Evaluating Teachers' Digital Literacy

Adriano Quieti, Mahidol University International College, Thailand
Alex Nanni, Mahidol University International College, Thailand
Joseph Serrani, Mahidol University International College, Thailand

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Abstract
The rise in technological innovations and the educational benefits associated with them has resulted in an increased use of technology in education. The appropriacy and efficacy of the use of that technology, however, is not always guaranteed. Although there is an assumption among many educators that integrating technology into teaching and learning will be automatically rewarding, the degree to which that technology is pedagogically beneficial is reliant on a number of elements, including a teacher's ability to use and understand why they are using technology. Research was conducted at a preparation center to an international university in Thailand to evaluate the integration of technology in teaching and learning and to assess teachers' levels of educational technology literacy and the appropriacy and efficacy of their use of technology. It was conducted over one term and utilised questionnaires and interviews, combined with Davies' (2011) "Framework for Evaluating Educational Technology Integration."

Keywords**:** educational technology, educational technology integration, educational technology literacy

Introduction

Whether it was the introduction of the blackboard or the audio cassettes and videos that were listened to and watched by many during their school years, technology has always played a role in education. Until recently though, technology has played more of a "standardized and relatively stable [role]" (Mishra & Koehler, 2006), and there has not been too much direct emphasis from governments for educators to use technology in their lessons. With the recent technological innovations of the Internet, mobile and personal devices, technology in education is taking more of a central role with governments insisting on more integration of technology in teaching and learning. In addition, many students bring personal devices to lessons instead of traditional stationary (Glenn & D'Agostino, 2008). This has contributed to an enthusiastic adoption of a range of technologies, both institutional and personal, being integrated into learning environments. There are a number of frameworks that are being used by educational institutions to assess their integration of technology; however, most focus only on what the technology is capable of and not on how effectively the technology is being used. This article will assess the educational technology integration and educational technology literacy of teachers at the Preparation Center for Languages and Mathematics at Mahidol University International College, Thailand using Davies' (2011) Framework of Technology Integration.

Context

The preparation center is part of a Thai university. Its purpose is to increase students' academic English level, so they can enter the international college. The center has approximately 400-550 students, depending on the quarter, and roughly 20 teachers. The students are mostly Thai and come predominantly from a Thai educational system that does not encourage student-centered learning (Kantamara, Hallinger, & Jatiket, 2006) while some have attended international schools or bilingual programmes that have adopted more of a Western, collaborative discussion based approach to teaching and learning. The range of technology used by the students differs widely. Informal discussions with the students revealed that in the majority of school lessons, technology was used mainly by the teacher as an instructional tool and not by the students, unless it was in a specially designed computer lab or information technology lesson.

The instructors at the preparation center are from England, Italy, the USA, New Zealand, Australia, and Thailand. They have a range of qualifications up to master's degrees, with a number studying at the doctoral level. They have also attended a variety of teacher training programmes. The teachers have experience teaching in language programmes, schools, and universities in Thailand and internationally. They have a wealth of knowledge that they bring to the programme, which includes a mixture of experience using technology in lessons for teaching and learning.

The center is quite technologically advanced. All of the students are required to bring laptops or personal devices to each lesson. There is a student's website that provides materials for students to self-study for their respective subjects and a

teacher's website for accessing subject specific resources. Many of the teachers use a variety of educational technology in the classroom as this is heavily encouraged and supported. As a result, the center's 400-550 students and 20 teachers all use technology in every lesson to support teaching and learning. This has raised the questions of to what degree technology is being used, how well it is integrated into the curriculum, and how effective the use of that technology is. To answer these questions, a framework was required to guide this study. The following section will discuss some views of the benefits and drawbacks of using technology and a few of the more popular frameworks being used in education currently and finally outline the framework chosen for our study.

Literature Review

Why Use Technology

Before looking at how technology is integrated, a brief discussion of why it is used is required. Some suggest that students will be more engaged to study if educators use technology (Prensky, 2001). However, others (Jones, Issroff, Scanlon, Clough, & Mcandrew, 2006), suggest that this type of motivation may decrease as the technology loses its initial appeal. Many schools are looking into utilising the personal devices that students bring with them, not only because they are powerful devices that can be used for learning, but also as the institutions do not need to pay for them (Johnson & Adams, 2011). This use of personal devices has also been identified as a motivating factor for students due to the level of control and ownership that are associated with them (Jones et al., 2006). The concept of ownership and control has enabled learners to move from passive recipients of knowledge in the classroom to active creators of it by taking control of their learning and collaborating with others (Naismith, Lonsdale, Vavoula, & Sharples, 2004). The increase of cloud-based computing and web-based applications has further made collaboration between students possible (Stevenson & Hedberg, 2011).

Although there are a number of positive reasons why technology should be adopted in the classroom, the literature also identifies concerns among teachers as to why it should be adopted with caution. The element of control has raised concerns regarding students having too much agency and using their technology in ways that the teacher had not intended (Jones et at., 2006). This concern of students being distracted by technology has been central to many discussions regarding students' use of technology in the classroom (Prensky 2004, Maguth, 2013 & NMC, 2008). Activity theory suggests that technology may be a distraction as their focus may shift from completing a set task to how to use the tool (technology) to complete the task (Waycott, 2004; Donato & McCormick, 1994; and Lantolf & Thorne, 2006).

Assessment Frameworks

To understand why technology is used or not in classrooms, a framework is required. A number of frameworks exist: the RAT, SAMR, and Davies' Technology Integration Framework. The first to be discussion is Hughes, Thomas & Scharber's (2006) RAT–Replacement, Amplification, and Transformation-Framework.

RAT–Replacement, Amplification, and Transformation-Framework

Hughes,et at. (2006) suggest that it is not sufficient to be able to simply identify the technology that is available but to identify the part technology plays in education. To do this, they created a framework that separates technology use into three levels: Technology as Replacement, Technology as Amplification; and Technology as Transformation (p. 1). Technology as Replacement looks at technology that does not change the activity or goal; it simply replaces existing tools or goals, such as replacing paper with a PDF. Technology as Amplification, according to Hughes et al. (2006), looks at whether the technology improves the productivity or efficiency of tasks or goals (p. 3). In the final area, Technology as Replacement, technology completely replaces an existing task or goal, and as it brings functionality that was not previously possible, it becomes "indispensable" (Pea, 1985, p. 175, as cited in Hughes et at., 2006).

SAMR

Another popular model, although not peer reviewed, is the SAMR model (Puentedura, 2010). This separates technology use into four levels: Substitution, Augmentation, Modification, and Redefinition. The lowest level of technology integration, Substitution, is similar to Technology as Replacement in the RAT framework, where technology replaces an existing task or goal but does not change it. In the second level, Augmentation, technology not only replaces the task or goal, but it provides improved functionality. In third level, Modification, technology allows the task to be designed differently. The final level, Redefinition, provides the ability to create new tasks that were not possible without the technology, for example, writing blogs or wikis as part of a writing task.

Davies' Technology Integration Framework

Although the previous frameworks provide a lens through which to assess technology integration, they only appear to focus on what the technology is capable of and what it is doing within a particular activity. There does not appear to be any question of why the technology is being used to achieve certain learning goals or whether it is better not to use technology at all. To answer these questions, Davies' Technology Integration Framework will be discussed.

Davies' (2011) Technology Integration Framework uses a three-level format similar to the RAT framework. However, unlike the RAT framework and the SAMR Model, Davies' framework assesses technology integration combined with educational technology literacy. The three levels of literacy are: Awareness, Praxis, and Phronesis. At the Awareness level, Davies states that a teacher is aware that certain technology is available, and they are starting to find out about the functionality of that technology. They are not a user yet, but they can answer the question: what can it do? (p. 48). In the next level, Praxis, teachers are moving from a beginner to a competent user. They are starting to investigate how they can use technology to achieve certain goals. They are becoming a confident and eager user of technology in

the classroom. However, they are still not considered by Davies to have a high level of educational technology literacy. It is only at the top level, Phronesis, that they become and expert user, where teachers are choosing when it is right to use a piece of technology, and they can answer the question: why am I using it? (p. 48). This final level, Davies explains, is where teachers demonstrate technology, content and pedagogy knowledge, better known as TPACK (Mishra & Koehler, 2006, as cited in Davies, 2011). As Davies' framework offers such a broad view of teachers' technology integration and teachers' educational technology literacy, it has been chosen as the framework for this study.

Research Methods

To investigate technology integration and teachers' educational technology literacy, a questionnaire was chosen as it provided a "an easy, quick form of data collection" (Creswell, 2008, p. 396), and it enabled the researchers to question the teachers (n=24) without having to sit down on a one-to-one basis or conduct a focus group. Some interviews were conducted, however, as some teachers were unsure how to answer some questions on the questionnaire or were more comfortable providing oral rather than written feedback.

The questionnaire was created using an online form system called Google Forms, which enabled the researchers to digitally create the form at their ease and allowed for the results to be automatically collected in a spreadsheet. The teachers were asked nine questions. The first six asked the teachers to state three pieces of technology they use to achieve certain learning goals/outcomes and why they chose to use them. The final three questions asked the teachers to state occasions, if any, where technology was available but they chose not to use it to achieve certain learning goals/outcomes. The results of the survey went through a first cycle of in vivo coding to identify salient features in the responses (Saldana, 2012). These underwent a second cycle of pattern coding to identify "emergent theme[s]" (Saldana, 2012, p. 152) in the data. These themes were then used to provide qualitative results.

Results

The results of the research identified a number of key aspects regarding the integration of technology and the teachers' educational technology literacy. Figure 1 shows the percentage of teachers using each piece of technology provided in the questionnaire. It highlights that the majority of teachers are using the cloud-based document service Google Docs (83%) and the cloud-based virtual learning environment, Edmodo (54%). There were also a number of teachers using the online plagiarism service Turnitin (29%), some using online sources (17%), and others using YouTube and VoiceThread (13%). The remainder of the technology was used by less than 10% of teachers.

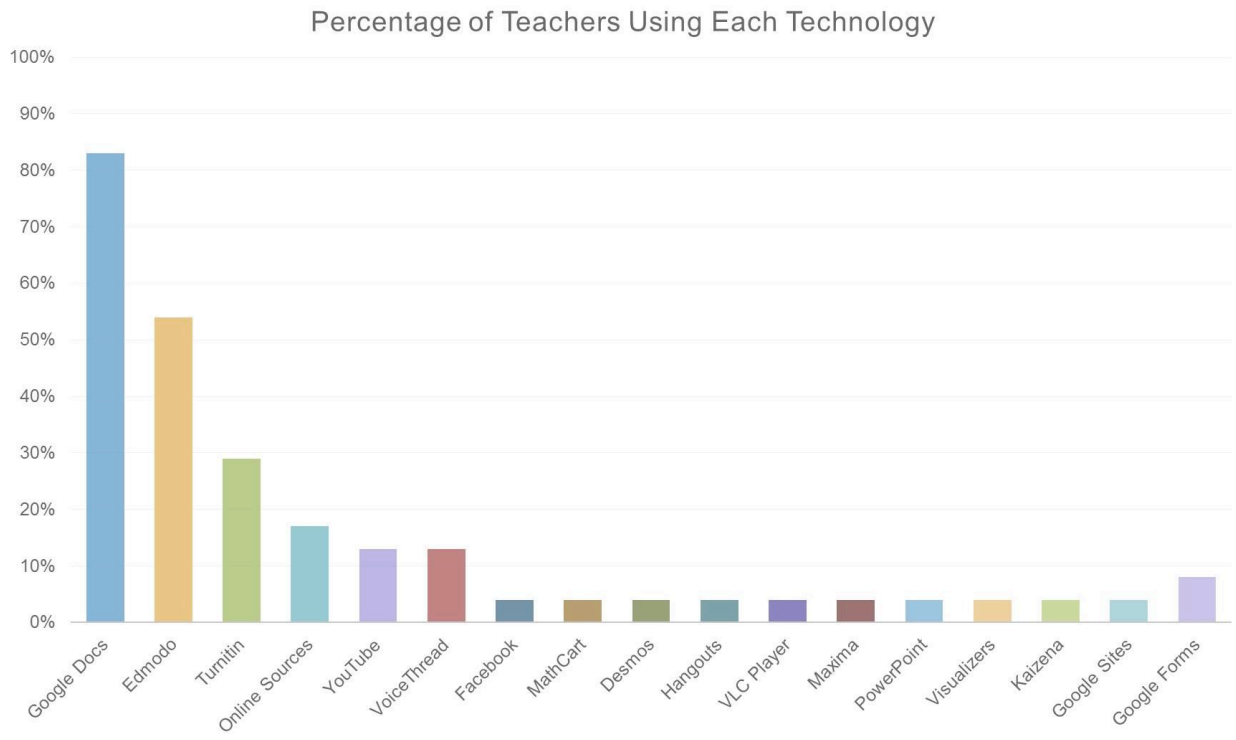

Figure 1

Figure 2 displays the results to the question of why each piece of technology was used. The majority of the teachers used technology for sharing resources, peer assessment, providing feedback, communication, collaboration, a gradebook, avoiding plagiarism, setting assignments, and keeping track of students' work. Google Docs, Edmodo, and Turnitin were used most for these. However, individual teachers did state that they used Facebook and Google Forms. The remainder of the uses for technology were less common and only used by a few individuals, pairs, or small groups of teachers.

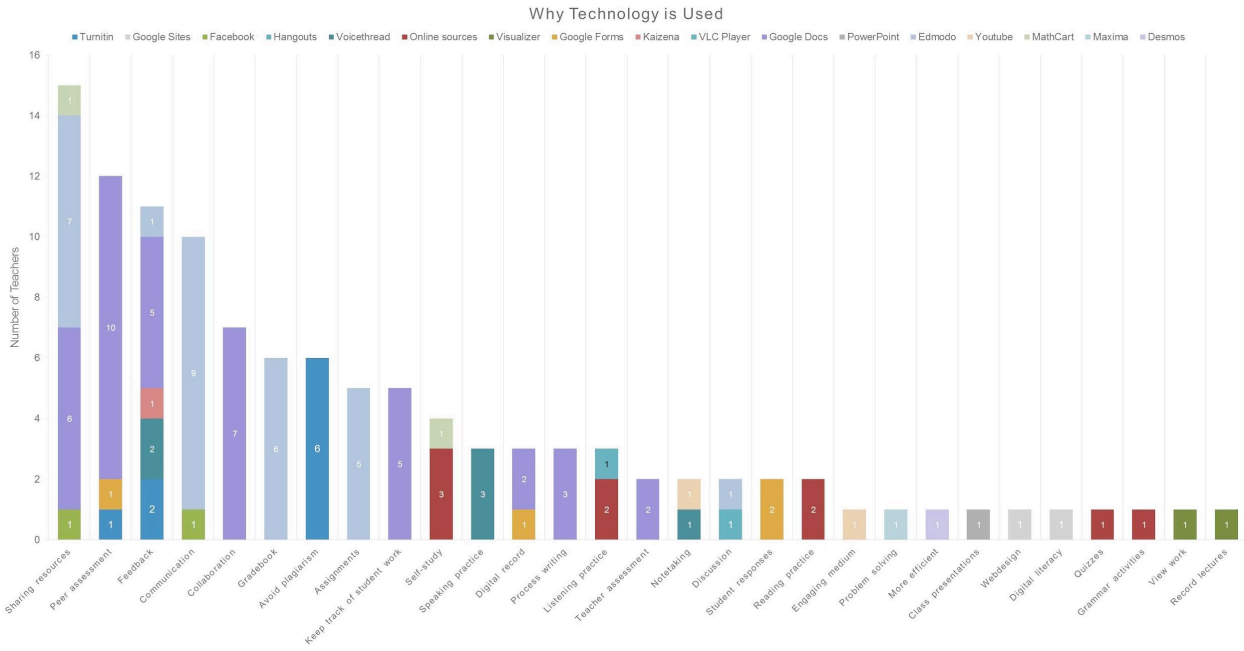

Figure 2

Why technology was not used (Figure 3) varied between the teachers. The salient reasons were that teachers found a non-tech-based approach to more authentic, such as completing a reading practice test on paper as the exam was on paper; they stated that it was easier for the students to complete certain tasks without using technology, in the case of reading and making notes; and a number of teachers found that the technology was a distraction. Some of teachers also commented that they did not want the students to rely on the technology to aid them with their writing, and others stated that they did not use technology as it was unavailable. The remainder of the reasons were stated by less than ten percent of teachers. The red bars highlight the responses that were deemed non-pedagogically justifiable reasons for not using technology with regards to the framework, and these will be discussed in the following section.

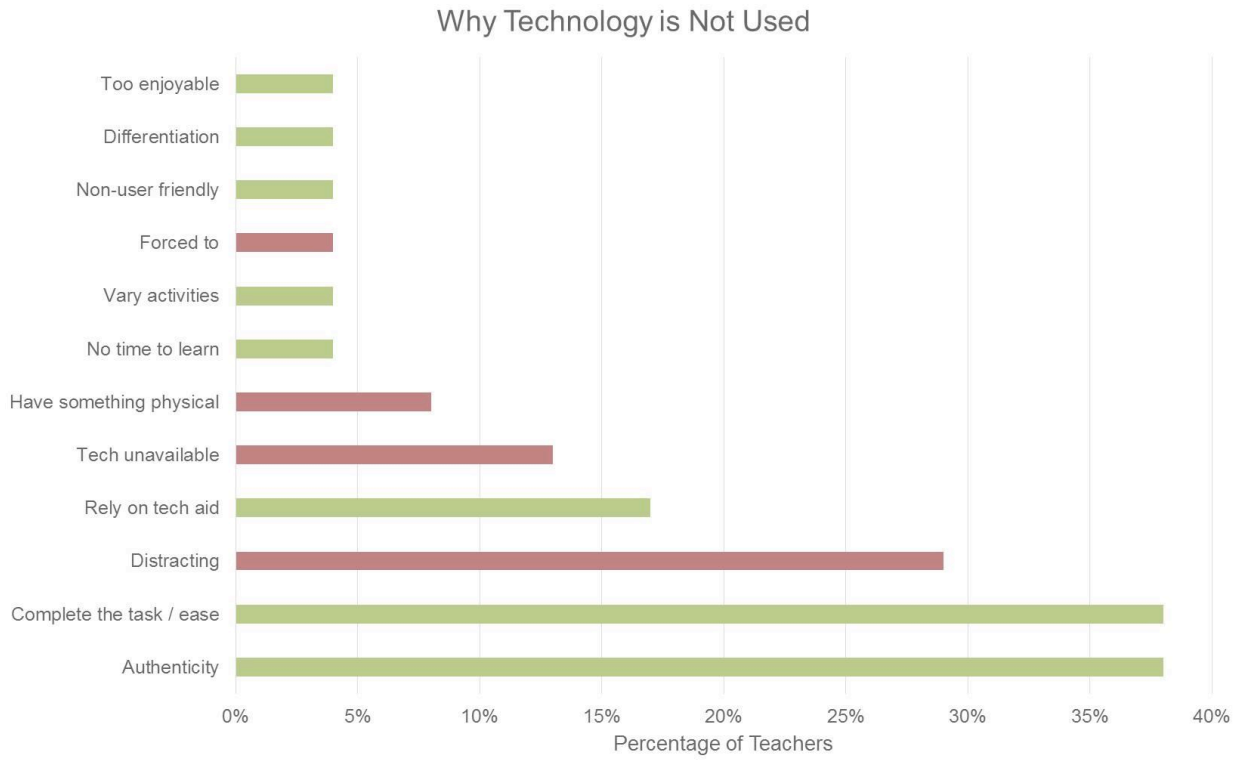

Figure 3

The majority of the teachers (Figure 4) rated themselves above average regarding their average educational technology literacy using the basic features of the technology, with only one teacher rating him or herself below 5/10 at using Google Sites. There does not appear to be any correlation between the popularity of the technology and a teacher's literacy rating. However, the complexity of the technology may be a factor as services, such as Turnitin and Google Docs received a below-average rating, and simpler-to-use applications such as YouTube received higher personal literacy ratings. An exception to this would be the two specialist mathematics applications, used by the maths teachers, who rated themselves at expert level.

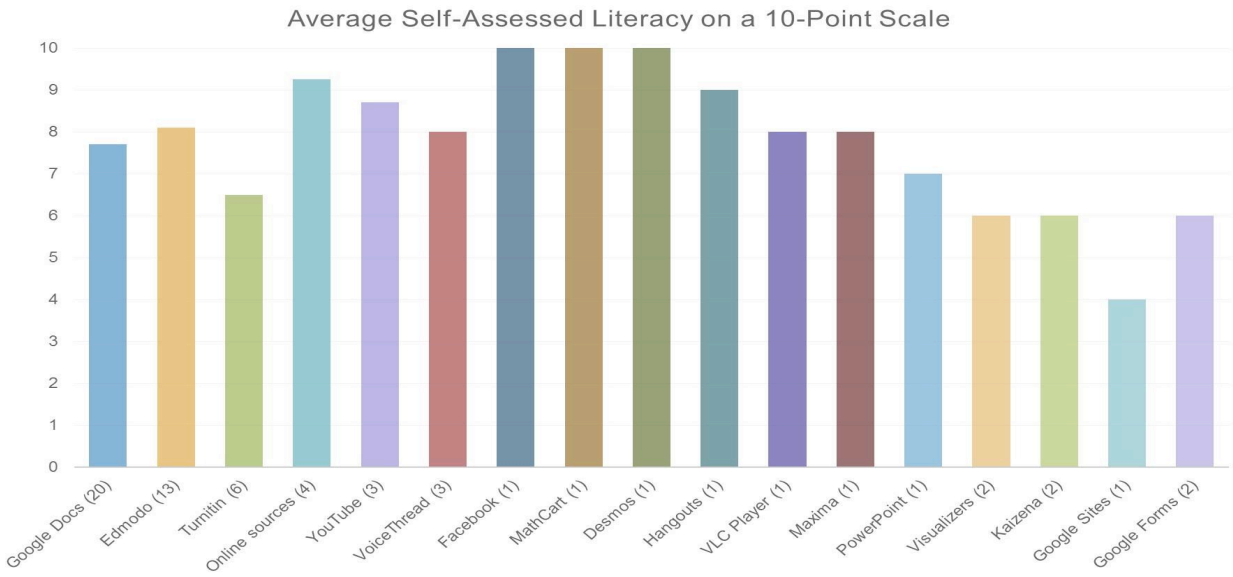

Figure 4

Finally, a comparison was drawn between each teacher's self-assessed average educational technology literacy level, the years they have been teaching, and their reasons for not using technology (Figure 5). The green bars indicate pedagogically justifiable reasons (regarding the framework) for not using technology, the amber bars identify that the teacher provided both pedagogically justifiable and non-pedagogically justifiable reasons for not using technology, and the red bars, as previously stated, represent teachers that were unable to provide any pedagogically justifiable reasons for not using technology. It can be seen that there is no direct correlation between a teacher's self-assessed literacy, the number of years they have been teaching and their reasons for not using technology.

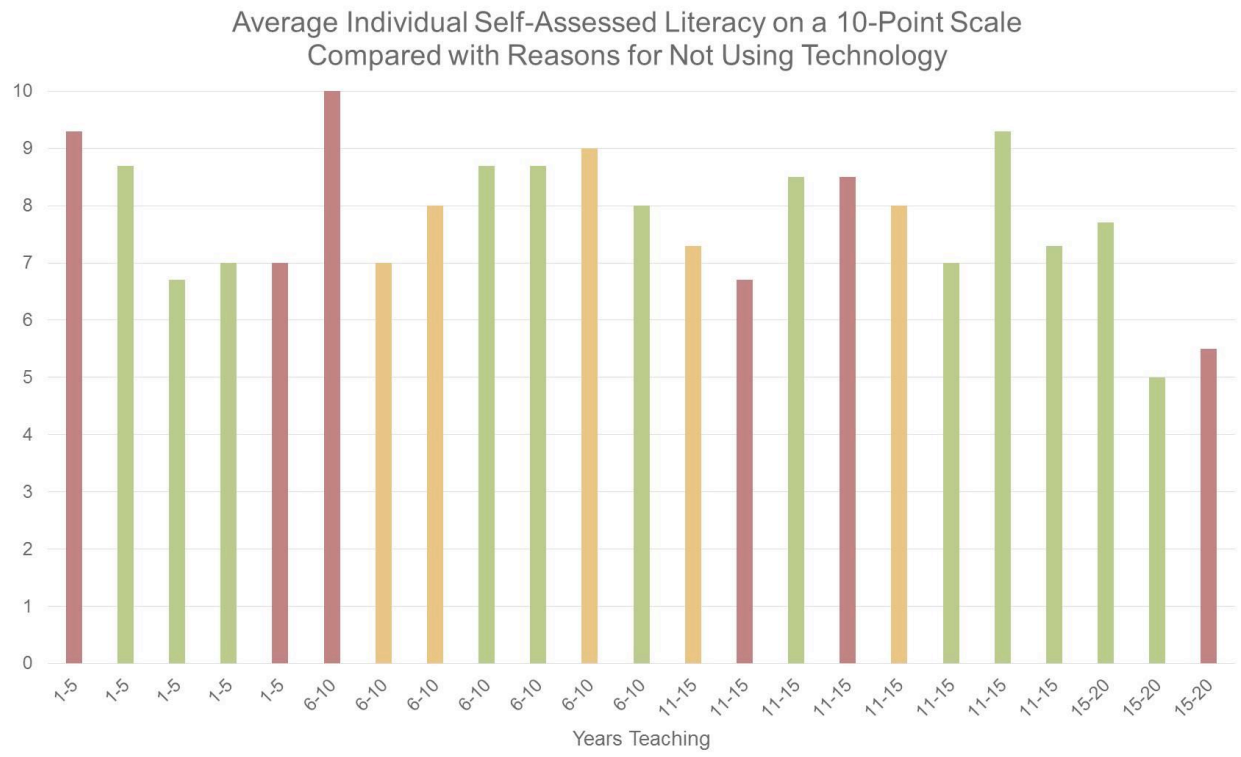

Figure 5

Discussion

The results from the research showed that all of the teachers used technology in the classroom. They also rated themselves at above average in confidence at using it, and they are all using technology at varying levels. The most common technologies used were web based collaborative tools, as identified by Stevenson and Hedberg (2011), and tools for communicating with students. In addition, teachers identified that technology enables students, as Naismith et al. (2004) stated, to not only collaborate, but also take control of their learning by peer assessing each other's work and completing many other tasks that enabled them to play more of an active role in the learning process.

There were a number of reasons why teachers chose not to use technology. Many of the teachers stated that using technology was not authentic enough for some activities. They felt that if the students were practicing for an exam that was non-tech-based, then they should not use technology while practicing. In addition to this, a number stated that the technology did not enable students to complete some tasks as well as they would be able to without tech as Waycott (2004), Donato and McCormick (1994), and Lantolf and Thorne (2006) stated with activity theory. The teachers found that completing tasks like reading, taking notes, and highlighting were made more difficult by using technology. There were, however, a number of teachers who agreed with what Prensky (2004), Maguth (2013), NMC (2008) and Jones et al. (2006) highlighted regarding students getting distracted by the technology or completing tasks that teacher had not set, and therefore, the teachers chose not to use technology for this reason.

Regarding the educational technology literacy of the teachers, all of the teachers are, at least, at the middle level of literacy (Praxis), according to Davies' framework. This was due to the fact that there are no non-users of technology. The majority of teachers identified themselves as being better than average at using the technology, and they use a variety of it in their lessons. To move to the highest level of literacy (Phronesis), Davies states that a teacher should be able to make pedagogically justifiable decisions as to why they would choose a non-tech-based approach to achieve certain learning goals. This would show they have achieved what Mishra and Koehler (2006) refer to as technology, content, and pedagogy knowledge (TPACK) and educational technology literacy, at least in a certain context (Davies, 2011). In this study, many teachers identified a variety of reasons why they do not use technology, but only half of them were able to provide pedagogically justifiable reasons for not using it in all of their responses. Almost a quarter of the teachers were able to provide some justifiable reasons, while the remainder were unable to provide any. The reasons that were considered non-pedagogically justifiable were such reasons as being forced not to use it, the technology was unavailable, they did not have time to learn to use the technology, and it was too much of a distraction. These were considered unjustifiable as teachers had not made a pedagogical choice to use a non-tech-based approach that would better achieve the goals of the lessons. The first three are not related to achieving the task, and the final reason, distraction, was considered to be a matter of classroom management and was not a choice to use a non-tech-based approach to better achieve the learning goals.

Recommendations

The study was moderately successful at identifying how teachers are integrating technology and has shed light onto their educational technology literacy. However, Davies' framework does not assess the degree to which technology is used within an activity. One possible way to do this would be to use a combination of Davies' framework with the RAT (Hughes et al., 2006) and SAMR (Puentedura, 2010) frameworks. This would not only assess whether the teachers were making sound pedagogical choices to use or not use technology, it would identify what effect that technology is having on the activities it is being used with; and therefore, provide a much broader picture of technology integration and the educational technology literacy of teachers. In addition, future research should be conducted over a longer period of time and include observations of teacher making choices to use or not use technology in different contexts, which is an element that Davies (2011) included in his study but was not possible in this study due to time constraints.

Conclusion

To conclude, this study used Davies' Framework for Evaluating Educational Technology Integration to investigate the technology integration and educational technology literacy at a preparation center to an international university. It found that all of the teachers were confidently using technology in their lessons. They stated various types of technology that they use and numerous reasons why they use that technology. Many of the teachers were also able to make pedagogically

sound judgments to not use technology in their lessons, which, according to Davies, showed they were operating at the highest level of educational technology literacy. The study also made recommendations for future research, which suggested combining the RAT, SAMR, and Davies' frameworks to provide a more rounded view of teachers' literacy and technology integration. In addition, a longer study that includes observation was also recommended to gain a greater understanding of teachers' educational technology literacy.

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