



Issues in Informing Science + Information Technology

An Official Publication
of the Informing Science Institute
InformingScience.org

IISIT.org

Volume 16, 2019

TECHNOLOGY IN THE CLASSROOM: TEACHERS' MOBILE TECHNOLOGY CHOICES IN RELATION TO CONTENT CREATION AND DISTRIBUTION

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ABSTRACT

Aim/Purpose	Teachers are being asked to integrate mobile technologies into their content creation and distribution tasks. This research aims to provide an understanding of teachers taking on this process and whether the use of technology has influenced their content creation and distribution in the classroom.
Background	Many claim that the use of technology for content creation and distribution can only enhance and improve the educational experience. However, for teachers it is not simply the integration of technology that is of prime concern. As teachers are ultimately responsible for the success of technology integration, it is essential to understand teachers' viewpoints and lived technology experiences.
Methodology	The Task-Technology Fit (TTF) model was used to guide interpretive case study research. Six teachers were purposively sampled and interviewed from a private school where a digital strategy is already in place. Data was then analysed using directed content analysis in relation to TTF.
Contribution	This paper provides an understanding of teachers' mobile technology choices in relation to content creation and distribution tasks.
Findings	Findings indicate that teachers fit technology into their tasks if they perceive the technology has a high level of benefit to the teaching task. In addition, the age of learners and the subject being taught are major influencers.

Accepting Editor: Eli Cohen | Received: December 12, 2018 | Revised: February 10, 2019 |
Accepted: April 15, 2019

Cite as: Sackstein, S., Spark, L., & Turner, B. (2019). Technology in the classroom: Teachers' technology choices in relation to content creation and distribution. *Issues in Informing Science and Information Technology*, 16, 235-254.
<https://doi.org/10.28945/4316>

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Recommendations for Practitioners	Provides a more nuanced and in-depth understanding of teachers' technology choices, which is necessary for the technology augmented educational experience of the future.
Recommendations for Researchers	Provides an unbiased and theoretically guided view of mobile technology use with content creation and distribution tasks.
Impact on Society	Teachers do not appear to use technology as a de facto standard, but specifically select technology which will save them time, reduce costs, and improve the educational experiences of their learners.
Future Research	A mixed-method approach, including several diverse schools as well as learners would enrich the findings. Furthermore, consideration of hardware limitations and lack of software features are needed.
Keywords	task-technology fit, education technology, content creation, content distribution, technology choices, teachers

INTRODUCTION

Technology offers potential benefits such as automation of tasks, reduction in costs and saving time (Verkijika & De Wet, 2018). According to Moreno-Munoz, Bellido-Outeirino, Siano, and Gomez-Nieto (2016) the inclusion of technology into almost every aspect of peoples' lives has facilitated vast improvements in communication and knowledge building, making connections between people instantaneous (Osseiran, Monserrat, & Marsch, 2016). In the past few decades, the advancement of technology has led to an increased demand and ever decreasing costs of ownership, which has resulted in spiralling technology sales (Potralia, Balland, & Morrison, 2017). Bulman and Fairlie (2016) argue that not only is technology integration being advocated in general society and industry, but so too in education.

In the past, technology within schools was limited to computer laboratories and was not readily accessible to both teachers and learners and, therefore, was often not utilised effectively (Clark & Luckin, 2013). However, as technology has progressed and become more mobile and affordable (Kilis, 2013), an increasing number of schools, teachers, and learners now have greater access to technology and are beginning to utilise mobile technology in the classroom. Furthermore, in order to reap the promised benefits that technology offers within an education context, large amounts are being invested by various stakeholders (Bulman & Fairlie, 2016). While Christensen (2002) claims that educational technology can only improve current educational contexts, Finley and Hartman (2004) argue that this can only be an improvement if every stakeholder is prepared to make the required changes to take advantage of the benefits offered. According to Berrett (2012) there are teachers who claim that technology does not improve education and has even made their teaching experience and related teaching tasks worse (Selwyn, 2015). However, Selwyn (2015) argues that teachers misunderstand the benefits that can be gained with technology integration due to the multi-faceted nature of the change that teaching with technology brings (Howard, 2013). It is the teachers, claims Prensky (2001), that resist technology integration as it requires them to rethink their teaching. Therefore, in order to understand how mobile technology is influencing education it is essential not only to understand mobile technology, but also to understand teaching tasks and teachers' perceptions of using these technologies in the classroom.

TECHNOLOGY

While classrooms have been equipped with technologies since the 1950s (Cuban, 1986), more recently the move towards replacing the "traditional textbook, pen and paper" with technology (Sackstein, Spark, & Jenkins, 2015, p.1) has resulted in classrooms becoming equipped with mobile technologies, both globally and within South Africa. According to Henderson and Yeow (2012), mobile technolo-

gies are more appealing and attractive than traditional classroom tools and are consequently increasingly the technology of choice in the classroom. Such devices offer extensive functionality; accessibility to a wide range of applications; are portable in nature; have extended battery power; and are cost effective (Dias & Victor, 2017). Hauptman (2015) states that mobile technology is any portable computing device with a touch screen which can run applications and is able to connect wirelessly to the Internet. Thus, the term mobile technology can be used to describe many new generation laptops, tablets, and smartphone technology.

Laptops, according to Russell, Bebell, and Higgins (2004), are used by teachers as an aid in giving lessons and used to perform administrative tasks. In addition, laptops can be used in conjunction with tools such as projectors in order to allow on-screen resources to be seen by the class (Richtel, 2011) as well as to perform administrative tasks such as compiling marks, keeping track of learner progress, and facilitating compilation of report cards (Inan & Lowther, 2010). Tablets, which are effectively a large touchscreen device (Thinley, Geva, & Reye, 2014), enable direct manipulation of the screen as there is no mouse (Buxton, Hill, & Rowley, 1985). In addition, as tablets can be used easily with one hand holding the device while the other operates the screen (Thinley et al., 2014), the use of a stylus to write on and annotate documents (Montrieux, Vanderlinde, Shellens, & De Marez, 2015) is advantageous. However, a disadvantage of tablets is the lack of a physical keyboard, as the virtual, on-screen keyboard of a tablet is not perceived as efficient as a physical keyboard (Montrieux et al., 2015). Smartphones are small-to-medium sized touchscreen devices that can fit in one's pocket and can be operated easily with one hand (Thinley et al., 2014). Smartphones are equipped with cellular data connections which make these devices almost always available for contact and collaboration (Gikas & Grant, 2013). One of the biggest disadvantages of smartphones is the small screen, which makes it one of the most difficult devices on which to create rich text documents (Gikas & Grant, 2013).

The range and proliferation of technology has not only created a wide range of possibilities for teachers but also has brought about challenges as teachers now need to adopt and integrate these varied forms of technology into their classes (Buabeng-Andoh, 2012). While portable technology offers multiple advantages for education, according to Clark and Luckin (2013), teachers need sufficient time to understand the features of each of the devices and ascertain how the various devices might best fit their teaching context and specific teaching tasks.

TEACHING TASKS

According to Shulman (1987) teaching is the act of imparting knowledge and skills and all teachers need to perform basic teaching tasks. Teaching involves varied tasks such as housekeeping duties, course execution, informing learners of what is required for the course, as well as describing what is required of the learner through the creation and dissemination of content (Calvert & Sheen, 2015). R. Ellis (2009) proposes that, to be considered a teaching-related task, the task needs to focus on the meaning of the coursework, have a knowledge gap to be filled, provide resources to bridge this gap, and present a framework to assess gap-bridging outcomes, in the form of an assessment. Teaching tasks include creating and distributing learning content for lessons; creating and administering assessments; application of theory to educational experiences; and facilitating communication between teachers, learners, and parents (Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur & Sendurur, 2012; Hew & Brush, 2007; Levy & Wubbels, 1992).

As different teaching methods exist on either end of the spectrum, from traditional or instructivist (Entwistle & Ramsden, 2015) to modern or constructivist (Beck, 2009; Kerres & Heinen, 2015), Buabeng-Andoh (2012) argues that the tools used for teaching tasks may differ depending on the methodology preferred by the teacher. Kim, Kim, Lee, Spector and DeMeester (2013) argue that technology use is "tightly connected with teachers' beliefs about effective ways of teaching" (p.78). These beliefs, claim Kim et al. (2013), are fundamental in nature and, even though teachers' roles may constantly change (Avidov-Ungar & Forkos-Baruch, 2018), altering these beliefs and their associated

teaching practices, which are based on personal and emotional experiences (Prestridge, 2012), does not happen quickly (Kim et al., 2013). While traditional or instructivist teachers have been thought to be less inclined to make use of technology in the classroom and modern and constructivist teachers are viewed as more enthusiastic about technology utilisation (Prestridge, 2012), Kim et al. (2013) and Ertmer et al. (2012) found that enacted beliefs, i.e., teachers' actual use of technology in the classroom, do not always align with teachers' fundamental beliefs about teaching. According to Ertmer et al. (2012) and Prestridge (2012), individual differences and the realities of the classroom also need to be taken into account when understanding teachers' technology choices in relation to teaching tasks.

While all teaching tasks are important and critical for effective teaching to take place, technology integration, claims DuFour (2002), is more focused on motivating teachers to make use of technology to create and share their content digitally. Moreover, according to Hadley and Reiken (1993), before teachers can begin imparting knowledge, assessing learners, or communicating progress, they are required to create or obtain content. Therefore, content creation and its subsequent distribution have been selected as the teaching task for this paper.

CONTENT CREATION AND DISTRIBUTION

Content creation is not new, in the sense that content has always been created for learners by someone, whether it is the teacher giving the lesson, another teacher, or an author of a textbook (DuFour, 2002). Content creation as a teaching task entails the production and sharing of resources for use in an educational environment (Hew & Brush, 2007). In a pre-technology context, content was largely distributed by paper and other resources would be restricted to the class (Sandholtz, 1997). For example, notes would be handwritten or typed and printed, which would then be photocopied and distributed to learners in class (Sandholtz, 1997). With technology integration, while the content is usually selected by the teacher in relation to the curriculum, learners can also select their own content through libraries or online resources (Gürol & Atsan, 2006).

Content distribution goes hand-in-hand with content creation, which entails providing content that has been created for learners (Ferdig & Trammell, 2004). Content distribution is the method of delivering content to the learner, whether it be physical notes handed out in class or digital notes downloaded online (DuFour, 2002). Prior to technology integration, content distribution was limited to hard copy notes and more recently to watching educational related videos in class. However, with greater access and availability of technology and associated tools, content distribution has been moved into a digital space that is not restricted by location (H. Huang, 2002). Aubusson, Burke, Schuck, Kearney and Frischknecht (2014) and Skinner (2016) claim that using technology in the classroom improves and enriches content distribution. For example, with learning management systems, notes can now be distributed on a digital, networked platform (Sandholtz, 1997; Skinner, 2016) and videos shown in class; these can be "re-watched" by the learner in another location (H. Huang, 2002). However, according to Watson (2001), teachers are resistant to using technology to distribute content as it introduces additional administration and technical tasks that did not exist when notes were distributed in hard copy. Despite this resistance, the investment in technology, and the growing demand for educational institutions to teach the 21st century learner, has meant that integrating technology is still strongly encouraged or actively imposed on teachers (Buabeng-Andoh, 2012; Christensen, 2002; Watson, 2001).

RESEARCH GAP

While teachers are constantly being bombarded with claims that using content creation and distribution technology in the classroom will improve the quality of education (Liu, Liao, & Pratt, 2009), Romiszowski (2004) argues that the use of technology for the creation and distribution of teaching content does not automatically translate into improved teaching and educational experiences. According to Sandholtz (1997), teachers with mainly instructivist teaching beliefs may resist integrating technology into their established pedagogic practice as they think that the technology does not assist

them in augmenting the educational experience of learners. In addition, teachers which hold predominantly constructivist teaching beliefs may not necessarily make use of technology in the classroom due to personal experiences or a mismatch between their ideals and the reality in the classroom (Prestridge, 2012). Therefore, it is clear that integrating technology into the classroom for content creation and distribution is not a simple issue.

As teachers determine whether or not technology is successfully integrated in the classroom (Hew & Brush, 2007; Liu et al., 2009) in order to gain a more nuanced insight into technology integration for content creation and distribution tasks, it is necessary to understand *whether teachers' perceptions of technology and the task being conducted influences teachers' choices to make use of content creation and distribution technologies.*

THEORETICAL FRAMEWORK

In order to analyse teachers' tasks of content creation and distribution in relation to technology integration in the classroom, the Task-Technology Fit (TTF) (Goodhue & Thompson, 1995) has been utilised. Task-Technology Fit, as the name suggests, makes use of two constructs; namely a Task's characteristics and a Technology's characteristics (Goodhue & Thompson, 1995). According to Goodhue and Thompson (1995), TTF is based on a utilization of information technology to perform organisational tasks, and therefore the outcomes are measured through improvements in job performance based on the integration of technology. Therefore, TTF is an appropriate theoretical framework as it deals with task, technology, and the fit between them.

RESEARCH METHODOLOGY

This study made use of an interpretivist paradigm in order to provide a lens by which to better understand the multiple, subjective social realities (Humphrey, 2013) of teachers. In addition, a qualitative research method using an exploratory research design was used to obtain an in-depth perspective of the individual teacher (Shields & Rangarajan, 2013). The single case study approach provided a rich and holistic understanding of "how" and "why" people make certain decisions (Nieuwenhuis, 2010).

Teachers from private schools within South Africa were selected as the population for this study as they have been working with technology for a longer period of time than teachers at government funded (also called public or state) schools (Selod & Zenou, 2003). At the private school selected, a digital strategy has been put in place that addresses both teachers and learners. All teachers at the high school have been issued with laptops and are allowed to make use of their own technology in the classroom. Learners are also required to use tablets issued by the school in place of textbooks, as well as submit the majority of their assignments digitally. Within the selected school, as it is likely that some teachers are more comfortable with technology than others, non-probability purposive sampling and face-to-face interviews were used to collect data from the teachers using a set of a-priori codes that were developed in reference to the TTF theoretical framework. The teachers interviewed in September 2018 were randomly chosen from those who said they use technology and who wished to participate. The interviews were semi-structured asking for demographic information, which education technology they used to create content, why that technology was chosen, and how that content creation was influenced by the education technology chosen. The interviews lasted for approximately 30 minutes

Six teachers with differing demographic characteristics were interviewed, at which point saturation was achieved. This makes use of the guideline provided by Mason (2010), which suggests that collecting more data would not likely add more value to that already collected. All teachers interviewed were female; the school employs 75% female staff. All interviews were recorded and transcribed verbatim to ensure credibility and trustworthiness. The teachers were also able to review the transcripts to confirm that their opinions were accurately represented. According to Humble (2009), a directed

content analysis entails applying the various groups of content collected within the concepts to the new context. As a result, once the teachers confirmed their responses, it was appropriate to perform a directed content analysis to understand how the responses are related to the teachers' technology choices for content creation and distribution in relation to the TTF theoretical framework.

RESEARCH FINDINGS

The content analysis, which provides insights into teachers' feelings, experiences, and attitudes to the tasks, the technology, and how the fit between the two occurs in the classroom (Hsieh and Shannon, 2005), has been separated into the three distinct parts of the TTF model. Firstly, **Task**, which refers to the teaching activity being carried out in a classroom such as creating or delivering notes (Goodhue & Thompson, 1995). Secondly, **Technology**, which refers to the actual technology being used as well as the reason(s) why it is being used (Goodhue & Thompson, 1995) is presented. Lastly, **Fit**, which refers to how the teaching task and teaching technology fit together based on subjective views and past experiences (Goodhue & Thompson, 1995) is presented. In order to protect the confidentiality of teachers, their names are represented by pseudonyms.

TASK

In order to understand how the nature of the Task plays a role, teachers were asked how they perform content creation and distribution for resources and notes. Resources refer to any content created and given to the learner by the teacher whether it is direct or indirect (Wiley, 2007), while notes are a subset of resources (Brown, Doughty, Draper, Henderson, & McAteer, 1996). As the creation and distribution of resources and notes are not one task, they are presented separately; creation occurs first, and may even influence the distribution method chosen by the teacher.

Note creation

For creation of notes, teachers report that they use Word Processors with Google Images, dictation (speech-to-text software), PowerPoint slideshows, and YouTube videos.

While all teachers report they are using technology to create learner notes, Gloria, Rachel and Tessa report that they specifically use a Word Processor to create learner notes. Tessa uses a Word Processor and Google Images because of convenience and up to date information: *"You can go onto Google Images and pretty much get what you're looking for."* Rachel uses a Word Processor to create her own notes that are not used by other schools: *"We actually create the notes ourselves."*

Norma makes use of Pinterest boards to differentiate her classroom note-taking experience: *"put them [notes] into Pinterest where they were given a [project] brief."* Norma also uses dictation software to create notes with her voice because this enables her to get her *"thinking through faster."*

While Sheryl and Abigail do not make notes themselves, they use materials which allow their learners to take notes in class. Sheryl makes PowerPoint slideshows because her learners prefer it to taking notes from a textbook: *"I do a lot of summaries based on the book, putting on a slideshow ... I just think that the kids like it much more than reading from their book."* Abigail says that using PowerPoint slideshows create a dynamic class environment with note taking: *"It just creates a much more dynamic class environment."* Abigail also makes use of YouTube videos to enhance her classroom note taking experience, *"if there's a junky YouTube video, I use that,"* and states that it makes *"a very interesting introduction into a new chapter."*

Distributing notes

For distribution of notes, teachers report that they use digital distribution platforms (such as ITSI), physically handing out notes in class, or a combination of the two.

In relation to distribution of notes, Rachel, Gloria, Norma, Sheryl, and Abigail report using a digital distribution platform: *"We use ITSI which is an online portal"* (Rachel). Reasons given for this choice are,

“We got ITSI that we use ... so ... that [notes] can get posted there ... where all the children have access to it” (Gloria); “... e-content is saved to the ITSI group ... I have taken some previous worksheets, scanned them and loaded them” (Norma); “Yes, because all the books are on ITSP” (Sheryl); “... we actually push it onto ITSI and they can get it directly from there” (Abigail).

However, it appears the choice to make use of the digital distribution platform varies according to the age of the learners (“you can see when the trend changes,” Rachel) as there is a different level of focus between junior and senior learners in using tablet technology. According to Rachel, with junior grades “games are massive” and thus the loss of control leads to less technology use “the minute you allow them [learners] to use a device ... there is a lack of focus”. Therefore, for younger grades, Rachel reports that she prints and delivers paper notes to the learners (“we create the notes ourselves and then print and give them”), while for the senior grades, learners use their tablets to access the notes (“we use the tablet, we use ... ITSP”). Abigail shares the same sentiment, bringing in that most parents of the learners would rather not have their children using a tablet: “most of the parents also prefer that because if the book isn’t on their tablet, the kids can be on any random website.” Tessa, who is the only teacher that does not appear to make use of the digital distribution platform but rather prints notes for her learners, says, “It’s very difficult to tell what they are doing in your classroom if you are ... using an iPad to teach.” Tessa goes on to say that learners tend not to read their notes on tablets: “They don’t read things [on tablets].”

Resource creation

Teachers report that the nature and extent of their resource creation, which includes PowerPoint presentations, YouTube videos, and hard copy resources, depends on the subject being taught. Teachers report that PowerPoint presentations are a popular tool for resource creation. For English it “mostly would be for poetry” (Rachel); Geography “for sharing of information” and “to teach them [learners] how to build things; and in Business Studies, for “presentations only” (Abigail). YouTube is also used in subjects like History “for introducing a concept and things like that” (Gloria). Hard copy resources are reported as important for subjects like Accounting “that’s the only way it works because you actually have to practice” (Abigail).

Resource distribution

Teachers report that for resource distribution they post online, print out resources, and rely on educational games. Teachers report distributing resources online via “ITSI, WhatsApp groups or email” (Gloria) and “Dropbox or ... Google [Drive] if it’s for the older grades” (Norma). Reasons given for online distribution are cost of printing: “... our English prep notes can run into eighty-ninety pages - so instead of printing all of that, we’re ... pushing it to them [online]” (Rachel). However, some teachers report that printed resources are being used as “most kids actually prefer the hard copy to highlight, to make notes, to make notes next to”. Educational games are also being used to distribute resources, for example in Business Studies “we play Caboot games, we will stop [the lesson], we will quickly go to Caboot and we will quickly come back” (Sheryl).

Table 1 summarises how teachers create and distribute notes and other resources, i.e., their tasks.

Table 1: Summary of Task

	Notes	Other Resources
Creation	Uses Word Processors, Google Images, PowerPoint slideshows and YouTube videos.	Uses PowerPoint slideshows, hard copy resources and/or YouTube.
Distribution	Posted online or printed hard copy. Dependent on age of the learner receiving the note.	Posted online, printed hard copy or through educational games. Dependent on the subject being taught.

TECHNOLOGY

In order to understand how the nature of the Technology used by teachers plays a role, teachers were asked how they used technology both in their personal and work capacities.

Personal relationship

Except for Sheryl, all teachers report that they use laptops for a variety of personal activities such as banking; research via searching the internet and YouTube; online shopping; communication via email, social media and Skype; and document creation. Sheryl, however, uses her laptop only for work related activities: *“If I’m not doing any school work that I’ve taken home, I can’t say I use a laptop at all.”* In relation to tablets, some teachers report using tablets for personal tasks such as playing games (Gloria) and social media, *“Facebook, Instagram”* (Sheryl). Norma and Abigail do not even own tablets, and it seems as if tablets are not used as much *“because everything I can do on my tablet, I can do on my phone”* (Rachel). Smartphones are reportedly being used for communication tasks by most of the teachers: *“getting emails, phoning, texting”* (Gloria); *“phone calls and texting”* (Rachel); *“communicating with friends and family”* (Abigail); *“email, especially at home, the emails are a big thing.”* (Sheryl). Norma however reports that she also uses her phone for documents: *“I’ve got Excel, PowerPoint and Google Docs on my phone.”*

Classroom relationship

Findings indicate that teachers make use of laptops in the classroom for administration and communication tasks as well as content creation and distribution. For administration and communication tasks, Tessa reports that she uses her laptop *“doing our marks ... school emails”* and Sheryl *“to take register and perform general administration tasks.”* Content creation tasks vary from using *“Word, Excel, and PowerPoint”*; to *“setting up worksheet ... and tests”* (Tessa); to *“YouTube videos for introducing a concept”* (Gloria); to using Photoshop to *“digitally manipulate pictures.”* Content distribution tasks include using Pinterest for teaching purposes (*“I have devised a Pinterest board,”* Norma) and Dropbox or Google Drive to share content (*“I have a Google and Dropbox account”*). Findings suggest that the subject being taught may influence the way in which laptops are used: *“For Accounting I use the laptop to mark ... to show calculations”* while *“for Business Studies I use it to show either YouTube videos or snippets out of Dragon’s Den”* (Abigail). Abigail reports, *“I use my laptop literally every single minute of a teaching day,”* but it seems that the lack of wireless capability on current laptops may also influence use: *“I would like to be able to use my laptop wirelessly ... completely un-cabled because that will mean I’m not bound to my desk”* (Rachel). Due to school policies that require the migration from tablets to laptops, teachers do not make use of tablets in the classroom, *“unless I’m working on the learner’s tablet”* (Norma). While there seems to be a general consensus that *“laptops and smartphones are both working towards the same objective”* (Norma), most of the teachers report that they do not make extensive use of their smartphones in the classroom: *“I don’t actually use my phone in my classroom a lot”* (Abigail); *“the children use theirs for research and things like that ... I don’t use mine”* (Gloria); *“it’s very difficult ... I find the space is too small”* (Norma). Rachel however reports using her smartphone for communication tasks, *“I keep apprised of what’s happening socially and academically in each class,”* whereas Norma indicates that she uses her smartphone in class for productivity apps, *“I’ve got Excel, PowerPoint, and Google Docs on my phone”*.

Table 2 summarises which technology is used by teachers for various tasks.

Table 2: Summary of Technology

	Communication	Productivity Apps	Administration Tasks	Online Storage
Laptop	X	X	X	X
Tablet				
Smartphone	X	X		

TASK-TECHNOLOGY FIT

In order to understand the Task Technology Fit, teachers were asked whether they believe the integration of technology has changed how they perform the tasks of content creation and distribution. Content creation is presented first, followed by content distribution and then perceived benefits and issues are presented.

Content creation

While teachers report that initially using technology for content creation tasks was daunting (“*I was very overwhelmed, but now it’s like second nature,*” Sheryl), most teachers believe that content creation is now easier due to the introduction of technology (“*I am old-school however technology is amazing,*” Gloria). According to Sheryl, who is now creating content by making slideshows for the learners “*back then it was quite difficult.*” For Norma, “*I used to take old calendars and cut them up and display them for the learners;*” she is now able to make boards using Pinterest. To create content, teachers feel that using technology enables them to make content more relevant as it encourages one “*to look outside the syllabus*”. Furthermore, it enhances the content being created, “*yeah, it’s helped hugely because ... history lends itself to research*” (Gloria), for example, “*we can research a building*” (Tessa).

Content distribution

Teachers feel that technology use has been advantageous for content distribution tasks as “*it saves a ... lot of time*” (Rachel). Previously “*we would have them write everything out of overhead projectors ... now I have the option of pushing it directly to their devices*” (Rachel). Tessa concurs “*the visualisation of diagrams is now a lot easier, you can show them more, you have access to more diagrams.*” Technology reports Norma, also assists her distribution tasks, “*I’ll project the images much larger and when it comes to art, sometimes the image I project is larger than the image in life ... this improves the interaction between the viewer and the art.*”

Benefits and issues

According to Abigail, using technology in the classroom is important as “*we need to prepare the kids for what they’re going to expect in the adult world out there ...*”. Furthermore, the ability to continue learning outside of classroom time is a benefit: “*if they haven’t understood their teacher, they could watch a lesson in a different manner which might help them*” (Tessa). However, teachers mention a number of concerns and issues with technology use for content creation and distribution tasks. Firstly, it can be distracting in the classroom: “*There is a lack of focus the minute you allow them to use a device in the junior grades ... I find technology to be distracting to the kids*” (Rachel). Secondly, when the technology does not work, it can be very frustrating: “*It’s great when it works because if it doesn’t work then, major problems*” (Gloria). Thirdly, teachers believe that a focus on using technology may result in the loss of fine motor skills: “*I think we need to be careful that we don’t lose our fine motor skills by using our verbal dictation options*” (Norma). Finally, constant use of technology may disable learners’ ability to think on their own: “*Not going to lie ... I think it’s made children dumber*” (Tessa).

ANALYSIS AND DISCUSSION OF FINDINGS

TASK

Task, within the TTF, refers to the teaching activity being carried out in a classroom such as creating or delivering notes and resources (Goodhue & Thompson, 1995). Key findings suggest teachers’ choices to make use of technology for the creation and distribution of notes varies according to the grade level of the learners which they are teaching, whereas, for other resources it is the subject which they are teaching which influences this choice.

Notes - Age of the learners

Sandholtz (1997) states that notes are either handwritten or typed out, depending on teaching style and are then usually printed and handed out to learners during class. According to teachers, the method of creating and distributing content, specifically class notes, depends on the age of the learners. Teachers report that they do not allow learners to make use of technology in the junior grades of grades 8 and 9, but rather use hard copy notes due to distractions *“the kids can be on any random website ... and playing around on their tablets”* (Abigail) as well as *“they don’t read things [on tablets]”* (Tessa). This aligns with Beland and Murphy’s (2016) study, which found that children under the age of 14 are most likely to be distracted by technology while the level of distraction decreases as the children get older. Therefore, claim Beland and Murphy (2016), teachers are less likely to use technology for notes as distractions diminish the quality of the teaching task.

Conversely, teachers report that most senior classes of grades 10 to 12, who are less distracted by the technology, are given the opportunity to utilise technology because of the cost-saving benefit of creating (*“back then it was quite difficult,”* Sheryl) and distributing notes online (*“prep notes can run into eighty/ninety pages - so instead of printing all of that, we’re literally just pushing it to them ... it saves a lot of time,”* Rachel). Goldin and Katz (2018) concur that technology is implemented in education not only to save money in printing, but also to save teachers’ time in preparation, printing, and distribution of notes. This suggests that teachers make use of the technology for the creation and distribution of notes when it saves them preparation time and printing costs, as long as it does not act as a distraction for the learners.

Resources - Subject being taught

H. Huang (2002) states that resources are the learning materials that are created by teachers, and include more than just class notes, as they are also used to demonstrate concepts in the class. The findings of this study seem to indicate that different methods are used for the creation and distribution of resources depending on the subject being taught. This aligns with V. Ellis and Loveless (2013) who found that different subjects and/or fields tend to call for technology at different levels.

Language & social sciences. Findings suggest that teachers are making use of technology for resources when teaching English (*“in English it would be off the slides”*) whereas in Geography *“they work off those printed notes”* (Rachel). V. Ellis (2013) concurs that language subjects like English are experiencing a shift towards the extensive use of technology in all areas, whereas technology is only being used for certain components of Geography of cartography through the application of Geographic Information Systems (Kerski, Demirci, & Milson, 2013). For subjects like History, Loveless, DeVoogd and Bohlin (2013) claim that the instantaneous availability of information due to the use of technology is more beneficial for teachers than traditional methods of looking up information in textbooks. Findings concur that subjects like *“History lends itself to research”* (Gloria) as technology enables one to conduct research more effectively.

Visual and creative arts. Findings suggest that the use of technology benefits content distribution in relation to ease of distribution (*“I will email it to them or drop it into the Dropbox or Google Drive for the older grades,”* Norma), however, the reproduction of the artwork may differ (*“the colour of the piece in a gallery versus a textbook version versus a printed version versus a digital version may all be four different colour versions,”* Norma). Long (2013) concurs that even though variations in reproduction may occur, the visual aspect of art benefits from the digital distribution of content. Furthermore, digital skills, claims Long (2013), are essential in today’s current art curricula and provide another medium for achieving a goal. Findings agree, as Norma reports that learners are required to use technology in the arts: *“they use Photoshop to digitally manipulate ... their photographs”*.

Business studies and accounting. Loveless et al. (2013) state that subject areas like Business Studies, which require learners to apply real-world context to theory, benefit from access to a wide range of resources. Findings concur as teachers involved in Business Studies report that digital tools such

as PowerPoint and YouTube are being used to create resources (“*I like creating PowerPoint slideshows where I can,*” Sheryl); as they are relevant and engage the learners (“*You know if there’s a funky YouTube video, I use that,*” Abigail). Furthermore, the ability to research within subjects like Business Studies is seen by teachers as important as it facilitates collaboration: “*asking them to search for relevant things on their phones or tablets ... they then collaborate*” (Abigail). However, for Accounting, teachers report that the distribution of hard copy resources is “*the only way it works because you actually have to practice [by writing on paper]*” (Abigail) as Accounting is a practical subject. Findings confirm that teachers will integrate technology when it fits in with their style of teaching and suits the subject they are teaching (Watson, 2001).

TECHNOLOGY

Technology within the TTF framework not only refers to the piece of technology being used, but also to the underlying reasons as to why it is being used (Goodhue & Thompson, 1995). Key findings suggest that teachers’ tasks may vary according to their access to the technology and the perceived level of functionality of the technology.

Access to the technology

Tondeur, van Braak, Ertmer, and Ottenbreit-Leftwich (2016) suggest that access to technology use in one’s personal life improves the efficiency of workplace tasks. Furthermore, according to Bruder (2014) people prefer to carry and use one device to do both personal and business tasks. Findings indicate that teachers use the laptops given to them by the school for personal tasks as well as for school related work. Therefore, as teachers prefer not to change between work and personal devices, it seems as if their choice to use laptops in the classroom is not simply related to the task being performed, but also due to the fact that they frequently use laptops in both their personal and work lives.

However, findings suggest that tablets are not being used. A reason may be that since the school replaced teachers’ tablets with laptops, teachers report that “*unless I’m working on the learner’s tablet*” (Norma), they are not making use of tablets in the classroom: “*now it’s just a case of they’re at home to play games*” (Tessa). According to Lefoe, Olney, and Herrington (2008), teachers need to own and use technology in both their professional and personal contexts in order to engage with them in the classroom.

While the school does not provide smartphones for the teachers, all teachers report that they have access to a smartphone in their personal capacity. For work related tasks, some of the teachers report that they use their smartphones “*only for communication*” (Rachel) “*if someone needs you at school*” (Sheryl), whereas others report that “*I don’t actually use my phone in my classroom*” (Abigail), but rather the “*children use theirs for research, and things like that*” (Gloria). Derks, van Mierlo, and Schmitz (2014) suggest that low levels of smartphone use at work may indicate that smartphones are not considered to be technology that should be used in the workplace. This suggests that, while access to the technology is essential, it is not the only reason teachers consider when selecting which technology to utilise in the classroom.

Functionality

Valentini, Pescador, and do Sacramento Soares (2013) outline that laptops that are introduced in an education space tend to perform a set of functions which would be difficult for another device to accomplish easily. This sentiment is shared by many teachers, who report that they make use of laptops for a range of teaching tasks. A limitation in the functionality of the current implementation of laptops at the school is the absence of a wireless connection. Teachers believe this functionality is essential as they would then be “*completely un-cabled because that means I’m not bound to my desk*” (Rachel).

Findings indicate that teachers are using smartphones primarily for communication “*I keep apprised of what’s happening socially and academically in each class*” (Rachel). O’Flaherty and Phillips (2015) concur that

smartphones are best used by teachers as communication devices as they can be used for quicker communication as opposed to typing-intensive laptops. Notwithstanding the preferences for using specific technology to achieve certain functions, some of the teachers report that it is the combination of laptops and smartphones that really enhance the functionality of technology: *“I’ll be doing one task on the computer and different task on the phone ... they can both be working towards the same objective”* (Norma). Marcial (2010) claims that people choose to use devices that complement each other and thus teachers’ choices of laptops and smartphones in the classroom may be due to them being seen as complementary technologies, whereas tablets are perceived as more for personal use.

Findings indicate that teachers do not perceive tablets as technology that can be used extensively in the classroom (*“my tablet irritates me,”* Rachel), and teachers report that they are using tablets to *“play games”* (Gloria) and for *“Facebook, Instagram”* (Sheryl). Literature suggests the reasons that teachers do not perceive tablets as technology appropriate for the classroom may be due to the lack of a keyboard (Schaffhauser, 2015), small size of the screen, and the limitation of one screen at a time (Marcial, 2010). This sentiment is shared by teachers: *“prefer prepping on a laptop as I can type quickly ... I get frustrated on a tablet”* (Rachel).

TASK TECHNOLOGY FIT

According to Goodhue and Thompson (1995), the Fit refers to the level at which the Task and the Technology relate to one another in order to provide benefit. Judson (2006) suggests that teachers who accept technology in their teaching tasks tend to find the benefits of technology to be far greater than teachers who do not accept technology in their teaching tasks. Teachers report that while at first they were *“very overwhelmed”* (Sheryl) using technology for content creation and distribution *“now it’s like second nature”* (Sheryl); *“technology is amazing”* (Gloria); *“I quite like it. I like digital”* (Rachel). Key findings suggest that teachers perceive that using technology for the task of content creation and distribution enables them to extend the content of the syllabus being taught; improve the interaction between themselves and the learners; facilitate easier creation of content; and saves teachers time and the school money in the distribution of content.

Benefits

Firstly, in relation to extension of syllabus content, Collins and Halverson (2018) state that by using technology, teachers are able to obtain and explore a wide range of knowledge sources in order to create content that will enrich the learners’ experience. Findings concur that using technology *“enables me to look outside the syllabus”* (Gloria), and teachers are able to extend the syllabus to include varied types of notes and resources.

Secondly, findings indicate that for Visual and Creative Arts, the use of technology influences content distribution tasks. Norma believes that using the technology improves learner interaction with the content *“so I’ll project the images much larger ... larger than the image in life ... what does that do to the interaction?”* This supports Freedman’s (1997) research which suggests that using technology has the potential to change visual art forms, which consequently opens up greater opportunities for interaction, critique and viewing of the art. Thus, teachers of subjects like the Visual Arts may be more inclined to make use of the technology to distribute content.

Thirdly, teachers report that using the technology to create content is easier (*“back then it was quite difficult,”* Sheryl), as teachers are able to use available content and integrate it into their pedagogy. According to Wiley (2007) teachers frequently re-use already existing content, adapting or annotating the content for their pedagogical requirements.

Finally, teachers report that the distribution of content via online and sharing platforms saves them time as they can just send one email or post: *“so instead of printing all of that, we’re ... just pushing it to them online”* (Rachel). In addition, as notes and resources do not need to be printed out, teachers believe that using the technology saves money for the school. These findings are consistent with Blin

and Munro's (2008) suggestion that using technology for distribution of content to learners saves costs and time in terms of printing and photocopying.

Frustrations

While the benefits of using technology for the Tasks of content creation and distribution are evident, findings suggest that frustrations are also present. Frustrations resulting from the lack of Fit between the Technology and the Tasks of content creation and distribution include distracted learners, technology (technical) issues, and a concern over the loss of fine motor skills.

Findings suggest that teachers feel using technology, especially for content distribution to learners' devices, influences learners' level of focus. Teachers report that when they use technology to teach, "*I find technology to be distracting to the kids*" (Rachel) as "*it's very difficult to tell what they are doing in your classroom*" (Tessa). Jackson (2012) and Beland and Murphy (2016) suggest that distractions amongst learners are a common frustration when using technology for teaching tasks, and thus teachers may be inclined not to make extensive use of technology in the classroom despite the potential benefits.

Teachers report that technology (technical) issues are a major frustration: "*it's great when it works because if it doesn't work then, major problems*" (Gloria). Campbell (1997) indicates that these technical issues are a major stressor to teachers who have integrated technology in their classrooms, especially when traditional teaching tasks have been replaced by technology. Thus, teachers who have tried to make use of the technology but have encountered technical issues may be unwilling to make extensive use of technology in their teaching.

Lastly, findings suggest that teachers are concerned that extensive use of technology is resulting in the loss of skill sets which are non-digital in nature, like drawing and writing: "*I think we need to be careful that we don't lose our fine motor skills.*" This finding concurs with Sülzenbrück, Hegele, Rinkenauer, and Heuer (2011) who found that the secondary effects of computer usage in young children may affect fine motor skills for tasks like drawing and legible handwriting. Therefore, teachers report that replacing traditional teaching and learning methods entirely with technology is not ideal.

CONCLUSION

Educational technology literature (Hew and Brush, 2007; Liu et al., 2009) suggests the success of technology integration depends primarily on teachers. Therefore, this study explored whether teachers' perceptions of technology and the task being conducted, influence teachers' choices to make use of content creation and distribution technologies. In order to answer this question, Goodhue and Thompson's (1995) Task-technology fit model was used. This model allowed the study to consider the creation and distribution of content (Task), the technology used to create and distribute content (Technology) and how teachers perceive technology and how these perceptions influence their choices in relation to technology use (Fit).

Findings indicate that, while teachers perceive technology as beneficial to their content creation and distribution tasks, frustrations also exist. For content creation tasks teachers feel that the use of technology provides benefits as it facilitates the extension of the syllabus content; enables the use of varied types of content; and saves them time as they are able to re-use already existing online content. However, for some of the teachers the use of traditional, hard copy content is still preferable. In relation to the task of content distribution, although teachers feel that the use of technology saves them time, as they can now push content to the learners via online platforms, the use of technology can be frustrating as learners' may be distracted in the presence of technology thus influencing teachers' control in the classroom. In addition, frustrations are also experienced by teachers when technical issues arise. Finally, teachers report concerns about how technology will affect learners in the future with respect to skills, like reading and drawing.

TASKS

According to H. Huang (2002), Li (2003), Kerski et al. (2013), Long (2013) and Loveless et al. (2013), the way in which technology is used differs based on whether the technology can benefit teachers and learners within a specific subject. Findings from this study indicate that while teachers still make use of hardcopy textbooks, technology is being used extensively to create content. In the Languages and Social Sciences, while teachers appear to research and create content using technology, the distribution of content is mainly through printed notes. In the Visual and Creative Arts, teachers favour digital content creation and distribution as it augments the visual aspect of the art and saves costs. In the Business Sciences, findings indicate that Business Studies teachers make use of technology for content creation as it provides them with rich content as well as facilitates collaboration amongst learners. However, in Accounting, hard copy resources are still favoured by teachers, as they believe that practicing Accounting by writing on paper is essential.

TECHNOLOGY

In terms of characteristics of technology's influence on the choice of usage, the literature (Bruder, 2014; Marcial, 2010) suggests that screen size, access, and functionality of technology determine the use of technology or a set of technologies. From the findings, while teachers report making use of laptops and smartphones in personal activities, for classroom activities the combination of laptops and smartphones is preferred.

TASK-TECHNOLOGY FIT

Finally, in relation to the Task-Technology Fit, teachers perceive content creation tasks are best conducted when using a laptop. Smartphones and tablets are not viewed by teachers as conducive for content creation tasks due to the physical limitations of the devices or lack of personal use by the teachers. For content distribution, while a preference for laptops exists, teachers also feel that smartphones are effective for communication.

LIMITATIONS

A limitation of this study is that the responses to the interviews are self-reported (Rohman & Bohlin, 2011). This may lead to a level of dishonesty known as 'social desirability' (C. Y. Huang, Liao, & Chang, 1998). Another limitation of the study is extraneous variables which are not included in the Task-Technology fit model. In addition, this study included only the views of teachers at a single private school.

CONTRIBUTIONS

Theory

This study provides an understanding of teachers' technology choices in relation to the content creation tasks they perform in the classroom without any judgement as to whether the use of technology is positive or negative. Thus, it provides an unbiased view of technology use with content creation and distribution tasks. Furthermore, as this study employed a theoretical framework on which to collect data and analyse evidence, it provides structured and theoretically grounded research not present in much of the educational technology literature in this context.

Practice

This study indicates that teachers have reasons as to their choices of technology use in relation to content creation and distribution. Understanding these reasons provides teachers and educational institutions with insight into the complexity of technology integration by teachers in the classroom.

While for those advocating that technology use in education is a requirement for the 21st century, this study suggests that a more nuanced outlook needs to be considered.

RECOMMENDATIONS FOR FUTURE RESEARCH

This study was conducted at one private school, and thus including several diverse schools that make use of technology would enrich the findings. As only teachers were interviewed for the study, a study could be conducted with learners to obtain their views of how teachers distribute content. From this study, an understanding of why teachers do not choose a technology because of its lack of software features was not specifically addressed. Research conducted to uncover the choice and issues with technology's software in the classroom would be beneficial, as this study focused specifically on the hardware. Further studies using mixed-methods may also provide a more comprehensive view of teachers' technology choices when creating and distributing content.

AFTERWORD

While technology is espoused to benefit education and always be advantageous to teachers, we have often wondered if this is truly the case. Findings suggest that teachers do not simply make use of technology without primarily considering whether the technology is beneficial for that specific task within that specific context. Teachers do not appear to use technology as a de facto standard, but specifically select technology which will save them time, reduce costs, and improve the educational experiences of their learners. In addition, in many situations, teachers will choose not to make use of the technology as they believe it interrupts an existing, tried-and-trusted task of teaching: "*There are times where the traditional is definitely the better way to go*" (Rachel).

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BIOGRAPHIES



Suzanne Sackstein is a lecturer at the University of the Witwatersrand, South Africa. Suzanne has worked in the academic field for over 20 years and has a keen interest in the area of research of technology use within an educational context. Suzanne has published a variety of articles as well as presented at a number of conferences on these topics. She is currently pursuing her PhD looking at teachers' beliefs systems and professional dispositions in relation to technology in the classroom.



Linda Spark is a Senior Tutor who found lecturing by accident after a few years in corporate working as a programmer and a consultant. She has 25 years of lecturing experience, mainly teaching programming and IT ethics. She has previously been the Assistant Dean of Teaching and Learning for the Faculty. She is also the grant holder of a programme providing student support that goes beyond academic support. Her research areas include student success, technology in education, student competencies, and IT ethics.



Bryan Turner is a data analyst at World Wide Worx, specialising in data security and privacy. He is also a writer for South Africa's longest-running online technology publication, Gadget.co.za. He studied Information Systems at the University of the Witwatersrand, Johannesburg, and focused on information systems in an education context.