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Impact Investigation of using a Digital Literacy Technology on a Module: Case Study of Tophat

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Abstract. With digital technologies replacing the previous source of entertainment and communication and becoming the primary means by which we are informed and entertained, there is a need to be informed and competent with the relevant skills. Also, there is a greater need to use the digital devices that are employed by students using these technologies, which tend to keep them captivated at all times. The aim of this study is twofold: to enhance student performance by improving the approach to feedback and enhance student engagement by improving student class participation with the use of their 'disruptive' devices. We hypothesize that student engagement with the digital devices lead to better and overall student performance. The areas identified for research were in relation to student feedback and engagement through the encouragement of their participation. The approach adopted in this research was the evaluation of the use of *Tophat* as a tool in the creation of an enhanced student-centred learning experience by creating an active learning environment. The strategy was to adhere to the usual idea of student tutorial and after an hour the first research activity started. This involved the use of the disruptive devices (mobile phones, iPads and Android devices) in a constructive manner. At the end of the session, Tophat was used to provide additional feedback and prepare them for their coursework. This was achieved through the use of 'Tournament' to find out each week those that engaged and performed well. The results showed that 74.8% of the students are of the view that the use of Tophat enhanced their engagement in the module and 71.9% students perceived that higher level of feedback was received through Tophat. The impact of digital technology in higher education was discussed in this study.

Keywords: Tophat; Technology enhance learning; Digital classroom; Students' engagement; feedback**.**

Introduction

The effect of the use of digital literacy technology on students has become a topical area for research, which is not surprising as education in itself has to meet the students in their own arena. It is an acceptable requirement that

institutions of learning should engage in the development of creativity and innovation in students (Kärkkäinen & Stéphan 2013). However, this is a tall-order which is difficult to achieve when the educational systems still function traditionally and are losing the students to digital media; even in the classrooms.

It is required that higher institutions should engage with providing students with skills for innovation, however, there is the question of the type of teaching, learning and assessment that can help students learn and acquire skills for creativity and innovation. Result from the research carried out by Sander (2000) suggested that students preferred to be taught by interactive lectures and group-based activities. Their least preferred teaching and learning methods were traditional lectures, role-play and oral presentations. This is similar to the experiences with students in the classroom today. Coursework assessment preference was for essays, research projects and problems/exercises.

Students' engagement

Engagement

Student academic engagement involves the willing commitment of the students to the course of their academic pursuits. Kuh (2009) stated broadly that student engagement is reflected in the amount of time and effort students put into achieving college outcomes. This involves the participation in the achievement of the required learning outcomes before they come into the classroom, in the classroom and after they leave the classroom. Students' engagement could be enhanced and influenced by instructors' pedagogical choices and practices (Lane and Shelton 2001). Such good practices provide students with prompt feedback, encourage active learning and communicate high expectations, encourage interaction between students and faculty, cooperation among students and respect different talents and ways of learning (Chickering and Gammon 1987).

Performance

The academic performance of students is viewed as a measure of the students' ability to show that they have achieved the learning outcomes in a particular course. This can be measured in myriad ways such as: attendance monitoring, observation, interview, tracking their online engagement with course content and participation, self-reporting. Also, there are other traditional means of checking performance based on the achievement of learning outcomes: essays, oral and poster presentation, critical reviews, discussions, examination and test.

Digital classroom in higher education

In the past, traditional ways of teaching and learning were upheld in the higher education institutions. This was viewed as a process of transmitting content to the students and comprised of the lecturers deciding on the topics, teaching and assessment methods (Biggs and Tang 2010). However, in today's larger classes with diversified students, many lecturers could encounter major difficulties in sustaining academic standards. In relation to these difficulties Biggs (1999) states that they can be overcome when all components of teaching and learning are aligned constructively. This will be based on the premise that learning objectives

clearly define what is required from students. This teaching context of constructive alignment encourages students to carry out the learning activities which will help them attain the required understanding (Biggs and Tang 2010).

Students are thus encouraged to engage in learning activities that are relevant in achieving these learning outcomes. Biggs and Tang (2015) explained that in this context, teaching is not topic-based, as is traditional teaching, but focuses on what students are intended to do after they have learned the curriculum topics. As a result, several efforts have been placed in developing activities that could engage students while enhancing the attainment of learning outcomes. Since the modern classroom is faced with several challenges with student engagement as one of the key issue, there have been efforts in the use of students' digital devices in fostering engagement while enhancing learning.

Digital tools in education

Due to several technological innovations and the dependence of students on these innovations, the higher education is undergoing significant changes in their methods of teaching, learning and assessment. This is because, as Prensky (2001:1) puts it, 'today's students are no longer the people our educational system was designed to teach'. Prensky (2001) further explained his view that due to the ubiquitous environment and the sheer volume of students' interaction with it, they process and think through information differently from their predecessors. He referred to them as 'native speakers' of the digital language. This places a lot of requirement on the educational institutions that cater for the needs of these students.

To meet these needs, the setting of the lecture hall remains the convention in most higher institutions, but, these are being enhanced by the integration of new tools, techniques and pedagogies (McAleese et al. 2013) which these 'native speakers' are conversant with. This integration has necessitated studies in relation to the best use of innovative technologies in higher institutions. A reflection on what Ihde (1993) calls the 'active relational pair' presents a view on the ways in which mobile devices have become absorbed into human social networking practices. Robinson and Hullinger (2008) also found that asynchronous instructional technology encourage students to achieve higher order thinking skills such as evaluation, analysis, synthesis, judgement, and application of knowledge.

In corroboration with this view, Merchant (2012) observes that the mobile phone, with Twitter, Facebook and YouTube is heavily marketed by a range of providers due to human reliance in their everyday lives. This is due to the fact that most customers rely heavily on the use of these applications in their daily social lives. Also in line with meeting the needs of the digital age by innovative ways to engage students through the use of various applications, games and tools in the classroom, Wilson and McManimon (2014) corroborated with McAleese et al. (2013). However, they argue that best practice session is utilizing

the cloud as a tool to bridge the learning gap by providing more useful instruments for the enhancement of teaching styles.

Student classroom response systems, which allow the instructor to gauge students' understanding of a given topic in real time, have been widely used in the higher education. The results showed that such fast response system can improve students' in-class attention, attendance, interests and involvement in the learning process, but also allow lecturer alter the content according to the students response (Bruff 2009; Terrion and Aceti 2012). Clicker as one of student response system has been proved to forester student engagement and success in the module (Hoeskstra 2008; Kaleta and Joosten 2007)

It is arguable that the integration of these new technologies and approaches to education are already having a clear and positive impact on higher education provision as seen in the findings of McAleese et al. (2013). They established that this integration presents the opportunity to design the methods of teaching to individual students' needs, advancing learning analytics which lead to quicker feedback on students' performance.

These technologies afford opportunities to learn anytime, anywhere and from anyone, provided the learner is motivated. This flexibility is crucial for non-traditional learners whom Prensky (2001) refer to as 'digital natives'. However, besides obvious benefits to the students, McAleese et al. (2013) articulated other benefits in relation to the institutions and governments. These are: a change in the approach to continuing professional development and lifelong learning; an important tool to governments in ensuring a diversity of provision within higher education systems to meet the needs of all learners and provision of the platform for reaching international markets which will complement existing developments in cross-border education. Also, there is the benefit identified in relation to the facilitation of greater collaboration with both global and local partners.

Regardless of these identified benefits, there are some identified disadvantages to the move towards digitalising classrooms. In this regard, Merchant (2012: 770) stated that 'as ownership and access to smartphones has spread into the teenage years, their place in institutions of formal education has been marked by contention'. This is a view which is widely held in a number of conventional institutions of learning. The view that mobiles have no place in the classroom has recently been contested by educators, such as Parry (2011), who suggest that mobile learning and literacies should play an important role in education. Parry argues that it is crucial to recognise that mobile computing power radically changes the classrooms and more importantly, the 'spaces that students inhabit and the conversations they have outside of our teaching' (2011: 17).

Woodcock et al. (2012: 80) observed that Technology is increasingly being introduced into the classroom, primarily through student-led activities and typically through the use of smartphones. Some of these activities are web-based and involve the use of applications such as QuizIt, Socrative and Tophat. These activities have been found to be useful in a lot of cases, and Liburd and

Christensen (2013) suggest that technology, particularly web 2.0, can help increase the depth of learning by increasing interaction, critical thinking, and collaboration.

However, there are identified issues in relation to the adoption of innovative teaching approaches. One of such is students' willingness to accept changes from the traditional way of teaching and learning. Besides the difficulty of some lecturers in adopting these innovative approaches, they are also a bit apprehensive about how students would respond to them. Brown et al. (2013:80) found that students are 'in fact able and willing to use a classroom response and engagement system in order to increase engagement'. Additionally, findings from their research suggest that students have an overall desire to use technology in the classroom. Brown et al. (2013:81) found in their study that contrary to perceived fears of lecturers that students may not all have smart devices in the lecture room, which can use for the innovative interactions, all the 413 respondents in their survey had 'at least one device that would be capable of responding via text message or through a browser'.

Several devices and innovative tools and software have been introduced to different classroom settings. The results have varied slightly, but what all these results have in common is a positive disposition of most of the students to the innovative practices. Some have used clickers as a means of enhancing students' classroom engagement. Park and Farag (2015) explored the use of addressing clicker in a legal studies course. Findings from their studies suggest that both lecturers and students are more engaged with the course material and in the process of teaching and learning. He claims that clickers can be used to break-up the monotony of lecture, assess student understanding of material and difficult concepts, and identify areas of student misunderstanding and confusion. This can give the lecturer an idea of where to focus on. Also, they suggested that the use of clickers give every student, even those who are uncomfortable participating in class, an opportunity to provide input (Farag 2015).

Common tools used in these innovative approaches include iPad, smartphones, laptops etc. Ravishankar et al. (2014) investigated the potential impact of the iPad/Tablet and its applications on teaching and learning in the area of electrical engineering. Their findings suggest that these devices may transform the teaching into a collaborative and interactive way.

An example of innovative software is the android classroom response system. Karakostas et al (2014) carried out a pilot study on the use of QuizIt which is a new prototype real-time response system for Android mobile devices meant to enhance active learning methods and assess students' understanding. Their results from a questionnaire-based evaluation show that the students were quite positive about the use of QuizIt as a supporting system to their laboratory course.

Some others have used Socrative as an online Student Response System to increase in-class student engagement. Dervan (2014) investigated the use of Socrative cloud-based (Internet) Student Response System (SRS) in improving student engagement and the learning experience, compared with the traditional

lecture setting. The findings from his study were positive suggesting that the use of Socrative as an online Student Response System increased the in-class engagement of students.

Overview of Tophat

In the light of the argument by Parry (2011), the use of several tools and techniques have been explored in educating students (Park and Farag 2015, Ravishankar et al. 2014, Karakostas et al 2014) but there is not much recorded on the use of Tophat.

A traditional classroom is based largely on lectures, but with the use of innovative techniques and tools, students are encouraged to participate in the teaching and learning process. In most cases, they are encouraged to take ownership of their learning. With the use of Tophat (Tophat.com) engagement and participation is encouraged by stimulating the students through discussion start-ups, asking questions, and gauging understanding with the students' own devices such as iPad, smartphones and laptops. The software makers boast of providing a command centre where one can run and manage all aspects of the classroom from one platform.

Research Purpose

Besides the issue of the appropriate type of teaching, learning and assessment, there is also the issue with the students' learning styles which are diverse. An attempt at developing strategies that will focus on the different students' learning styles would result to student engagement and likely lead to enhanced student performance. Krause et al. (2008) argues that it is imperative to develop a broader understanding of engagement as a process with several dimensions. Since technology continues to be increasingly used by educational institutions (Becta 2009), this implies the need for appropriating pedagogical and education tools in supporting the enhancement of the quality of student experience.

This need has necessitated several researchers to carry out studies on pedagogy, digital literacy technologies, student engagement and performance. However, there has not been any study on the impact of the use of TOPHAT as a digital literacy technology tool on students' engagement and feedback provision. Consequently, this study will focus on the following questions:

RQ1: Does student class participation improve with the use of their 'disruptive' devices on the Tophat platform?
RQ2: What is the perceived impact of the use of TOPHAT on students' engagement in the module?
RQ3: Does Tophat increase the amount of formative feedback received by students?

Methods

Participants

The participants were postgraduate international students in Engineering Management at Coventry University in UK. A total of 187 students enrolled in the course however, 103 students (55%) participated in the survey.

Design and Procedure

Students who enrolled in engineering management course were invited to participant in this study. Students were informed that their consent entailed the ability to withdraw out of the study at any time without punishment. The module lasted for eight weeks, as part of the assessment; students need to complete the coursework by applying the skills acquired over the period of the module. As part of the module requirements, students were directed on how to set up Tophat accounts during the lecture in the first week of the module. At the end of fifty minutes lecture session, students were asked to use their digital devices (e.g. smart phones, IPad, laptop) to access different questions, tournament and discussion forum, which were designed to monitor class attendance, test their understanding of lecture contents and serve as revision questions for the piece of coursework. The Tophat accounts were administered by the two researchers. University student email addresses were used to send the students invitation to the platform. Educational activities on the Tophat platform were set up by the researchers and these included questions design, attendance register, tournament etc.

Instruments

An online survey was designed and administered through Tophat to measure the students' perceptions of the impact of Tophat on their module engagement, teaching and learning experiences. Two sets of questions were designed and released to the students though their digital devices. The first set was for testing the students' understanding of the module content, while the second set was for investigating students' opinions and learning experiences.

In the first set of designed questions, different types were used, which included multiple choices, word, numeric, sorting problem, matching problem and 'click on target' questions. The second set comprised 4 Likert-scale question using four-point agreement level from 1 (Strongly disagree) to 4 (Strongly agree) and qualitative word questions.

Analysis

Descriptive statistics analysis in the form of percentages and means were used to analyse the demographic data of the participants. The students' gender, age and technology level were assessed. Four Likert scale survey questions focused on the impact of Tophat on students' engagement, understanding of module content, feedback, coursework feed-forward. The students were also asked to evaluate the use of Tophat and its impact on their engagement and feedback

received on the module. Additionally, students' preferred question type was observed based on their response. The researchers had access to the data of students' class attendance, correctness of responses, participation weight.

T-test and ANOVA test analysis were carried out to assess the differences in students' engagement and understanding for the different gender and age groups respectively. PASW (SPSS) Statistics Version 17 was used to analyse the data exported from Tophat. To evaluate the degree of students engagement in the module through Tophat, thematic analysis technique was utilised to determine the efficiency of Tophat in enhancing students' engagement and feed-forward for the integrated coursework.

Results

The presentation of the results is mapped onto the structure of the earlier section "analysis". The data showed that reliability cronbach's alpha (α) was 0.796, indicating acceptable reliability.

Description of survey data

The age of 103 participants ranged from 19 to 45 years, with 29% female and 71% male, which were distributed as follows: Under 21 years old (6.8%), 22 – 25years old (70%), 26 – 30 years old (12.6%), 31-35 years old (5.8%), over 36 years old (4.8%). The finding showed that the average score of participant self-appraisal of their technological competency was seven out of ten. The means and standard deviations of the responses to the four Likert scale questions addressing the students' perception of Tophat are provided in Table 1. Students' perceptions of the effects of Tophat were distributed as follows: enhanced their engagement (74.8%), enhance understanding of the topics (67%), enhance level of feedback (71.9%) and feedforward to complete their coursework (61.1%).

Table 1: Descriptive statistics for Likert-scale questions

Construct	Mean	Strongly Disagree	Disagree	Agree	Strongly Agree	Standard Deviation
1. The use of Tophat has enhanced my engagement.	2.825	6.8%	18.4%	60.2%	14.6%	0.75961
2. The use of Tophat has enhanced my understanding of the topics	2.737	7.8%	25.2%	52.4%	14.6%	0.80393
3. The use of Tophat on this module has enhanced the level of feedback	2.835	5.8%	22.3%	54.4%	17.5%	0.78086
4. The use of Tophat on this module for feedback has impacted positively on my ability to complete my coursework.	2.670	6.8%	32%	48.5%	12.6%	0.78451

Experience with Tophat based on Gender

Two gender groups exist; male and female. The t-test assesses whether the mean results of the two gender groups are statistically different. Table 2 below shows the results of the t-test which examined the impact of gender groups on the scales of Technological skill, Engagement in the module, understanding of the module content, level of feedback, and coursework feed-forward. No significant difference was found between male and female students' response to those components.

Table 2: Demographic differences by gender group (n=103)

Variable	Mean		t	Sig.	Multiples Differences
	Male	Female			
Technological skill level	7.1233	7.3000	0.193	0.662	None
Engagement	2.8904	2.6667	1.860	0.176	None
Understanding of module	2.7671	2.6667	0.330	0.567	None
Feedback	2.8630	2.7667	0.322	0.572	None
Coursework Feedforward	2.7123	2.5667	0.731	0.395	None

Experiences with Tophat based on Age

The variable of age was divided into five groups: below 21; 22 to 25; 26 to 30; 31 to 35 and over 36. An ANOVA test was conducted to test how age influences different students' perceptions of Tophat. The results of the ANOVA test are shown in Table 3. The result showed that there is no significant difference among different age group of students' perception of Tophat.

Table 3: Demographic differences by age group (n=103)

Variable	Mean					F	Sig.	Multiples Differences
	A (<21)	B (22-25)	C (26-30)	D (31-35)	E (≥36)			
Technological skill level	8.429	7.039	7.333	7.250	7.000	0.936	0.446	None
Engagement	3.143	2.831	2.667	2.750	2.667	0.470	0.757	None
Understanding	3.000	2.740	2.583	2.750	2.667	0.295	0.881	None
Feedback	2.857	2.870	2.583	2.750	3.000	0.388	0.817	None
Coursework Feedforward	2.857	2.714	2.250	2.750	2.667	1.032	0.394	None

Thematic analysis of students' engagement

The qualitative data collected was analysed thematically with the initial codes selected based on the data. These codes were the overriding concepts from the data, which were presented as negative and positive views (Table 4 and 5, column 3), where applicable. Presented in Table 4 – 7, are quotes (column 2),

which are representative of the students' views, as depicted in the codes (column 1).

In relation to the perception of the students' on the way Tophat affected their engagement on the Module, several views were aired. Some of these quotes are presented in Table 4 below and were coded broadly as impacting their: participation; provision of game-based learning, a learning community; emphasis on learning outcome and revision. A few of these comments presented in table 4 are:

> *It has impacted my engagement in this module positively in the sense that it makes the course look easy by revising what has been taught in the tutorials with all the students which makes it more interesting, interactive and well understood through the feedback given after any questions asked.*
>
> *Tournament is an interesting feature and makes us more engaged to the Tophat*

Although a few participating students did not respond to this qualitative question, 47% of the entire sample believed it impacted on their engagement while 12% felt otherwise. A few of their quotes were:

> *It was a total waste of time. I don't learn anything from it*
>
> *I learned from class lectures not from Top Hat*

In terms of the impact of Tophat on feedback provision, students' perceptions are presented in Table 5. The quotations are coded into six main parts: Clarity, feed-forward, quality, timeliness, approach and accuracy. Some comments by the students which are presented in table 5.

> *We get feedbacks immediately after each session*
>
> *Tophat helps to track our progress throughout the module; it has a user friendly interface*

However, 10% of the entire sample believed that quality of feedback should not be delivered on Tophat platform. A few of their quotes were:

> *I can't really say something about it that depends on evaluator if he/she thinks Tophat is of more value to this course but for me feedback should not be based on Tophat.*
>
> *Not much. As sometimes I don't understand why the answer is wrong.*

Students were also asked their most and least favourite feature of Tophat. Their quotations are listed in Table 6 and Table 7. According to students' response, the use friendly interface, game-based learning (tournament) and instant feedback encourage students to involve in the learning process. However, students also expressed their concerns in relation to the use of Tophat, such as: predominantly use a surface learning approach, low quality of the feedback, instability of technical support (wifi, devices, Tophat did not integrate with the commonly used education platform – Moodle).

Table 4: Summary analysis of the impact of Tophat on students' engagement

Q: Would you say Tophat has impacted on your engagement in this module?		
Codes	Positive (48)	Negative (12)
Participation	• Easy for sign, it has the code for each lecture. it has helped because I cannot be in the class while I'm not in the class	• Nothing. I mean when I touch this is the time I must to
Game-based learning	• Tournament is an interesting feature and makes us more engaged to the Tophat	
Learning community	• Easy to communication • Active learning	• I learned from class lectures not from Top Hat
Emphasis on learning outcome	• Being aware of the activity after every class, made me concentrate fully to the lectures in preparation of the activity. • more engaged better understanding of terms through multiple choice layout • Provided a guide line for the study skills • I can find the key point of lecture	• It was a total waste of time. I don't learn anything from it • Not impacted
Revision	• It has impacted my engagement in this module positively in the sense that it makes the course look easy by revising what has been taught in the tutorials with all the students which makes it more interesting, interactive and well understood through the feedback given after any questions asked. • I remember the material after answering the fast question • Improved understanding and rehearsal • To remind me to finish my work on time • By getting knowledge from MCQ • It can help me to understand the module better • It helps, but most of understanding is coming from class.	• Help but not necessary

Table 5: Summary analysis of the impact of Tophat on feedback provision

Q: How would you say Tophat has impact on the level of feedback in this module?		
Codes	Positive (52)	Negative (18)
Clarity	• Making me understand the meaning of answer. But, I have a suggestion that I think we can finish Tophat at home • To see how much students learn from lecture • It help me to familiarize with research	• Not much. As sometimes I don't understand why the answer is wrong.
Feed forward	• development of my understanding • I don't know how to say that but its helped me through questions • it increased my eagerness in learning	
Quality	• It quite level of feedback. • Increased my satisfaction some, but very little. • high impact • Very good to get latest information • Satisfyingly great	• Not much feedback received • I'm not sure that Tophat impact in feedback part
Timeliness	• It has good impact because feedbacks are always given on time • We get feedbacks immediately after each session • The best thing with the Tophat that we get the feedback immediately • Get the feedback easy and quickly • It had been perfect, proving prompt n accurate feedback	
Approach	• This way of feedback was a better way • Top Hat helps to track our progress throughout the module , it has a user friendly interface • Convenience • Easy way to deliver the feedback • It's a good way to give feedback, helpful • Provided a very complete feedback system • It has made my learning experience more fluid	• Not significantly • I can't really say something about it that depends on evaluator if he/she thinks Tophat is of more value to this course but for me feedback should not be based on Tophat.
Accuracy	• The feedback for the module has been very accurate and good • It has impact on the level of feedback because of its interactivity amongst students • It will help by getting different ideas from different students	

Table 6: Summary analysis of the students' dislike of Tophat

Q: What did you like about the use of Tophat in enhancing your learning experience?	
Codes from the data	Actual quotations
Interactive approach	• The fact that it made accessing information about the course online interactive. • Looked forward to the engagement after every class • engaged me with e learning
Revision, feedback and feed-forward to the coursework	• Seems like a really good learning tool • Choice question • Help me refresher course. Friendly interface. • It can help me to enhance my understand of course and if I have any question that I can ask there
Tournament	• More interactive than writing on paper and creates competition amongst fellow students • Increased competitiveness • Competition • Competitive with others at the end.
Convenient	• Was able to use device anywhere • It could be convincible approach but during in dissertation time. • Everyone can answer • Can use with phone
Easy to use and user friendly	• No feedback on answered questions • Easy to use • Different types of questions in a good learning way
Test the understanding, summaries the learning outcome	• It made me question my understanding of the course because I'm unable to answer questions in time • It helps to understands the notes from the lectures • Improve understanding of lecture • Giving me some choices, then ask which is correct. • Asking questions about topics thought in class served as a refresher

Table 7: Summary analysis of the students' dislike of Tophat

Q: What did you not like about the use of Tophat in enhancing your learning experience?	
Codes from the data	Actual quotations
Surface learning, in-depth learning	• No feedback on answered questions
Technological infrastructure (Wi-Fi, devices, and classroom, integrated with Moodle)	• Tophat is superfluous, why do not use our Moodle? • The fact that the questions are done live in lectures. Sometimes I did not have my tablet or laptop with me and it is annoying to complete questions on a mobile device • Sometimes no signal • Sometimes it gets reset, keeps showing the same question, what I experienced during the questionnaire • network problem • I didn't like its complex procedure, everybody can't afford android phones and this software is working on assumption that everybody has android phones and that also in working condition every time, please keep learning procedure simple, so that we learn what is required not the technology for its usage.
Time to response	• Not very useful. When I can use this program, the time, question, answer are limited. On other time, is just a picture on my iPad and nothing in it • Not enough time cope the word answers • Not enough time to complete all the questions • Access through phone which is difficult to type
Fully explanation on how to use it and the purpose of using it	• A bit complication to register • The fact that it wasn't introduced in the beginning of the course, If It was introduced earlier, I feel it would have really enhanced my learning experience • Never use it before • Open questions are not clear enough • Not fully prepared and used when the class was done so to motivation from the class was lacking • I should use it more and know an effective way to get use it • It doesn't work well on my phone and the time frame before the next question pops in is too short have experienced difficulties to use it and don't know where to find feedback for my answers • A bit hard to understand at the beginning how it works

Discussion

RQ1: Does student class participation improve with the use of their 'disruptive' devices on the Tophat platform?

The data demonstrated that the students' participation in the module with the use of Tophat on their digital devices increased from week to week. User friendly interface and active learning approach resulted to increase in the student excitement and motivation to participate in the module activities. Variation in the types of questions used served to encourage student participation and held their attention for a longer period of time.
On the other hand, some challenges were identified. Some of these were that it took around three weeks to encourage all the students to register on Tophat. Also, the students struggled with the technological infrastructure; these were in relation to access to internet connection in that classroom (wifi), affordability of smart mobile devices; proficiency in the use of these devices; desire of working on a familiar existing platform (Moodle). When the students did get involved with the activities, the data suggested that some of them (11%) were of the view that the time given for them to respond to the questions was too short.

RQ2: What is the perceived impact of the use of TOPHAT on students' engagement?

Quantitative analysis showed that digital attendance register through Tophat improved students' classroom attendance. The quick test at the end of each session gives students a clear idea of the expected learning outcome and the results informs them of their sense of mastery of the topic covered. The availability of the revision questions with correct answer also allows students to reinforce their learning, conduct constructive revision and further study. Furthermore, the use of tournament fosters students' behavioral engagement and affective engagement as competition with peers was found to increase students' enthusiasm and motivation towards the module. Discussion forum generated learning communities, in which students interacted with lecturers and peers easily through their digital devices. This close interaction between lecturer and students on the platform was found to improve students' critical thinking, knowledge acquisition and overall learning experiences. Most importantly, Tophat provide a platform that allows students who are shy and deliberate to express themselves. Such anonymous voting and discussion system maximize students' psychological adjustment and knowledge attainment.

RQ3: Does Tophat increase the amount of formative feedback received by students?

Both quantitative and qualitative results showed that the use of Tophat as part of the module plays an important role in providing instant and clear feedback. Easy access to the feedback could help students develop their understanding of the knowledge and feed-forward to complete their integrated coursework. However, using Tophat as a means of focusing on providing prompt and summative feedback results to a lack of detailed explanation and as such limits

students' in-depth knowledge exploration. As most of the management module request students to think outside the box, vague feedback may restrict students' creativity and ability to formulate a broad understanding.

Conclusion

This study aims to determine whether the use of Tophat could enhance students' engagement and provision of feedback/feedforward in a higher education module. The findings showed that the integrated features of Tophat such as tournament and quiz increase students' engagement across all the age range and gender. Prompt feedback received by the students enables the process of their revision and ability to apply the knowledge of concept acquired (feedforward). These results are important for educational practitioners as there is university emphasis on a move towards the application of digital technology in teaching, learning and assessment. The impact of Tophat was found to transform disruptive digital devices to efficient tools for pedagogical interventions. Furthermore, in relation to the classroom application, the students' digital devices were used to constructively impact the lecture sessions. They were found to engage with the learning through the activities set up on the Tophat platform. The implication from the findings of this research is that the use of digital devices as an innovative tool can enhance students' learning experiences by providing instant and quality feedback.

Limitation and Future work

Not all the students that participated in the study had sufficient understanding of the use of the technological infrastructure. The Tophat system was not used repeatedly as a means of teaching and engaging the students fully during the lectures, but at the end of the 50minutes lectures. Students were provided with revision questions, which they attempted after lecture session. These questions were designed to engage them for 30 minutes and feed-forward for their coursework. These questions could have been more comprehensive and engaged them for a longer period of time. The research focused on one master level module, further study can be expanded on undergraduate level.

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