

Students' Use of Educational Tools: an SRL Focused Longitudinal Study

Completed Research Paper

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Abstract

Electronic educational tools are generally recognised for their usefulness in the classroom, especially in the area of gamification. However, there is little evidence that considers their effectiveness. In our research, we explored students' perceptions of the utilisation of classroom tools and their effect on learning. In doing so the effects of features, such as competition and gamification, on their perceptions and motivation were examined. We interviewed a number of students and analyzed their perceptions of tool usage through the lens of self-regulated learning. Our qualitative findings indicated that the tools' gamification and competition features facilitated and motivated the students. In addition, increased participation highlights that students' positive or negative perceptions of the usefulness of the tools and how they used them depended on their own motivation and preferences.

Keywords: Electronic educational tools, competition, gamification, students' perceptions

Introduction

Electronic educational tools are popular and regularly deployed in higher education. Such electronic tools are sometimes distributed through Learning Management Systems for fully online learning or partly in a blended learning course (Dabbagh and Kitsantas 2005). Instructors are free to choose which tools to deploy as either a primary source of information or as replication, e.g. videos or online quizzes. Here sometimes some part or core concept will be recorded and provided as supplementary materials for students (O'Bannon et al. 2011). These tools enable the instructor to deliver material in an active learning form to large numbers of students, therefore increasing student engagement and promoting deeper learning. Dabbagh and Kitsantas (2005) stated that providing various toolsets help students 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 choose 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 views about these tools. Shuell and Farber (2001) identified student perception as an important factor in understanding the relationship between technology and the learning process. We postulate that perception is under-examined in the educational tool use literature frequently employing quantitative methods to gain insights. Using the qualitative method of time sequenced interviews we have explored these characteristics. By interviewing each participant twice, (before and after substantial tool experience) we hope to remove any bias associated with "technology novelty".

The following research questions guide our study:

“What is the perception of students regarding the use of an electronic educational tool in their classes?” We analyzed students’ perception through the lens of self-regulated learning (Winne and Hadwin 1998). 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. Several studies have investigated tool use from the Technology Acceptance Model perspective (Davis 1993), but we explore this further to understand why students neglected tool use or have not been used as we expected them to use by interviewing students (Almarashdeh et al. 2010; Mun and Hwang 2003; 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 seek to enable improvements in self-regulated learning environments for students. Previous studies explored students’ self-reported evidence of tool usage activities we endeavour to add more depth to the existing research through a series of interviews.

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 to continue 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 behavioural 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, 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 get engaged in activities, they are less likely to work hard and less likely to perform well. Vygotsky (1978) also notes 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 these 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. 2014a; Ravishankar et al. 2014b). 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.

There are different studies (Esnashari et al. 2018; Esnashari et al. 2018) which investigate how students use the available tools. The findings revealed that students differ in terms of the amount of tool use. Winne (2004) further stated that a student’s perception of the functionality of the tool implies a relationship as to 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 cognitive 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, unfortunately, few studies have explored this from a self-regulated learning perspective.

Self-regulated learning

We adopt our definition of self-regulated learning from that defined by (Pintrich 2000) as “an active, constructive process whereby learners set goals for their learning and then attempt to monitor, regulate,

and control their cognition, motivation, and behaviour, guided and constrained by their goals and the contextual features in the environment". There are different variations of self-regulated learning which has been categorized into two groups; goal oriented and meta-cognitively weighted.

While there are different versions of SRL available, all the versions of SRL follow the same three phases of preparatory, performance, and appraisal. Among all the variations of self-regulated learning, we focus on Winne's work which has the most heterogeneous theoretical background. Winne's model has been influenced by Bandura (1986) and Zimmermann (2000) which present a social cognitive theory. In contrast to what other authors have defined as SRL, Winne looks at SRL as a recursive process. In the metacognitive monitoring, the feedback can be given in any phase. In other words, monitoring happens in the performance phase and feedback in the appraisal phase.

Winne's work is more strategy oriented so it is helpful to assess the effectiveness of different strategies used by the students to be compared with each other. For this reason, the students' self-report has frequently been used to understand the strategies that students used and is considered as an effective lens to investigate contemporary e-learning. Winne (1996) looks at self-regulated learning as an inherent part of learning. He defines self-regulated learning as meta-cognitively guided behaviour 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 which is the perception of students about the task. 2) goal setting and planning 3) enacting tactics and strategies planned in the previous stage, 4) adopting study techniques meta-cognitively.

Methods

In this course, the core material was available on the course Learning Management System, and review sessions were conducted in the classroom 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 to engage the students in class activities. The lecturer used educational 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 (forum) in case they needed to clarify anything among themselves or with their lecturer.

Our research here is part of a larger mix method study where we aim to understand students' perceptions from a qualitative and quantitative perspective, we report here on the qualitative interviews. In order to select our participant firstly we conducted a questionnaire survey using the MSLQ tool (Pintrich 1991). 189 first-year students from a university in New Zealand participated in the survey. The students were surveyed from one program which was taught through blended learning and ran for 12 weeks. This paper focuses on student perceptions of using tools in the classroom. Students were invited for interviews based on the results of the MSLQ questionnaire. In our analysis of students' motivation and strategy use in our full study, we observed a large standard deviation among students, therefore, we explored it further to see if we could identify different groups and subgroups of students based on their level of motivation in the classroom (Heirweg et al. 2019; Linnenbrink-Garcia et al. 2018; Rigueiro et al. 2018). We applied the K-Means clustering algorithm on students' motivational data collected clustering into four groups (Magnusson and Stattin 1996; Zusho et al. 2003). We invited students from each cluster to attend interviews. The first three students from each cluster who responded to the invitation were chosen to participate in the interviews. We interviewed 12 students twice in the course. We interviewed high, medium, and low motivated students to see how different their perceptions were. These three levels of motivation were selected in order to compare our study findings with earlier work in this field (reference). In accordance with standard interview protocols, 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. In this study, we investigate the perception of students and in our other study, we used the quantitative data to draw parallels to our qualitative data. With our qualitative method we are able to contextualise and understand more deeply the data from our quantitative survey data.

Findings

In this analysis, we follow Winne’s framework which outlines the four critical points that are required for SRL. Different stages of SRL, what teachers and students do and what the tool does to serve each stage of the process is depicted in Table 1. Providing the materials online is the first step in the SRL process. Therefore, the lecturer by providing the materials online contributed to the self-regulated learning of students. The students can access the material anytime and can use them based on their time availability. The tools accelerate the process of accessing the materials. Based on students’ self-interpretation, the student defines the task for themselves. Based on the motivation and metacognition that they had, they set the goal and plan for their learning. For example, student 15 mentioned “I allocate time. I reward myself when I do the task”. In the process, they constantly judge their learning. Through the quizzes at the end of videos, the students will check what they know? How much could they remember? This will activate prior knowledge and the strategies they used. In this case, they metacognitively take control of their learning, and they choose study time and content for themselves.

Table 1. Mapping between the stages of SRL and learning process of students

Self-regulated learning theory	Teacher	Student	Tool
Comprehending- Goal setting	The teacher puts all the required sources, sets all the activities, gives all the directions, and the criteria for marking	Comprehending the task, setting personal goals	Videos, audios, instructions, activities
Planning / Strategies	The teacher puts the timeline there, asks students to watch and take the test before they come to the class	Managing their time, taking part in the quizzes, getting help from the peers and teacher	Online videos, Communicating, Discussion
Evaluating	Review students work, Redirect them if needed	Determining the progress of her self comparing it with the goal, revising strategies	Grades, tracking progress, quizzes

In this study, the lecturer provided students with electronic educational tools and encouraged students to design their own learning environment. Depending on the environment that students prepared for themselves, they had a different learning experience. We asked students about their feelings regarding their learning environment. Students in their own words talked about their process of learning. How tools helped them to self-regulate their learning, what strategies they used to make that happen. For example, student 17 mentioned that:

“So the way I learn, I used to be quite a graphical learner, like I liked to see diagrams and images and stuff. But for me, the way that I learn now the most would probably be just like writing it out, as opposed to typing. Like physical writing’s a lot better, I feel that I have to think about it more than just sort of pushing buttons, so it gets ingrained in my memory. And the way that I sort of evaluate my learning is a lot of papers have learning outcomes and stuff like that at the end of each week. I won’t necessarily do that each week, maybe like two weeks, and stuff like that, and I’ll go over those and I’ll double check that I like know all of that. And then if I don’t I’ll go back, I’ll try and learn it, and I’ll find things that I don’t understand and I’ll go to my group and see if they know it. And if not then I’ll go to the lecturer. So I’ll sort of like, I don’t break it up into sort of weekly schedules, I’ll sort of break it up into, I sort of like time how many weeks I’ve got until the next test and then I’ll break up how many topics I have to learn. And then I’ll set like, you know, maybe like three days to learn a topic, and I’ll go over that and make sure I know everything, that kind of stuff. Yeah, sort of break it up into little windows of need to know this by then. (S17)”

Referring to self-regulated learning, through reflection and thinking about his own learning process, Student 17 reported that he is a graphical person. He knows that the best way for him to learn is to use

pen and paper and create words and symbols. So, for him, he first sets a goal to learn something he does not know. To master the new learning, he first needs to make it concrete using signs and symbols to make the new information part of himself. Using the physical act of writing creates a thinking space for him that again involves reflection. The ability to produce the written content also is a way to evaluate whether or not he has learned the new information. Through writing, he embodies the new information and self regulates his behaviour. To self-evaluate his learning, he also uses the learning outcomes and double checks whether he has acquired the new learning every fortnight.

Students' perceptions through self-regulated learning

In this section, the reflection of self-regulated learning will be given. In this framework, the perception of students is reflected in the use of the tool in their process of learning.

Comprehending the task (Providing the required material)

Comprehending the task is the first and foremost element in self-regulated learning. The student must understand what he /she needs to do so that it shows the learning and completion of the tasks. When the students understand the learning environment and task requirements, the first turning point occurs. To accomplish this stage students need to understand the factors such as time requirements and environmental opportunities and constraints which affect the academic success of the students. In a traditional learning environment, the teacher provides the curriculum material through instructional procedures. In new online learning, the materials will be available through the tools for the students who have the potential to facilitate the SRL by providing accurate, meaningful and accessible information.

Darabi et al. (2004) emphasized that teachers, by providing direction and assistance in the description of the problem or the required learning task, can promote the first stage of SRL which is comprehending the task for students. In this study, the teacher supports the comprehending task of students by providing directions and instruction online for the students. The teacher provides online lectures, quizzes, and instructional design for the students. The teacher who is an expert in teaching provides different activities which can help learning of students and explain the importance of participation in the activities for their learning to the students. In this study the teacher explains the activity and states it is timed.

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 support 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 period of 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 of the students would watch them. We asked students about their feelings regarding their learning environment. Student 13 mentioned,

"I feel I'd choose the online one because it's more flexible towards a way of learning. So, like, some people don't learn as well when they go to lecturers, but sometimes if they have online stuff, it's much more helpful. Yeah, and like, the way its been presented is really good. It's new, fun, but like, it's really nice." (S13)

And Student 12 mentioned,

"It was quite useful because I don't, coz I live around South Auckland so if I can't make it on, like, in my classes I tend to use the online. (S12)"

Students thought that their course was their best course, as such, they indicated that the competitive electronic environment using tools made learning more fun. It also made the learning independent of the location.

Referring to the self-regulated learning cycle, the first stage is providing all the material so that students understand the task in order to be able to regulate their learning. The teacher helps the students by putting all the materials online on the tool and gives them permission to do the activities at their own pace. The tool provides them with the facility to have access to the material in their own time. By providing the material to students, they will understand the required learning activities, they set the goal for themselves, and they can do the activities anywhere that is more convenient to them. This is consistent with other studies in self-regulated learning (for example Darabi et al. (2004)) which showed the importance of providing direction and assistance in the process of learning the task in self-regulated learning through an implemented software.

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. One of the students (S1) reported that if he attends the classroom, he will write more notes and he is inclined to listen. While being at home, he "might lose control of learning and end up taking a nap. However, many students the availability of the electronic tools made studying better, as noted by (e.g. S6),

"Yeah, I think that, like, if you're actually going to the lectures, you're more motivated to engage in the lectures. Like, you can't have a nap in class. If you're watching it at home, then you're more tempted to be distracted and do other things. You'll be like, 'oh I'm bored of this, I'll pause it and go do something else'. Like I feel that actually in the class, you have to focus in on the class and what you're learning."(S1)

"Yeah, to more actively engage and to more learn the content. Whereas with, like, just having a recording, it's kind of like, well there's no class, I'm just gonna watch a recording. It's not big deal, I can just chuck it up and then it'll be there."(S6)

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 7) to 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)

Bhattacharjee (2001) mentioned 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 feeling has 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 4), mostly mentioned that they had the same feeling and that the tools were very helpful, and they continued using the tools as shown below.

"I think at the start I thought, oh, like the video recordings, oh it's really a cool idea. It'll be like, it'll be more helpful. But I think as I've progressed, it's kind of like, am I actually learning the content or am I kind of, like, putting the video on, watching the video, not really, like, focusing in on the video instead of actually being able to, like, sit through a lecture, like actively engaged kind of stuff. I think it was a cool idea."(S4)

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 3), 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.

“Yeah, and then I think with, like, Top Hat, at first I thought, oh this will just be something really simple, childish, and then, ‘cos, as it progresses, kind of like, oh this is a really helpful tool that, like, it's helping us learn and all this kind of stuff.” (S3)

Goal setting

To accomplish this stage, the students need to identify the learning task and start to set the goal for their learning. This is the conclusion from comprehending the task in the SRL process. The students in this study set the goal based on, for example, what average passing rate was for the course. The teacher can help the student for setting the goal or achieving the goal. For student achieving their goal, the teacher runs the activity and asks students to participate in activities through the tool. The teacher allocates a mark for participation so that students have enough motivation to participate in activities. This stage is the setting of goal and participation in the activities that is the second stage in self-regulated learning. When students understand what they need to do in order to accomplish the task, they start to set the goal and start to do planning.

Students had different goals for accomplishing the task. Students 10 mentioned

“I wanted to get all participation marks.” (S10)

Student 12 mentioned

“Wanted to learn the topic for my future work.” (S12)

Student 1 mentioned

“I reward myself to keep myself on the track by weekly reading catch ups.” (S1)

Referring to the self-regulated learning cycle, the second stage is for the learner to set the goal. Based on the explanation of the teacher, the students wanted to be the best student in the class. The teacher helps the student to set the goal and help them by providing the material and also monitor them to make sure students can achieve their goals. Students use the available videos and readings, based on their time and other limitation that they have. They participate in activities set for the students.

Applying strategies

Setting the strategies is the third step in self-regulated learning. Having determined the material and the activities that students need to do, they develop the plan and strategies to perform the required task. Providing the material online and letting the students do the activities in their own time enabled the student to promote self-regulation by planning and doing self-paced and self-management. Providing the material online on audience participation tool and giving students the facility to access them all the time. Students # 6 and 5 mentioned audience participation tool helped them to set their strategies.

I think “[Name of the tool] can affect the classroom but in a positive way. Like, it just brings everyone together. But I think it's the best thing for goals because it's a really good tool, like I said, and I think also it becomes a lot of responsibility, it comes a lot down to the student to, to watch every video and take the quiz at the end and take notes if needed. (S6)

“It's hard to catch up on, like, I had to do everything at once. But [Name of the tool] still very useful and I think, for the first, like, eight weeks, I made the most of it, definitely.” (S5)

Referring to SRL, students based on the task to do, will set strategies for themselves to achieve their goals. Students are always evaluating their strategies to understand whether they are correct or whether they need to apply any changes in their strategies. The data from our study is consistent with other studies (Banyard et al. 2006) which emphasize the effect of online tools for promoting self-regulated learning through setting the strategies, planning and self-management.

To accomplish this stage the students need to develop strategies which could help them achieve their goals. Planning is what students do to tackle the task. Yang (2006) defined planning as allocating time to satisfy the requirements of the task and choose the strategies which can help to achieve the object of the task. Then the students participate in activities based on the available times and the constraints they have that is choosing strategies which is the third stage in self-regulated learning. The teacher can help the process by setting a reminder for the students so that students do not miss the deadlines.

Evaluating the strategies- Usefulness of participating in the quizzes

Students by participating in the quizzes evaluate their learning. They will understand how much they know and whether the strategy they used was helpful for them to achieve their goals. This process helps them for self-evaluation and promote self-regulated learning. 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 9),

“Yeah, so I’d say, like, quizzes and stuff are probably going to be really helpful for the tests, like, we’ve got and first week back and such. And coz I’m kind of getting the understanding that the questions are gonna be the exact same format. And it’s all about, yeah, as I said before, if you’ve forgotten the answer to one of these questions it kind of just triggers that memory and quite often, coz I guess it’s who I am, I’ll go and read a little bit around that thing and watch the video again as well.” (S9)

The students used the questions to evaluate their learning and applied changes in their strategies (i.e. 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 10), mentioned,

“With the Top Hat I find it useful to an extent though, coz quite often after I watch the videos with the Top Hat, like, you get a set of Top Hat questions on earlier in the week and then by the time it gets to the Top Hat it either, tend to probably remember most of the question, like, answers. “ (S10)

The student (e.g. S6), stated that if they did not perform well, they would review her 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 is they would self-reflect to see if they needed to write more notes. This is changing strategy that is the result of self-reflection.

“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)

Through participating in the quizzes the student does self-evaluation which is the final stage in self-regulated learning. Referring to self-regulated learning, through continuous monitoring and checking the accuracy of learned materials helps students to employ strategies and plans which help them to better achieve their goals (Progress monitoring). This is consistent with the other studies (Yang 2006) in SRL which indicate through using WBLE, students do the performance control (self-monitoring) in promoting self-regulated learning.

Evaluating the strategies- Immediate feedback from the teacher

When students participate in the activities through audience participation tool, the teacher provides immediate feedback to the students. Providing immediate and informative feedback helps students to learn. This immediate feedback helps and prevents students from wasting time for a look around to find the right approach to deal with the question and absorb the information the teacher provided them with. This immediate feedback could not happen without using the tool. Students mentioned that instant feedback they received helped them as the student (e.g. S7) mentioned,

"Yeah, I like going to the review sessions more, it's better. It's different, like your effort's different, 'cos you're surrounded by people. Yeah. And in, in his, does he give you any feedback, like with the, like, link or something that you have to go or he will just give you the exact answer through the tool." (S7)

Based on the feedback they got, students (e.g. S 13) applied changes in their strategies. For example, writing more notes based on the feedback they received.

"Yeah, so after, like, the Kahoot, like, we'll be like, okay A is the right answer and then, like, let's say like a lot of people didn't get it right he will, like, go to the slide that he has for the lectures. And then he'll be like, this is actually the right answer guys, because blah, blah, blah, yeah and I write down in my notes and more note." (S13)

Referring to self-regulated learning, giving timely and immediate feedback is very helpful for scaffolded guidance which helps students to plan for more strategies. This is consistent with other studies (e.g. Denton, Madden, Roberts, & Rowe, 2008) which identify the effect of timely and effective feedback in the learning of students in the self-regulated learning process.

Regulation- Having fun through tournaments and gamification, increasing motivation

Running the quizzes through the tournament was very motivating for students due to providing a fun environment. This environment helps them to participate more and through answering more questions they learned more as reported below by Students #11.

"Yeah, definitely, I reckon the Top Hat and Kahoot helps a lot. Because without that, then I feel like no-one would be motivated to watch the videos, like such a long video and watch it without doing anything else and actually learn." (S11)

Students (e.g. S 12) mentioned that the tool made the class more interactive so the students would not get bored.

"I need the information to come in, but doing, like, interactive things, like, that makes me awake coz I'm actually doing something." (12)

Students also mentioned that they used the audience participation tool due to its affordances such as competition. 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. 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, kind of stuff."

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.

"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 leader board. 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 even without getting extra score." (S17)

Competition comes with a comparison which can have an effect on 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. Competition made the class more attractive, and the students were motivated to participate and enjoy their 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.

Referring to self-regulated learning, through game-like features and environments which have a positive effect on engagement and motivation of students, the tool helps students with their process of learning. Students mentioned, running the quizzes through the gamification aspect of the tool increased the motivation of students. Increasing the motivation of students through gamification is consistent with previous studies (e.g. Kafai, 2008). Other studies (E.g. Rowe, Shores, Mott, & Lester, 2010) show games have been used to teach students different subjects including scientific inquiry which is congruent with our experiment here.

Regulation- Usefulness of having discussions – scaffolding knowledge

The use of the discussion tool (Piazza) was mixed among the students. Even though Piazza was available for students' communication, the students did not think that there is a place for asking questions and communication.

"I don't really post, I just, most of the time if there's something I don't know how to do it's on there already. So I don't really feel the need to post. I don't really post on Piazza at all, to be honest, yeah, 'cos I don't really need to."(S16)

They just used Piazza as a tool for asking questions about the exam and assignments. Therefore, the tool was not used in a way that it was planned to be by the students.

"I don't use Piazza, I just use it for assignment. But for the other course [Name of the course] we used it a lot."(S12)

Students see Piazza as a tool for getting an update with regards to the exam date, assignments and general enquiries. But not for communication purposes, for example, for information seeking and asking a question of other peers and their lecturers. Most students did not ask other peers in Piazza, they did not trust other peers' knowledge, or they thought their lecturer would not look at their questions in Piazza. Some students trusted the answers based on how many endorsed the answers.

"Yeah, I post in Piazza. I think at the start of the year I asked one of the questions, but yeah, I don't really ask my peers because sometimes they don't really know themselves. So I tend to kind of self-learn everything, or if I don't really get I ask in Piazza."

I don't tend to use Piazza very often. I find that quite often the questions that people are asking on Piazza are questions that you can very easily answer in the course book but some people don't refer to the course book. (S5)

Some students asked questions in Piazza but would seek information themselves and asked others in parallel so that they did not wait for something that might not help them achieve their goals. The quotation below reminded us of the way that students used the tools very much depended on how the lecturer introduced and used the tools in class. Doing the activities and participating in discussions enable students to do peer interaction and self-evaluation which again promote self-regulation. Also, participating in discussion with the teachers and getting guidelines from the teacher will help the scaffolding process of the knowledge for the students which promote self-regulated learning. Having access to a better collaboration experience, helps students to understand their weaknesses and think about their knowledge which is all very helpful for promoting self-regulated learning. This finding is consistent with other studies (Azevedo, Cromley, Thomas, Seibert, & Tron, 2003). Through scaffolding guideline, the students can be helped in their learning process through self-regulated learning.

Discussion

The focus of our study was to understand the perception of students regarding the learning environment prepared by the lecturer for the students. We investigated the students' perception as perception has been identified by different researchers as a factor affecting the amount of tool use (Salomon 1984; Shuell and Farber 2001; Struyven et al. 2008). We asked about students' experience of using tools. How they actually used the tool? When and under what circumstances, what motivates or hinders them to use the tools? Experience of the learners from their own perspective gives us a better understanding of

their challenges and strategies they use to overcome them. Knowing about the learners' experiences, issues, and strategies they employ to overcome their challenges, helps the educators to come up with better ways to facilitate the learning process of students when using online tools such as videos, tests, online discussion forum.

Based on the literature, providing tools help students to self-regulate their learning. In this process it is proposed that they evaluate and reflect on their learning. When we asked about their experience with online materials and tools. We found that students' experience with online tools helped them to reflect on their own learning experience and evaluate what tools help them when and under what conditions, so far as students become aware of their abilities. As such students learnt from their reflection what works for them, they became more aware of their learning process and were more confident to be able to independently perform the tasks. In our full study we observed that students just grabbed the cursor and moved it to the end of the video without watching it, we understood that they actually did not want to participate in the activity in a way that was meant to. We investigate this further in the interviews to understand their perceptions. We identified reasons which led students to neglect tool use includes lack of motivation, lack of time, financial problems, etc.

We thought that blended learning was the best way of learning for students. From our perspective, we thought that we were helping students' self-regulated learning process. We believed that all the facilities provided by the lecturer promoted self-regulated learning by reading, note-taking, self-management, and time management, help-seeking, visualization for self-monitoring, progress monitoring, and feedback. From our point of view, the most important contribution of the audience participation tool was when there was a lecture theatre with a large number of students, and the students were unable to answer questions. This was very helpful for the teacher to gauge the level of understanding of the students and for example identify students who are at risk. The characteristics of individuals such as motivation, and emotional control, self-efficacy is much easier to control with the audience participation tool compared to the traditional learning environment. What we observed and heard was that students perceived more competence in the environments which was made competitive by the lecturer. They invested more effort and valued the task. To summarize, students in our study believed in the power of the learning environment. They also thought competition in the game worked as a motivator by the students.

Most of the students thought the tools are helpful for their learning process. However, there were students who disagreed. Even though the first stage of SRL was providing material and task comprehension, by providing the materials online, not all students could benefit from that. There were students who were not able to take control of their learning, and they left the material until the last minute. Students thought they were more isolated as they did not have to attend class which did not help them to self-regulate their learning and that actually they did not learn. So contrary to SRL theory (Winne 2006), we provide the material, and we expected to see students can take control of their learning. What we found and could not explain through the theory was when the tools did not allow the student to participate for a number of different reasons be it: internet speed; willingness to cooperate with other students; access to technology; or external pressures or beliefs, the participants chose not to participate in activities.

As we observed, some students were happy, some perceive the environment more like a gaming environment, and some did not benefit at all. Most students reported that they enjoyed the fun learning environment, these students believed that the audience participation tool added the gamification to the learning environment, but we are not sure how much they actually learnt. Some mentioned that the gaming environment and gamification aspects of the tool increased their motivation and consequently help in their process of learning. However, this is a limitation in our study; we would like to connect the perception of students and course outcome to see how different student by different perceptions achieved differently in their final course outcome.

This study has shed light on student learning which will be very helpful for learning scientists. Tool designers and instructional designers will be able to find out about students' preferences in tool use, and the effect of using different tools on the performance. This information would be helpful for developing learning pedagogies to support student-centred learning. Finding reasons behind student

tool use differences helps to design more appropriate instructional design, which can help different kinds of students. It provides information for the instructors about how students use the tool differently and what the pattern of students' tool use is. Understanding which tool is more popular will help the tool inventor to improve their learning tools, and it also helps teachers to design the instructional design in a way that desires students' tools use and use the tools more for scaffolding and cognitive help. Understanding the perception of students' regarding tool use and its functionality will help tool designers to invent tools which could help more students and is more adaptive to students' needs.

Conclusion

In a bid to encourage students to take responsibility for their own learning we observed the blended learning mechanisms deployed by one lecturer in the classroom. As part of a larger mixed method study, we used a cluster analysis grouping of student responses to the MSLQ survey we interviewed 12 students twice in a 12 week period in order to examine their perceptions of electronic tools in the educational setting. We asked students about the competition and motivation aspects of the tools. Through these narratives, we identified different aspects of how the tools helped them to manage their time, taking control of their learning process, and how it helped them to engage with the activities to learn more deeply. 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 (Davis 1989)", 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 (Davis 1989). 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. We found that even though students had a very positive attitude toward the tools and believed in the functionality of them, they used tools differently and their tool use was affected by students' characteristics. Our study showed that the level of motivation was different among students, and motivational and perceptual differences affect tool to use.

Limitation

We used the data from a relatively small data set from 189 students from one department and one university. Future research is needed to validate our findings. For us, the webcast was a replacement for the classes. Therefore, students were required to watch all the lecture if they wanted to learn the whole topic. Review session recordings were the only repetitive material for students. In the future, we suggest that the study explores giving students more freedom by replicating the entire class.

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