the students, Becker (2007) stressed the importance of feedback as an important element in gaming that was necessary for learning.

"I mean I guess it does because, like, it's like you get feedback straight away so, like, the Kahoot will be like what is the name of this, and then there'll be, like, all these answers, and you'll click one and then obviously, like, straight away it'll say you're wrong or right." (S12)

Students mentioned that they used the audience participation tool due to its affordances such as competition. The competition was identified as one of the main themes in the students' interview data. Students talked about the fun environment the tool brought to the class through competition. The competition was identified by students as one of the elements which acted as a motivator for students to participate and try more, which consequently affected their course learning outcome.

"Yeah, we do, like, competition ones in Top Hat, like tournaments and stuff and it's kind of, like, it's fun to interact with your other students and be like, oh I can beat you" (S7)

The competition was defined by Alessi and Trollip (2000) as competition between user and computer, competition against oneself, against chance, and against time. Competition has been identified as an element which has a relation with challenge and consequently has a relationship with intrinsic motivation (Malone and Lepper 1987). Cheng et al. (2009) studied the benefit of competition in the level of engagement and active participation. Wu et al. (2010) mentioned that by allocating a score to the game, it is possible to motivate students to put in more efforts which consequently affected their learning. Our study's result was consistent with that of Wu et al. (2010) because in our study, with no extra score, competition alone motivated students to participate.

"So, there's a lot of competing, but it's all for fun, it's all for fun those quizzes, none of them count towards your grade, so it's, it's more, it's really relaxed, but at the same time you're learning" (S2)

Competition comes with a comparison which can affect students' self-efficacy which relates to motivation and performance (Bandura and Locke 2003). As Bandura and Locke (2003) mentioned the way that user looks at the competition can affect self-efficacy, beliefs and consequently the motivation.

"But it's very, it's, like, not too, it's very specific but then once you do this quiz, like, three times and you're competing with other people because you do the, so you do Top Hat, like just quizzes. So, what he does is, so he'll just give you, like, three questions and you would answer them by yourself, no leaderboard. And then we'll do a Kahoot, that's the whole class competing against each other, and then we'll do a Top Hat tournament. Which is, like, it's the same thing as the Top Hat quiz, but instead you compete with, like, the whole class." (S2)

Competition made the class more attractive, and the students were motivated to participate and enjoy their involvement and learning. The students reported that they were very competitive. The students all mentioned that competition worked as a positive motivator for their learning. Students talked about how others actively answered questions that worked as a motivator. In contrast to the studies that examined the positive effects of competition on learning, Van Eck and Dempsey (2002) argued that competition does not improve performance and it very much depended on whether the students were performing at the best of their abilities. Competition can also have the opposite effect on the students with low self-efficacy beliefs and then it may undermine their performance. In our future study, we will investigate how student with low efficacy perceive the effect of competition.

Conclusion

In this study, the lecturer provided students with a variety of tools in order to make them responsible for their learning. We examined how students used the available tools. We ran MSLQ three times to understand the level of students' motivation in the course and based on the level of motivation we identified four clusters of students. We invited students from different clusters and interviewed the first three students from each cluster who responded to our invitation. We interviewed students on what their perceptions were regarding tool use and how their perceptions changed during the course. We asked students about the competition and motivation aspects of the tools. Students talked about how the tools helped them with its

anonymity feature, time management, taking control of their learning process, and how it helped them to engage with the activities to learn more. We looked at how students' perception changed and whether changes in the perception affect tool usage. In this case, we added to the literature since we were validating a behavioural decision making in the self-regulated learning process. Even though several studies examined tool use from the perception of "usefulness or perceived usefulness", we examined the motivation of students in a self-regulated learning environment. We investigated how the tools helped students in their self-regulated learning process. The technology acceptance model (TAM) considers initial attitudes and expectations. What we investigated was about how students' intentions changed when they understood the helpfulness of the tools in their learning. The prediction of self-regulated learning was that providing tools for the students, would help them to self-regulate their learning. Our study showed that the level of motivation was different among students, and motivational and perceptual differences affect tool to use.

REFERENCES

- Alessi, S. M., and Trollip, S. R. 2000. *Multimedia for Learning: Methods and Development*. Allyn & Bacon, Inc.
- Almarashdeh, I. A., Sahari, N., Zin, N. A. M., and Alsmadi, M. 2010. "The Success of Learning Management System among Distance Learners in Malaysian Universities," *Journal of Theoretical & Applied Information Technology* (21:2).
- Bandura, A., and Locke, E. A. 2003. "Negative Self-Efficacy and Goal Effects Revisited," *Journal of applied psychology* (88:1), p. 87.
- Becker, K. 2007. "Pedagogy in Commercial Videos," in *Games and Simulations in Online Learning: Research and Development Frameworks*. IGI Global, pp. 21-48.
- Bhattacharjee, A. 2001. "Understanding Information Systems Continuance: An Expectation-Confirmation Model," *MIS quarterly*, pp. 351-370.
- Cheng, H. N., Wu, W. M., Liao, C. C., and Chan, T.-W. 2009. "Equal Opportunity Tactic: Redesigning and Applying Competition Games in Classrooms," *Computers & Education* (53:3), pp. 866-876.
- Clarebout, G., and Elen, J. 2009. "Benefits of Inserting Support Devices in Electronic Learning Environments," *Computers in Human Behavior* (25:4), pp. 804-810.
- Clark, R. E. 1983. "Reconsidering Research on Learning from Media," *Review of educational research* (53:4), pp. 445-459.
- Dabbagh, N., and Kitsantas, A. 2005. "Using Web-Based Pedagogical Tools as Scaffolds for Self-Regulated Learning," *Instructional Science* (33:5), pp. 513-540.
- Davis, F. D. 1993. "User Acceptance of Information Technology: System Characteristics, User Perceptions and Behavioral Impacts," *International journal of man-machine studies* (38:3), pp. 475-487.
- Draper, S. W., and Brown, M. I. 2004. "Increasing Interactivity in Lectures Using an Electronic Voting System," *Journal of computer assisted learning* (20:2), pp. 81-94.
- Esnaashari, S., Gardner, L., and Rehm, M. 2018a. "Characterizing Students Based on Their Participation in the Class," *International Conference on Artificial Intelligence in Education*: Springer, pp. 84-88.
- Esnaashari, S., Gardner, L., and Rehm, M. 2018b. "Students' Perceptions of Using Technology in Flipped Classrooms Environment," *EdMedia+ Innovate Learning: Association for the Advancement of Computing in Education (AACE)*, pp. 190-199.
- Evans, C. 2008. "The Effectiveness of M-Learning in the Form of Podcast Revision Lectures in Higher Education," *Computers & education* (50:2), pp. 491-498.
- Gašević, D., Jovanovic, J., Pardo, A., and Dawson, S. 2017. "Detecting Learning Strategies with Analytics: Links with Self-Reported Measures and Academic Performance," *Journal of Learning Analytics* (4:2), pp. 113-128.
- Green, S. M., Voegeli, D., Harrison, M., Phillips, J., Knowles, J., Weaver, M., and Shephard, K. 2003. "Evaluating the Use of Streaming Video to Support Student Learning in a First-Year Life Sciences Course for Student Nurses," *Nurse Education Today* (23:4), pp. 255-261.
- Hung, J.-L., Wang, M. C., Wang, S., Abdelrasoul, M., Li, Y., and He, W. 2017. "Identifying at-Risk Students for Early Interventions—a Time-Series Clustering Approach," *IEEE Transactions on Emerging Topics in Computing* (5:1), pp. 45-55.
- Malone, T. W., and Lepper, M. R. 1987. "Making Learning Fun: A Taxonomy of Intrinsic Motivations for Learning," *Aptitude, learning and instruction* (3).

- Martin, A. J., Papworth, B., Ginns, P., Malmberg, L.-E., Collie, R. J., and Calvo, R. A. 2015. "Real-Time Motivation and Engagement During a Month at School: Every Moment of Every Day for Every Student Matters," *Learning and Individual Differences* (38), pp. 26-35.
- McKeachie, W. J. 1990. "Research on College Teaching: The Historical Background," *Journal of Educational Psychology* (82:2), p. 189.
- O'Bannon, B. W., Lubke, J. K., Beard, J. L., and Britt, V. G. 2011. "Using Podcasts to Replace Lecture: Effects on Student Achievement," *Computers & Education* (57:3), pp. 1885-1892.
- Park, and Farag. 2015. "Transforming the Legal Studies Classroom: Clickers and Engagement," *Journal of Legal Studies Education* (32).
- Perkins, D. N. 1985. "The Fingertip Effect: How Information-Processing Technology Shapes Thinking," *Educational Researcher* (14:7), pp. 11-17.
- Pintrich, P. R. 1991. "A Manual for the Use of the Motivated Strategies for Learning Questionnaire (Mslq),"
- Ravishankar, J., Epps, J., Ladouceur, F., Eaton, R., and Ambikairajah, E. 2014. "Using Ipad/Tablets as a Teaching Tool: Strategies for an Electrical Engineering Classroom," *Teaching, Assessment and Learning (TALE), 2014 International Conference on: IEEE*, pp. 246-251.
- Romero, C., Ventura, S., Espejo, P. G., and Hervás, C. 2008. "Data Mining Algorithms to Classify Students," *International Conference on Educational Data Mining 2008*.
- Salomon, G. 1984. "Television Is" Easy" and Print Is" Tough": The Differential Investment of Mental Effort in Learning as a Function of Perceptions and Attributions," *Journal of educational psychology* (76:4), p. 647.
- Sánchez, R. A., and Hueros, A. D. 2010. "Motivational Factors That Influence the Acceptance of Moodle Using Tam," *Computers in human behavior* (26:6), pp. 1632-1640.
- Saroyan, A., and Snell, L. S. 1997. "Variations in Lecturing Styles," *Higher Education* (33:1), pp. 85-104.
- Scheiter, K., and Gerjets, P. 2007. "Learner Control in Hypermedia Environments," *Educational Psychology Review* (19:3), pp. 285-307.
- Scutter, S., Stupans, I., Sawyer, T., and King, S. 2010. "How Do Students Use Podcasts to Support Learning?," *Australasian journal of educational technology* (26:2).
- Shuell, T. J., and Farber, S. L. 2001. "Students' Perceptions of Technology Use in College Courses," *Journal of Educational Computing Research* (24:2), pp. 119-138.
- Struyven, K., Dochy, F., Janssens, S., and Gielen, S. 2008. "Students' Experiences with Contrasting Learning Environments: The Added Value of Students' Perceptions," *Learning Environments Research* (11:2), p. 83.
- Taylor, M. Z. 2009. "Podcast Lectures as a Primary Teaching Technology: Results of a One-Year Trial," *Journal of political science education* (5:2), pp. 119-137.
- Van Eck, R., and Dempsey, J. 2002. "The Effect of Competition and Contextualized Advisement on the Transfer of Mathematics Skills a Computer-Based Instructional Simulation Game," *Educational Technology Research and Development* (50:3), pp. 23-41.
- Vygotsky. 1978. "Mind in Theory: The Development of Higher Psychological Process." Cambridge, MA: Harvard University Press.(Original work published in 1930-33).
- Winne, P. H. 2004. "Students' Calibration of Knowledge and Learning Processes: Implications for Designing Powerful Software Learning Environments," *International Journal of Educational Research* (41:6), pp. 466-488.
- Winne, P. H. 2006. "How Software Technologies Can Improve Research on Learning and Bolster School Reform," *Educational Psychologist* (41:1), pp. 5-17.
- Winne, P. H., and Hadwin, A. F. 1998. "Studying as Self-Regulated Learning," *Metacognition in educational theory and practice* (93), pp. 27-30.
- Winne, P. H., and Hadwin, A. F. 2013. "Nstudy: Tracing and Supporting Self-Regulated Learning in the Internet," in *International Handbook of Metacognition and Learning Technologies*. Springer, pp. 293-308.
- Winne, P. H., Nesbit, J. C., Kumar, V., Hadwin, A. F., Lajoie, S. P., Azevedo, R., and Perry, N. E. 2006. "Supporting Self-Regulated Learning with Gstudy Software: The Learning Kit Project," *Technology Instruction Cognition and Learning* (3:1/2), p. 105.
- Wu, M., Liao, C. C., Chen, Z.-H., and Chan, T.-W. 2010. "Designing a Competitive Game for Promoting Students' Effort-Making Behavior by Virtual Pets," *Digital Game and Intelligent Toy Enhanced Learning (DIGITEL), 2010 Third IEEE International Conference on: IEEE*, pp. 234-236.