What are the Influences on Teacher Mobile Technology Self-efficacy in Secondary School Classrooms?

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Abstract

As digital technologies develop and change, so do the ways these tools are integrated into classrooms. In particular, as mobile digital technologies become ubiquitous there is a need to investigate how teachers engage with these tools—both personally and professionally. Research has consistently shown that teachers' underlying beliefs and attitudes (particularly their self-efficacy beliefs) are key elements that influence use and integration of digital technologies in the classroom. In this paper, changes to and factors influencing teachers' mobile digital technology self-efficacy beliefs, and their subsequent classroom use of devices, are examined in the context of a one-to-one iPad mini device programme in an international school. Results indicate that all of the teacher participants reported an increase in the use of the iPad mini in the classroom, partly as a result of students' development of collective efficacy. As well as this collective efficacy, which supported the increased use of devices, other factors supported the development of teacher self-efficacy. These included modelling and coaching from colleagues, but mastery (or actual experience) was the foremost contributor to the development of teachers' mobile technology self-efficacy. This study revealed that allowing teachers time to experience mastery in relation to mobile technology use, and having access to expertise (both colleagues and students), were key elements in building self-efficacy for teachers over time. Perceptions of device value and device affordances were also identified as factors that fostered the development of self-efficacy and subsequent mobile device implementation and use.

Keywords: self-efficacy; technology self-efficacy; mobile digital technologies; collective efficacy; modelling; one-to-one devices; international school

Introduction

Given the rapid growth of digital technologies in schools, teachers play a crucial role in the successful implementation of new technologies in classrooms. Teachers' beliefs and attitudes towards technology have been linked to subsequent adoption and integration (Donnelly, McGarr, & O'Reilly, 2011; Ertmer & Ottenbreit-Leftwich, 2010). A key component of these beliefs is self-efficacy, which is broadly defined as an individual's beliefs in their own ability to influence or achieve certain outcomes (Bandura, 1994; Paraskeva, Bouta, & Papagianni, 2008; Shea & Bidjerano, 2010). The link between teacher beliefs and subsequent integration of technology has been identified as an important area of research, particularly given the potential value of technology use for educational purposes such as personalised learning and links to successful student outcomes (Ertmer & Ottenbreit-Leftwich, 2010).

Self-efficacy and technology use

Self-efficacy is strongly connected to beliefs about mastery as well as value and usability of devices, so it plays an important role in the acceptance and uptake of technology in the classroom (Shea & Bidjerano, 2010).

As a central component of social cognitive theory (Bandura, 1982), self-efficacy addresses the complex interaction between cognitive beliefs, environment, skills, emotion, and behaviour. It is considered central to an individual's ability to effect change, influencing the choices a person makes regarding new situations or skills, such as using technology in the classroom (Bandura, 2006). Self-efficacy is linked to success and has been positively linked to achievement outcomes, self-regulation, and cognitive learning strategies (Shea & Bidjerano, 2010; Schunk & Pajares, 2002). Higher levels of self-efficacy have also been connected to greater persistence in new tasks (Dweck & Leggett, 1988; Schunk & Meece, 2005).

Self-efficacy, unlike similar constructs such as self-concept or self-esteem, focuses on an individual's beliefs in their performance capabilities for a particular task that has yet to be undertaken in a particular context that has (Bandura, 1994; Paraskeva et al., 2008; Schunk & Meece, 2005; Schunk & Pajares, 2002 Tschannen-Moran, Woolfolk Hoy, & Hoy, 1998; Zimmerman, 2000). An individual who has a well-developed sense of self-efficacy tends to be more motivated and will invest more effort in new challenges and tasks, particularly if they perceive a successful outcome is possible (Schunk & Meece, 2005). In terms of the connection between self-efficacy and changed attitudes or achievement in particular domains, change is not necessarily immediate and there may be delays in how quickly new mastery experiences translate into changed efficacy beliefs (Bandura, 1982). As such, longitudinal studies (such as the one adopted for this investigation) allow exploration of the nature of self-efficacy changes over time.

Self-efficacy judgements are influenced through four main sources of information: mastery (or enactive/actual experiences), modelling (vicarious experiences), coaching (verbal persuasion), and physiological reactions (Bandura, 1977; Hinton, Simpson, & Smith, 2008; Margolis & McCabe, 2006; Schunk & Pajares, 2002).

Mastery experiences are the most influential source of information to contribute to the development of self-efficacy, with success generally raising self-efficacy and failure lowering it (Bandura, 1982; Schunk & Meece, 2005). This study sought to investigate whether, in the context of implementing mobile technologies, mastery experiences were the most influential sources of information for teacher self-efficacy judgements.

Modelling, which encompasses the observation of similarly skilled individuals in similar contexts, can encourage the observer to attempt similar tasks if they perceive that they could also be successful in similar circumstances (Schunk & Pajares, 2001). If the model does not complete the task successfully, the self-efficacy of the observer can be negatively affected.

Coaching or verbal persuasion by a trusted individual (for example, encouragement to use particular mobile apps) can also have some effect on motivation to try new or challenging tasks, although this can be fleeting (Schunk & Meece, 2005).

Physiological symptoms such as increased heart rate or sweating can be signals of anxiety, indicating a perceived lack of skills or ability. Such anxiety often results in avoidance behaviour. Hesitancy about using computers can be an indicator of this anxiety, and subsequent avoidance may mask low technology self-efficacy (Celik & Yesilyurt, 2013).

Technology self-efficacy can itself be divided into separate domains, including online (or internet) self-efficacy, specific device (such as laptop or smartphone) efficacy or classroom

technology integration efficacy. As in other domains, enactive mastery is the most powerful influence on technology-related self-efficacies (Ertmer & Ottenbreit-Leftwich, 2010). Researchers agree that technology self-efficacy is a key component that needs to be considered when addressing the integration of technology in the classroom (Abbit & Klett, 2007; Celik & Yesilyurt, 2013; So, Choi, Lim, & Xiong, 2012). Allowing teachers time to explore new technologies and the empowerment that results from 'small successes' are key elements for building technology self-efficacy (Ertmer & Ottenbreit-Leftwich, 2010).

Teacher efficacy and digital technology self-efficacy in the classroom can also be considered as two different domains. Teachers who have a high sense of self-efficacy are apt to examine their own practice and teaching approaches as a source for change rather than placing the responsibility solely on the shoulders of their students (Protheroe, 2008). However, a teacher may feel efficacious towards teaching overall, but less efficacious about using technology in the classroom (Shinas, Yilmaz-Ozden, Mouza, Karchmer-Klein, & Glutting, 2013).

Perceived ease of use and perceived usefulness are further important aspects of technology adoption in a given situation (Chuttur, 2009). The easier a user perceives technology to be, the higher the self-efficacy associated with its use (Davis, Bagozzi, & Warshaw, 1989). Familiarity with a particular digital device or tool is also considered to be a key element for building confidence and use (Mueller, Wood, Willoughby, Specht, & Deyoung, 2005). Teacher perception of the value and use of digital devices can also play a key role in adopting technology in the classroom. In particular, pedagogical beliefs about the value of technology can heavily influence whether a teacher will engage with technology integration at the curriculum level (Lai & Pratt, 2008). The added value that technology brings to the classroom includes learner engagement, which is subsequently linked to success (Oblinger, 2014).

Research indicates that teacher attitudes towards technology can also create barriers to technology integration (Abbit & Klett, 2007; Ertmer, 1999; Kopcha, 2012). Mueller, Wood, Willoughby, Ross, and Specht (2008) suggests that as physical barriers to technology integration lessen, teachers' perceptions and attitudes become more important. Research also suggests that while a teacher may be confident using technology for personal use, this confidence may not carry over into the classroom (Abbit & Klett, 2007). Conversely, Paraskeva et al. (2008) argue that teachers who have high technology self-efficacy are "more open to new ideas and they are more willing to experiment with new methods" that can benefit students (p. 1084).

In addition to teachers' personal and professional technological self-efficacy, collective efficacy is a further important consideration. Collective efficacy refers to the collective beliefs of a group in their ability to achieve specific outcomes (Bandura, 1982, 1998, 2006). Collective efficacy encompasses a synergistic approach to problem-solving, in which the combined confidence of a group of peers can be higher than an individual's own beliefs (Bandura, 2006). Research suggests that collective teacher efficacy centres on the perceived ability of the entire group's collective skills and resources (Goddard, Hoy, & Hoy, 2000; Klassen, Usher, & Bong, 2010; Pajares, 1996). The potential for collective efficacy to influence the success or failure of particular initiatives is of particular interest. Kopcha (2012) supports this notion by suggesting that a community of practice, which can be inherent in group environments, can subsequently influence engagement with new initiatives. Taken together, it is clear that self-efficacy plays an important role in teachers' personal and professional adoption of new technologies. The rapid increase in the use of digital devices in classrooms also highlights the importance of the current study.

The study

The central goal of this research was an in-depth exploration of teacher self-efficacy beliefs regarding the uptake and use of mobile technologies in classrooms, and how these beliefs develop over time. This research explored how teachers' mobile technology self-efficacy changed over a school year, the factors that influenced this change, and a comparison with traditional self-efficacy sources as outlined by research.

Context and participants

The research location was chosen because the school was about to begin a one-to-one iPad-mini implementation. The school is an English-speaking international school based in Germany and follows a northern hemisphere school year (beginning in August and finishing in June). Approximately 60 full-time teachers are employed across the school and come from a variety of cultural and educational backgrounds. Key features of the school culture include embracing internationalism, and promoting inquiry in learning and respect for others.

The school issued teachers of the relevant classes (Grades 6–8, 12–14 year olds) with iPad mini devices prior to the end of the 2012–2013 school year (June 2013) in preparation for introduction of the devices in the following school year. Teachers were also provided with a range of professional development options before students received the devices, including presentations on specific applications during professional development sessions. These sessions included training on professional development days, when staff could choose to attend a session that focused on an app they were interested in. Several subjects (for example, Language and Maths) received specific instruction on how the device could be used in these subject areas. Teachers' use of the device was also showcased in short presentations in staff meetings, and staff could make individual appointments with the ICT co-ordinator or technology support staff as needed.

Students in the specified grades received their devices in September/October of the 2013–2014 school year. An anonymous survey was initially carried out to ascertain general teacher attitudes towards the introduction of the iPad mini (see Appendix A). After this survey, five teachers agreed to participate in phase two of the research investigation. These five teachers taught in a range of subject areas, and had a range of self-efficacy beliefs. Both genders were represented. The data arising from the longitudinal interviews in phase two are the focus for this paper.

Data collection

Fifteen semi-structured interviews (three per participant) took place at approximately 4-monthly intervals over the first year of the iPad mini implementation. A series of interviews was considered appropriate for this study because it allowed an in-depth exploration over time. This method allows the researchers to focus on what can be learned in a specific case from which general conclusions can be formed (Denzin & Lincoln, 2003; Yin, 2003). A longitudinal approach was relevant, as this study sought to examine the self-efficacy beliefs of individual teachers in relation to their mobile technology use in the classroom over an extended period. Interview questions were based on key technology self-efficacy themes from the literature.

Each interview was a maximum of 30 minutes long, and focused on individual teachers' experiences of the implementation of the iPad mini. Interviews were spread over the year, so potential changes in self-efficacy over the implementation period could be observed.

Each teacher's data across their three interviews was analysed, followed by cross-case analysis across all teacher interviews. This approach allowed researchers to identify common themes and findings for individual teachers, and these were subsequently analysed across the participant cohort. An open coding analysis of the information gathered was considered an appropriate

approach (Strauss & Corbin, 1996), allowing themes to arise through analysis. Identifying common elements in both individual teacher cases and across the sample of data (Gudmundsdottir, 1996) indicated common understanding of how self-efficacy was influenced by various factors.

Results

The findings are arranged thematically to highlight key findings as they relate to self-efficacy in connection to both traditional sources of self-efficacy judgement and to the use of the iPad minis.

Mastery (enactive experiences)

All five teachers indicated that they had invested time in learning how to use the device—by either attending training, or independently exploring the device's capacity—and that this directly influenced their efficacy perceptions in relation to the device:

> I think the more time you have with something even if it's just you are wasting time . . . you're just really confident in how it could be used. (Teacher 4, Interview 3)

> You have to just dive into that experimentation because it's a steep learning curve, but it's a short one. (Teacher 3, Interview 3)

> You just go through and have a look at these apps and play around with them and see what you can learn. (Teacher 2, Interview 2)

Collective efficacy

Another key theme that emerged over the implementation period was the importance of collective efficacy, between teachers and students, in terms of device usage:

> What do I do when I strike a problem? I ask the kids. (Teacher 1, Interview 2)

> Before I can even breathe to answer said question, another student has leapt in and answered the question for me, which is fun and exciting . . . (Teacher 3, Interview 2)

The results also indicated a perceived change in the role of the teacher into more of a facilitator and collaborator. Students and teachers working together to find a solution was a key element to fostering the development of collective efficacy, as the following comments indicate:

> I am willing to try things that . . . I don't necessarily know how to do because we can kind of try to figure it out together. (Teacher 4, Interview 3)

> I solve a lot more through collaboration with the students. (Teacher 5, Interview 3)

Modelling

Collegial modelling and differentiated learning also emerged as sources for teacher self-efficacy judgements associated with device use:

> I think when we share each other's ideas that's when, because I don't have time to just sit and look at apps and websites so when I hear of something new or see something new I want to try it. (Teacher 4, Interview 2)

> Someone presented it, but that's not enough. I'd like some designated time to be able to do it for my subject and have someone help me when I have questions. (Teacher 1, Interview 2)

While this modelling was usually perceived to be a positive influence, it also induced some concern, as seen with Teacher 1:

> [I] really feel insecure with that because I have a colleague who's so fantastic at that and I just watch . . . and think "Woah I'd love to be able to do that!" (Teacher 1, Interview 1)

Some teachers indicated that being the model for other teachers positively affected their own confidence in relation to using iPad minis:

> I really felt comfortable in saying, oh look, here's how you could use it effectively . . . so I felt like I was sort of able to give advice so that also obviously boosts my own confidence in it. (Teacher 4, Interview 3)

> I started to find out more and more that I'm using the iPad far more than a lot of other people and successfully using it . . . teaching other people how to use the iPad and that was really good for my confidence in seeing myself as skilled user. (Teacher 5, Interview 3)

Device value

The perceived value of the mobile device also emerged as a salient theme in the data. This value was expressed in several ways, including affordances such as efficiency in student organisation, encouragement of student agency, and differentiation of learning (by difficulty and interest) for students:

> It's increased the learner's toolkit. That for me is invaluable. (Teacher 3, Interview 3)

> They're not just users . . . they are starting to become creators. (Teacher 5, Interview 1)

Teachers also commented that student enjoyment was a positive element linked to device use:

> If it's done right, it's making our teaching more engaging…more active for the students too. (Teacher 3, Interview 1)

> [The student] was just so excited to show me her video that she made of her drawings. (Teacher 4, Interview 1)

Language tools provided by the device, as well as student agency, were also highlighted as affordances:

> …a lot of our students are language learners, or . . . people with dyslexia. It gives an opportunity to be on a level playing field. (Teacher 4, Interview 3)

> It can benefit especially the language learners who are . . . still acquiring the language skills that we are teaching, or the students who have organisational challenges . . . and then also the gifted students have really been able to fly. (Teacher 5, Interview 3)

Barriers to device use

As well as identifying affordances of using the new devices, teachers highlighted school and device infrastructure and (to a lesser degree) time and classroom management as barriers to device use:

> You know, plugging it in, getting all the wires. Then it being slow and that thing going around and around, waiting for that. (Teacher 1, Interview 1)

> It would be feasible if we had better internet. (Teacher 4, Interview 1)

Teachers mentioned classroom management issues that arose from using the devices with a range of students' attitudes' and the challenges these presented:

> Sometimes they forget to recharge the batteries or they leave it behind. It's more of a behavioural problem I think with the student rather than the technology itself. (Teacher 2, Interview 2)

> Kids that are off task are always off task, whether they're off task on their instrument or talking to a friend or passing a note or now they're just doing something on the iPad they shouldn't be, and it's all the same type of classroom management, it's just a new distraction. (Teacher 3, Interview 1)

Teachers also adopted specific coping strategies, suggesting a level of resilience associated with the challenge of the implementation:

> At first you find it frustrating and then you kind of almost expect it to happen, and so when it does happen it doesn't really affect you. (Teacher 4, Interview 2)

> I don't think it's stopping people from using the iPads or the technology of the applications, it's just a frustration point. (Teacher 3, Interview 2)

Some teachers indicated that they felt they would benefit from concentrated or additional time to explore subject-related applications, or that their mastery of the device was limited due to time restrictions and their general teaching load:

> My self-talk . . . is "I can only do what I can do" given the time, the time in the day and the teaching, the support that I can have . . . so I have to draw a line around it otherwise I'd go mental. (Teacher 1, Interview 2)

Throughout the study, teachers reported an overall sense of growth in efficacy in using the iPad mini although this varied in degree and form, with some teachers demonstrating clear growth relating to personal use, and others demonstrating growth in their efficacy in collective classroom use of the device.

> Since the beginning of the year, perhaps a bit more confident. (Teacher 2, Interview 3)

> You can kind of change things on the fly and I think that's when you know you are pretty confident. (Teacher 4, Interview 3)

> I don't think there's any situation where I wouldn't feel confident about using the iPad in the class now. (Teacher 5, Interview 3)

Teachers with higher self-efficacy at the beginning of the implementation maintained efficacy and experienced further growth in overall mastery of the device. Those with lower self-efficacy at the beginning maintained their initial self-efficacy and developed a more discrete sense of efficacy that often centred on particular apps or specific uses of the iPad in the classroom:

> So I'm more, certainly more familiar with how Pages works on the iPad, how Number works on the iPad and in that respect I feel more confident. (Teacher 2, Interview 2)

> I'm really confident with the kids using it, but I don't use it much myself. (Teacher 1, Interview 3)

Where there was change in efficacy, some teachers reported growth in both personal and collective classroom efficacy, while some reported a sense of only collective efficacy. This sense of collective classroom efficacy enabled teachers to implement the device, regardless of their own personal efficacy.

> Mostly I won't know it, but someone will know it. (Teacher 1, Interview 3)

> I am willing to try things that I know that I don't necessarily know how to do because we can kind of try to figure it out together. (Teacher 3, Interview 3)

Discussion

Teachers identified multiple sources of information on which to base their self-efficacy judgements. Enactive mastery, collective efficacy, modelling, and perceived value of the device emerged as important findings from teacher interviews. While barriers to mobile digital technology were mentioned, teachers also demonstrated resilience in addressing these barriers, indicating a robust sense of self-efficacy when using the iPad mini in the classroom.

Having time to explore or develop their understanding of device use was identified as an important element that influenced teacher efficacy when using the iPad mini. All teachers stated that they had invested time in learning how to use the device by either attending training sessions, or independently exploring the device's capacity. They felt this investment directly influenced their efficacy perceptions in relation to the device. This finding is consistent with research that indicates that taking time to learn and develop skills is important in technology use and uptake, and that the restriction of available time is a hindrance to teacher uptake of technology (Ertmer, 1999).

Exploration of the practices of both teachers and students during the implementation indicated that no teachers experienced a decline in their self-efficacy. This suggests that, given the range of experiences over time, these teachers were able to build efficacy even if personal usage was minimal, or efficacy was initially low.

Mastery

Enactive mastery experiences were identified by the teachers as the most salient in terms of building self-efficacy. This finding aligns with existing research on self-efficacy (Bandura, 1982; Joët, Usher, & Bressoux, 2011; Schunk & Meece, 2005). All but one teacher indicated that exploration and experimentation with the device were strong factors in developing their confidence in terms of their personal use of the device and of its integration in the classroom. All teachers who reported intentional experimentation also attributed an increase in their efficacy to this experimentation. Two of the five teachers said indicated that they felt they would benefit further from concentrated time to explore subject-related applications, or that their mastery of the device was limited by time restrictions.

A common characteristic among the more efficacious participants (Teacher 3, Teacher 2, and Teacher 4) was an extended and sustained approach to personal device experimentation, despite obstacles or barriers to integration. This is supported by existing literature, which finds that a higher sense of self-efficacy is linked to motivation (Margolis & McCabe, 2006; Schunk, 1991; Schunk & Zimmerman, 1997) and persistence in learning (Schunk & Zimmerman, 1997).

Collective efficacy

Teacher collective efficacy, and how it influences student achievement (Goddard et al., 2000) is well documented; however, it usually focuses on teacher-to-teacher peer relationships and subsequent connection to student achievement rather than teacher-to-student collective efficacy.

The findings from this study show that fostering collective efficacy in a class can enable teachers and students to become collaborators when using mobile technologies for learning. This sense of collective classroom efficacy was reported as being present in the classroom to different levels, with some teachers (Teacher 1, Teacher 2, and Teacher 3) reporting a shift in their own perspective to a more agentic approach, allowing use of the device to be governed jointly by student and teacher. This belief in the synergistic capability of the group to achieve particular outcomes is consistent with existing literature on collective efficacy (Goddard et al., 2000; Klassen et al., 2010). Collective efficacy, between teachers and students and focused primarily on technical problem solving, was a repeated finding. The collective efficacy found in this study enabled the teachers with lower self-efficacy (such as Teacher 1 and Teacher 5) to continue to engage with the device in the classroom, even though they felt, individually, less efficacious about device use. For those with higher self-efficacy at the commencement of the study (Teacher 2, Teacher 3, and Teacher 4), a shift towards supporting greater student autonomy when using the device was evident. Teacher 3 observed their students' skills and noted an increase in reciprocal learning and innovation

Device value

All five teachers identified perceived value of the device as a key theme. Value aspects reported by teachers centred largely on affordances such as improved task efficiency, quality of work, students' personal management, student extension/acceleration, and support for English as an Additional Language (EAL) needs. This aspect of device value, and its subsequent effect on technology acceptance and self-efficacy, is supported by existing research that suggests perceived value of technology can affect teacher use and integration both positively and negatively (Donnelly et al., 2011; Mueller et al., 2008; Oblinger, 2014; Shinas et al., 2013; Soa et al., 2012). Perceived value can also be seen to influence teacher uptake of technology and persistence in using the technology (to some degree) regardless of personal teacher self-efficacy. This was clearly seen in the case of Teacher 1 who, despite her own low self-efficacy concerning the device, was still able to actively engage with students' use of their devices in her classroom.

Teachers with higher self-efficacy in this study (Teacher 2, Teacher 3, and Teacher 4) also reported perceived ease of use, along with an overall sense of mastery of the iPad mini. Teacher 1 and Teacher 5 indicated a sense of ease with particular applications; however, this was limited to apps they were comfortable with. This finding aligns with research that indicates that perceived ease of use can positively affect teachers' use of technology (Davis et al., 1989; Holden & Rada, 2011).

Modelling

Modelling is most beneficial when there is perceived similarity between the observer and the observed. In the case of Teacher 1, observing the expertise of colleagues led to some anxiety. This response aligns with self-efficacy literature on modelling, which indicates that similarity in skill level is necessary to enable the individual to feel that the desired skill is within reach, otherwise the effectiveness of the modelling experience is significantly reduced (Bandura, 1994; Schunk & Meece, 2005; Schunk & Zimmerman, 1997). While much literature on modelling focuses on the observer being influenced positively through this process (Margolis & McCabe, 2003; Schunk & Pajares, 2002), the findings from this study highlight that, when the model experiences success, their own confidence may also be positively influenced, indicating the benefits of modelling may be reciprocal.

Research on avoidance currently focuses on avoidance as a coping mechanism in low efficacy individuals (Bandura, 1982; Schunk, 1991; Zimmerman & Cleary, 2006). Some teachers indicated avoidance of particular applications or forms of use due to lack of confidence, others indicated that they did not use the iPad as a teaching tool in certain circumstances because the

limited availability of specific subject-related apps meant the device was not suitable for particular purposes. This suggests that some decisions to not use the device as a teaching tool were intentional informed choices rather than the result of avoidance behaviour. Although existing research suggests that a potential barrier to technology use is a perceived sense of challenge to traditional roles of the teacher in the classroom (Ertmer, 1999; Paraskeva et al., 2008), this was not apparent in this study.

Infrastructure

All of the teachers indicated that infrastructure issues—such as slow internet and device limitations—were potential barriers to using the device in the classroom. Despite this, all participants continued to use the iPads. This continued use can be attributed to several extrinsic and intrinsic motivations. Extrinsic motivations include expectations arising from the school environment (such as the school-wide implementation) and professional commitment, which research indicates can encourage technology use regardless of an individual's efficacy (Brown, Massey, Montoya-Weiss, & Burkman, 2002). As in the existing literature, in this study intrinsic motivators included perceived pedagogical value and efficiency which, in turn, influenced persistence with technology use (Donnelly et al., 2011; Lai & Pratt, 2008).

As with all research, this study had a number of limitations. First among these was the small sample size (five participants in the longitudinal interviews). Although this sample provided a rich set of data, it does not represent the views of the teachers as a whole at the school, nor those outside the research setting. As research suggests that changes to perceived self-efficacy can take place over extended periods of time (Bandura, 1982), a further extended series of interviews may have provided a fuller picture of self-efficacy development.

Conclusion

An individual's belief in their ability to master new skills and develop competence continues to be a key aspect of any process of acceptance of change. Teachers' self-efficacy for using mobile devices is becoming increasingly important as the use of mobile technologies in schools increases. The results of this study contribute to a small but growing body of research regarding teacher mobile technology self-efficacy and technology use, particularly for teaching and learning purposes in secondary classrooms.

Of particular note is the contribution made to our understanding of the importance of teacher–student collective efficacy. Much of the research on mobile and collective technology efficacy focuses on self-efficacy from the perspective of teachers, rather than classroom collective efficacy between teachers and students. The findings in this study suggest that this sense of collective efficacy may be broader than similar peer relationships (i.e., teachers with teachers) and can instead be context-specific when a group of diverse individuals are working towards a common goal. The teacher–student collective efficacy reported here is promising because the shift in roles can enable shared responsibilities and increased learner agency. As technological innovation continues apace, the collective efficacy findings from this study suggest that collaboration between teachers and students offers a promising approach for enabling the successful implementation of digital devices in classrooms.

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Biographical notes

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Appendix A Online Survey Results

	Question	Mean	Standard Deviation (N)
1	I like using technology in several areas of my life.	4.1	1.1
2	I am encouraged to try new technology when I hear about what others are doing.	3.5	0.85
3	Watching other people use technology makes me feel like I can try new things.	3.5	0.97
4	If people around me feel confident with technology, I am more likely to try too.	3.9	0.99
5	I feel confident about using technology in my classroom regularly.	3.5	0.97
6	I believe I can master new technology skills in general.	3.7	1.06
7	I like to have a lot of support when learning about new technology.	3.6	0.97
8	When I have a problem with technology I keep trying until I fix the problem	3.4	1.07
9	I like taking risks and trying new things when using technology.	3.3	1.34
10	I think it is important to be able to play and explore with new technology.	4.1	0.99
11	I have had many positive experiences using technology in my teaching.	3.6	0.70
12	I feel technology can help improve my classroom teaching.	3.9	0.88
13	I think previous technology training will help me in developing new skills, even if it is for something different.	3.6	0.96
14*	If technology doesn't work once, I would be unlikely to try again.	1.6	0.52
15	I am looking forward to the implementation of the iPads	3.6	0.96
16*	I feel nervous about the iPad implementation.	2.1	0.88
17	I believe I can master new skills specifically when using the iPad mini.	3.6	1.07
18*	I feel I can only be successful with the iPad mini if I have lots of support.	2.8	1.03

* Reverse order question