

Exploring the Gap of Meaningful Implementation of Educational Technology in Canadian Classrooms

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Introduction

The use of digital technologies has become an emerging and permanent fixture in our global education systems, being seen in almost 95% of classrooms worldwide (Vega & Rockman et al., 2019). Researchers have found that educational technology (EdTech) has the potential to vastly improve teaching and learning if applied appropriately. Integration of EdTech and Internet Communication Technologies (ICT) in education settings can facilitate more flexible and democratic styles of teaching and learning, improve engagement and achievement, provide students with more autonomy and control over their learning, and promote the development of both cognitive and comprehension skills in students (Buckingham, 2003). Educators play an integral role in ensuring that this educational technology is integrated in a meaningful way. Yet despite this, many pre-service and practicing Canadian teachers are faced with multiple challenges and barriers of effectively integrating EdTech into their teaching practices. The problem of better training educators to use emerging technology in schools in an efficient and constructive manner is a long-standing one. According to Project Tomorrow, the majority of teachers (86%) feel like technology is a core part of learning, yet they reported that only 1% of schools are prioritizing technology training for their educators, and as a result 75% of teachers reported feeling “not very comfortable” in using technology in their teaching practices (Project Tomorrow- Promethean, 2020). Researchers have found that the lack of successful learning opportunities in the constructs of technology and pedagogy has impeded teachers' incorporation of technology (Levin & Wadmany, 2008). One prime example of this is in pre-service teacher education programs. Traditionally these programs have opted for either little to no courses including EdTech, or isolated ICT courses that are integrated early in their programs (Kleiner, Thomas, & Lewis, 2007). In this study, we decided to focus our research efforts on analyzing the gap that exists within our education system in regards to the meaningful integration of

technology by analyzing the experiences of pre-service teachers, students who are enrolled in an accredited teacher education program. Results allowed us to discuss how we believe we can work towards closing this gap, and enabling future teachers to implement a variety of educational technologies into their practice.

Methods

The purpose of this study was to gauge pre-service teacher competence and confidence surrounding the use of educational technology in their past and future teaching practices, and to observe if there was a gap in their educational technology education.

Participants. Participants in this study included 50 students from three teacher college programs across Ontario, Canada. The preservice teachers in this survey were 45 females and 5 males between the ages of 22 and 45. Cumulatively, they had experience teaching a wide range of subjects, and were divided almost evenly between primary junior teachers (K-6) and intermediate senior teachers (7-12). All participants in this study were volunteers. Participants were invited to participate in the survey via the online platform Facebook.

Materials. Results were obtained from a 19-item survey created by the researchers (see appendix). The survey included 13 questions relating to the participants' experience and confidence using educational technology, as well as their experience learning about it. The survey also included a section with 6 demographic questions including age, gender, years of education, educational focus, and location of study.

Research. The research design of this study was non-experimental. The survey was administered online using Google Forms. Participants were informed that the survey would be anonymous, and that they would be able to cease participation at any time. Participants were asked to read the questions of the survey carefully, then respond to the best of their ability. Researchers informed potential participants that if they had any questions regarding the survey or the study to reach out.

Results

Our results were analyzed through a lens that focused on our demographics and our findings from the survey.

Demographics

In order to have a better understanding of the experiences of all students, inquiry into demographics was asked. Fifty respondents met our sampling criteria and of these forty-five respondents identified as female and five as male. Respondents were between the ages of 17 and 47. Of the fifty participants, 28 (56%) attended Queen's University, 18 (36%) University of Ottawa, and 4 (8%) Wilfred Laurier.

In Canada, teacher education programs are divided by grade level streams: Primary/Junior (PJ) receiving qualifications to teach grades K-6, Intermediate Senior (IS) receiving qualifications to teach 7-12, and Junior Intermediate (JI) qualifying to teach 4-10. Of our respondents, twenty-five (50%) were enrolled in the PJ stream, twenty four (48%) in the IS stream, and only one respondent (2%) in the JI stream.

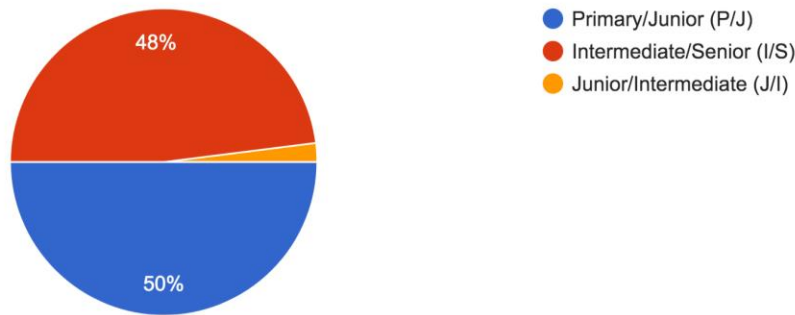


Figure 1. Participants' teaching streams. In Canada, teachers are certified with basic teaching qualifications in one of three consecutive divisions: Primary/Junior (qualified to teach kindergarten to grade 6), Junior/Intermediate (qualified to teach grade 4-6), and Intermediate Senior (qualified to teach grade 7-12).

Findings

As a part of our investigation into the technology gap that exists within our education systems, we gathered data and scanned for themes relating to both pre-service teacher experience using EdTech, and their education surrounding the topic. Based on our survey, we have broken our results down into three subsections as they relate to the research questions we looked to address: (a) The use of technology in schools, (b) Confidence surrounding the use and integration of technology in teaching practices, and (c) Education courses surrounding technology.

The Use of Technology in Schools

Technology in the Classroom. Our survey findings revealed that the majority of pre-service teacher candidates have experienced some form of educational technology during their practicum placements/previous teaching positions (94%). However, there was a vast difference in the frequency at which they saw the implementation (Figure 2). When asked how often EdTech was used on their placements either by their associate teacher or themselves, 64% of respondents reported that they observed EdTech “occasionally” or “frequently”, 20% as “never” or “rarely”, and only 16% of participants reported “almost always” to “all the time”.

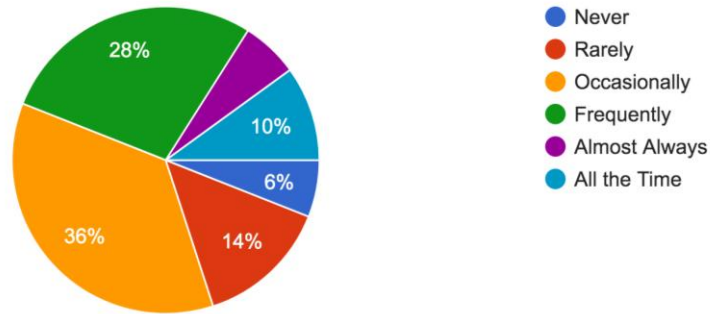


Figure 2. Participants reported the degree to which they observed educational technology (EdTech) during their previous practicum placements. The respondents were given the option to select one of six options to describe the EdTech they observed; Never, Rarely, Occasionally, Frequently, Almost Always, and All of the Time.

Types of Technology in the Classroom. Respondents provided a wide variety of responses regarding the types of educational technology that they have seen on their placements, or had experience using in their teaching. While there was a wide array of technology they reported, responses could be filtered into four broad categories; Software Programs, Physical Technology, Applications and Teacher Specific Tools (Figure 3).

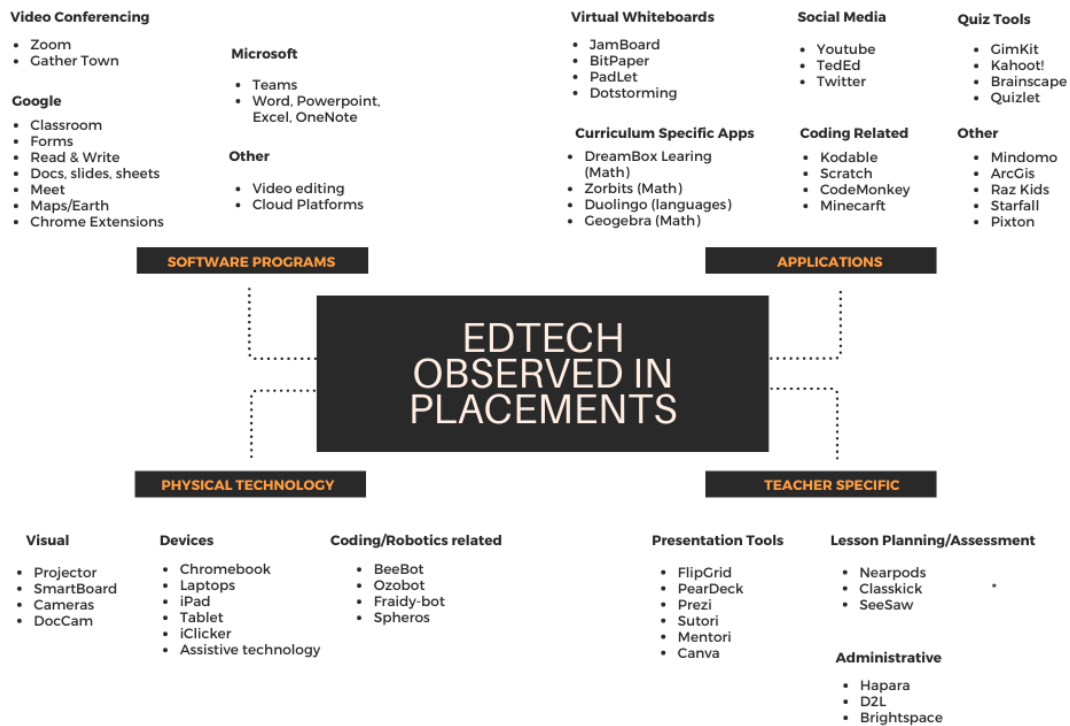


Figure 3. Compiled list of educational technology that pre-service teachers reported observing/using on their teaching placements. The list is divided into four main areas of technology: software programs, physical technology, applications, and teacher specific tools. These categories were broken down further to distinguish the main reasons for the technology utilization.

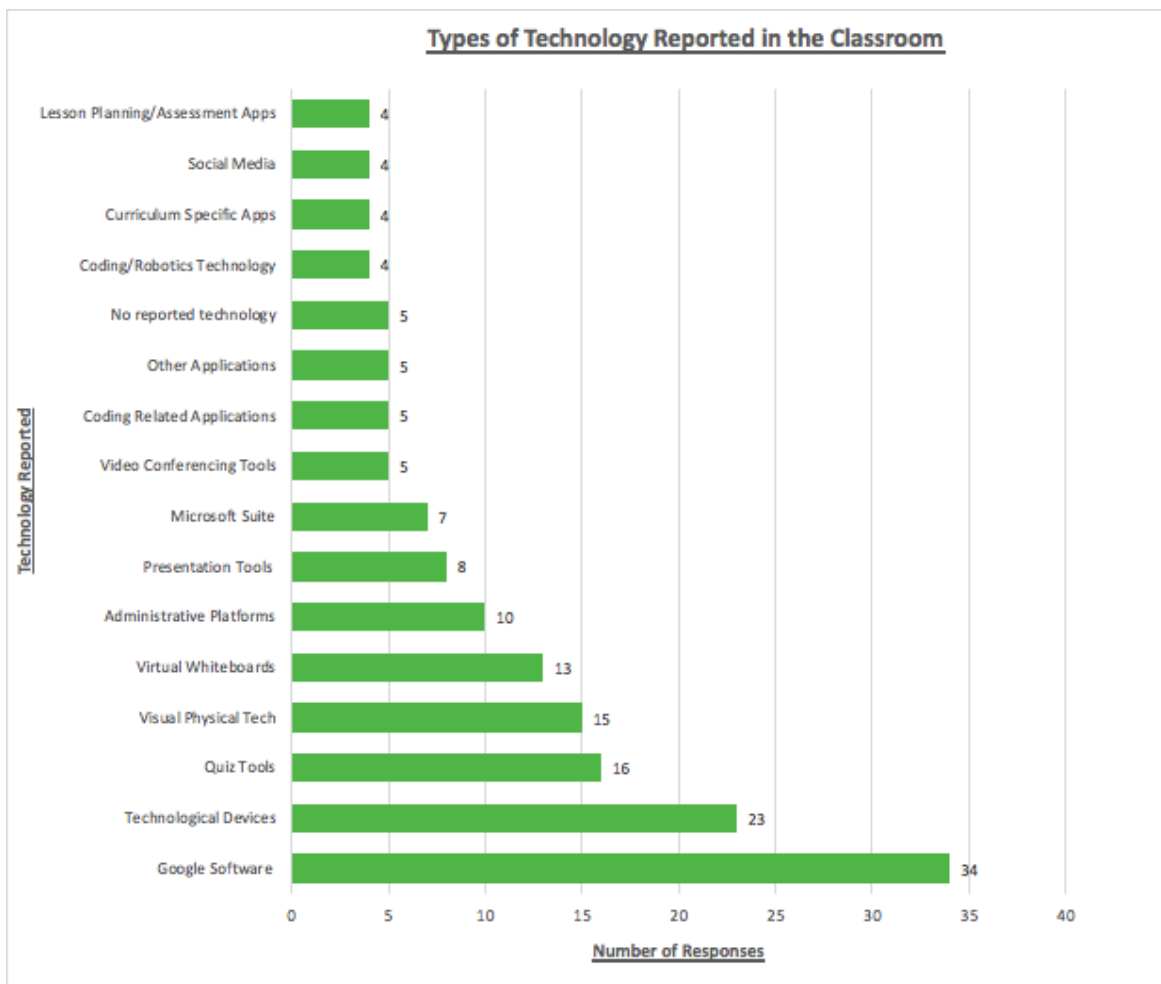


Figure 4. The report of observations showed that the most commonly observed technology category seen among teacher candidates was digital applications (29%), followed closely by software programs (28%), then physical technology (26%), teacher specific applications (14%), and lastly no technology reported (3%).

Existing Barriers Preventing EdTech use in classrooms. When asked to report if they felt there existed barriers in integrating more technology into their placements and future teaching practices, some common themes emerged. The majority of respondents reported that they felt like access to technology was one of the biggest barriers they faced in implementing educational technology, with one participant stating that “it’s difficult to ensure that all students have access to the same forms of technology” specifically in virtual learning settings, and another quoting “access to specific software's and programs” specifically when they are at the cost of the educator”. Another common theme seen throughout participants responses was the technical

issues that can arise when using technology, specifically more advanced systems. This included anything from troubleshooting apps and devices, internet and connectivity problems, and issues that arise from outdated technology. Lastly, respondents also reported that lack of knowledge and comfortability using new forms of technology presented a challenge when implementing technology into their lessons, one respondent reporting that “they were not comfortable enough with using technology themselves” let alone to teach a lesson with it, and another saying that having to learn how to use new technologies and programs can oftentimes be “overwhelming”.

Confidence Surrounding the Use of EdTech

This brings us to our next research finding, where overall confidence surrounding the use of Educational Technology was explored as a possible factor influencing pre-service teachers’ likelihood to integrate it into their teaching practices.

Technology Competence. To assess respondents' familiarity and comfortability using technology, they were asked to report on a scale how they would describe their level of knowledge regarding EdTech, from unfamiliar (no experience with EdTech) to expert (extremely proficient). Results varied, however the majority of respondents identified that they felt they were of average technological knowledge, i.e. were able to demonstrate a general competency in a number of technologies (46%). Only 20% of respondents reported feeling they possessed an advanced (20%) to expert (0%) knowledge of EdTech, 18% identified being beginners, and 16% identified that they were unfamiliar to newcomers and still required more education on the subject.

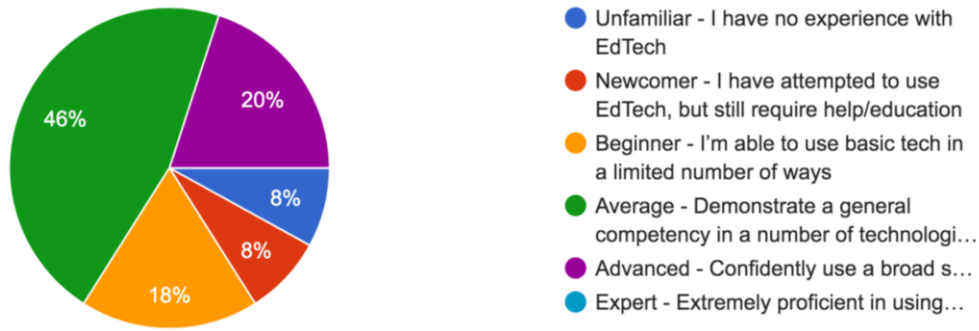


Figure 5. Respondents identified the level of proficiency they felt in their knowledge of educational technology. The options were reported on a scale with a corresponding definition of the proficiency in EdTech levels. The options were: Unfamiliar: I have no experience with EdTech, Newcomer: I have attempted to use EdTech but still require help/education, Beginner: I am able to use basic technology in a limited number of ways Average: I demonstrate a general competency in a number of technologies, Advanced: I can confidently use a broad spectrum of EdTech, and Expert: I am extremely proficient in using a broad spectrum of EdTech. Majority of respondents reported feeling they were of “Average” competency concerning their proficiency levels.

Technology Experiences. Within the survey, pre-service teachers were asked to rate their experiences on a scale of 1 (being poor) and 5 (being excellent) in implementing a new technology into their teaching practices. The mostly commonly identified was a rating of 4 (44%), followed by 3 (36%). The least frequent experience involving the integration of technology with only five votes each was 5 and 2 (0.1), and zero responses for 1 (0%).

How would you rate your experience with implementing technology (ie. teaching a new software program/app, introducing a new hardware technology...like an iPad) in an in-person or virtual classroom?
50 responses

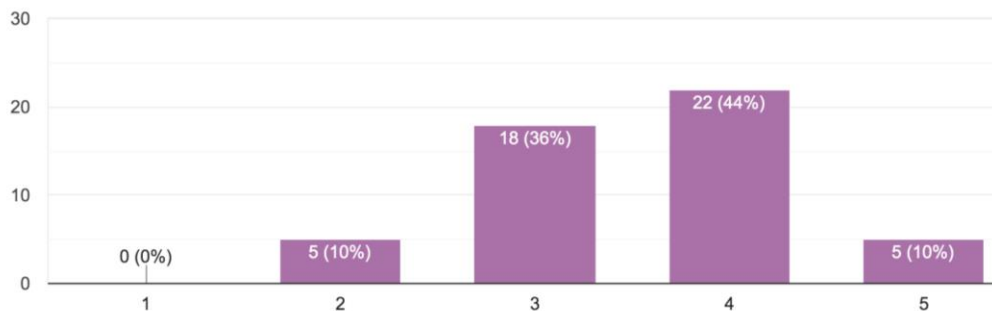


Figure 6. On a scale of 1-5, 5 being excellent and 1 being terrible, respondents rated their experience on integrating new forms of technology into their teaching practices. The majority of respondents reported feeling that their experience implementing technology was at a 4.

Confidence Integrating Technology. In assessing respondents' general confidence surrounding the meaningful use of technology in the classroom we received a variation of responses.

Confidence was assessed on a scale from 1, strongly disagree, to 5, strongly agree. Around 38% of respondents reported that they ‘agreed’ with the statement that they felt confident integrating EdTech in a meaningful way, while 32% selected “neutral” (neither agree nor disagree). Only 16% of respondents felt that they “strongly agreed” with the question, and 14% selected that they either “disagreed” (12%) or “strongly disagreed” (2%) with the statement.

I feel confident using technology in a meaningful way in my classroom?

50 responses

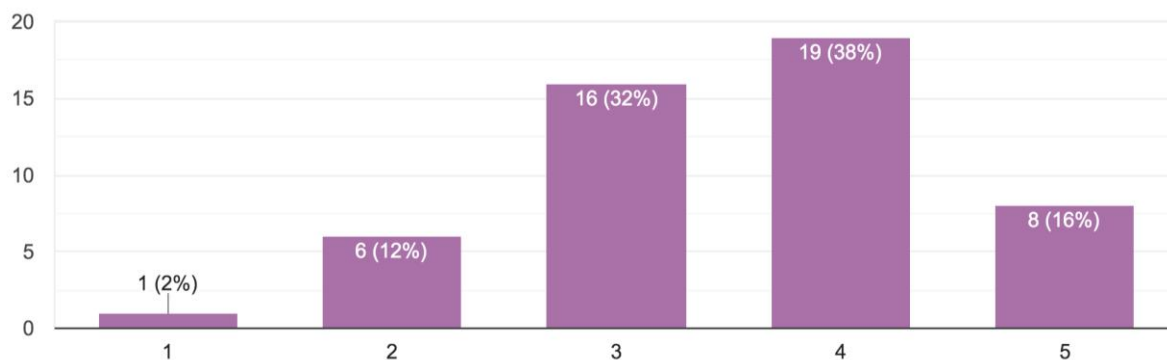


Figure 7. On a scale of 1-5, 5 being extremely confident and 1 extremely unconfident, respondents rated how their confidence levels surrounding implementation of technology into future teaching practices. The majority of respondents reported feeling that their experience implementing technology was at a 4.

Education courses surrounding technology

In exploring our last research question, lack of educational courses surrounding the use and integration of EdTech were considered as a possible factor influencing teacher readiness and competence in the use of technology. Survey results found that over three quarters of respondents (82%) felt that a gap existed in their education surrounding the use and integration of EdTech. When asked, only 6% of participants felt that they “strongly agreed” with the statement “I feel like I received adequate education on how to implement and use a variety of educational technology in a meaningful way”. The majority of respondents 42% reported that they either “disagreed” while 38% felt “neutral” regarding the statement.

Courses on EdTech. Out of our fifty participants, only 58% reported they had received a course on educational technology in their program, while 42% reported that they did not have one. We then asked candidates to respond to the degree at which their other courses in the program talked about the use and integration of technology as it relates to curriculum, and pedagogy. As we had participants who came from different schools, different courses, and different concentrations, we expected the results to be varied. The most commonly identified response was “1-2 of my classes have discussed it” (40%), followed by “3-4 classes have discussed it” (28%). Only 8% of respondents reported that “none of their classes have discussed it”, and 24% reported that “it’s brought up in every course”.

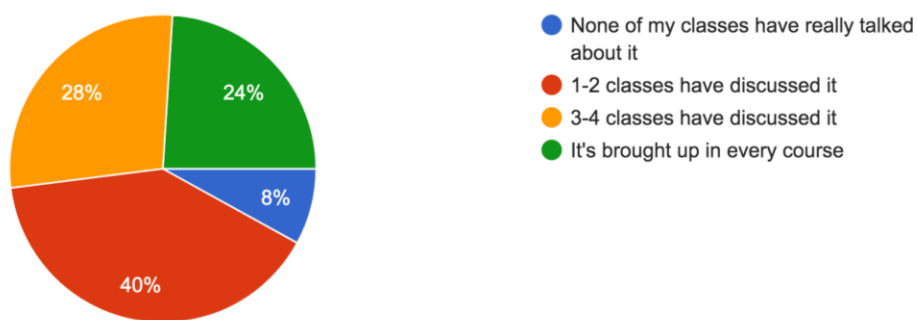


Figure 8. Respondents reported how much they experience learning about technology within their education programs. Depending on the grade division, teacher candidates have 4-6 courses during their semesters. When asked to report in how many of their classes EdTech was discussed, majority of respondents reported that only 1-2 of their classes discussed EdTech.

Last but not least, in assessing pre-service teachers’ responses regarding what they wish they had learned or knew regarding educational technology, the integration or implementation of technology into their teaching practices was the most identified response. Within these submissions, one of the most commonly brought up themes regarding integration had to do with specific curriculum content-based technologies, as illustrated by some candidates sharing what they wished they had learned:

“Specific EdTech that relates to my curriculum teachables. The only educational

technology we learned was catered towards younger students.”

“How EdTech can be used in specific lessons or to meet specific curricular expectations.”

“I wish curriculum courses included more information. The EdTech course I took largely focused on P/J level and I/S math and science.”

“All the technology that has been mentioned forces the teacher to design material around the technology instead of the technology naturally supplementing the content.”

“How to use the technology to open up new ways of learning, rather than just being a fancy/gimmicky technology veneers over old methods of learning. How to genuinely do new things with the help of technology.”

The remaining responses were related to access to technology, awareness of school board approved technologies, policies and laws surrounding technology in the classroom, and overall confidence in using tech, as highlighted by one respondent:

“I just want to learn more. Gain more literacy and confidence in EdTech”.

Discussion

The researchers in this study are two pre-service teacher candidates who have spent time teaching in Ontario classrooms over the last five years. During this time, and after reflections, it became apparent that there exists a gap in the implementation of educational technology in Ontario classrooms, as well as in teacher competence surrounding it. This topic slowly took the shape of our research focus for this study. Due to the Covid-19 pandemic, we were unable to

survey teachers currently teaching in classrooms in Ontario. However, the pre-service teachers we did survey have had some experience teaching in Ontario classrooms, as indicated by their survey responses. This study aims to answer two questions regarding the previously mentioned research focus. The first is *'Why is there a gap between meaningful technology implementation in classrooms?'* and the second is, *'How can we close this gap?'*. Throughout this study, three key factors were identified that we believe play a big role in answering both of these questions. The first being that proper training in teacher education programs revolving around educational technology to prepare future teachers is lacking. Furthermore, we believe that in-service teachers need to be provided with better training in schools to support their successful integration of educational technology in the classroom. The last issue we identified involves teacher confidence, or lack thereof, which in turn leads to lowered competence. Using the teacher digital competency framework (TDC), these three issues will be explored in depth to provide solutions on how we can work towards closing the technology gap that exists within our schools.

As a way of introduction, author Gary Falloon created what he has termed the Teacher Digital Competency or 'TDC' framework (2020). This framework works to encompass everything a digitally competent teacher should be aware of and consistently working to practice in their own teaching. Falloon discusses both the TPACK and SAMR frameworks. The term 'TPACK' stands for 'technological pedagogical and content knowledge', while 'SAMR' refers to 'substitution, augmentation, modification, redefinition'. According to Falloon, TPACK "presents a holistic model that theorises the relationship between, and contribution of, technological, pedagogical and content knowledge to effective curriculum learning-focused technology use" (2020). Essentially, teachers have knowledge of the technology, the curriculum, and how to teach, but TPACK works to mold those all together seamlessly and naturally. On the other hand, SAMR is

a levelled framework that looks at the use of educational technology in stages—progressing from substitution (for example, using a smartboard in place of a whiteboard) through to redefinition (for example, students might create and post an assignment on YouTube). For this model, teachers would be working to progress from simple substitution to the higher stage of redefinition in their use of educational technology in the classroom. These two frameworks, while helpful, do not fully encompass everything a digitally competent teacher needs to be aware of. Falloon builds on a previously created framework by Janssen et al. (2013) that describes areas of digital competence, and broadens this framework further by incorporating the TPACK model. Most notably, beyond the references to TPACK and Janssen et al.’s areas of digital competence, the TDC framework aims to include what Falloon calls ‘personal-professional competencies’ and ‘personal-ethical competencies’, which have not been included in previous models.

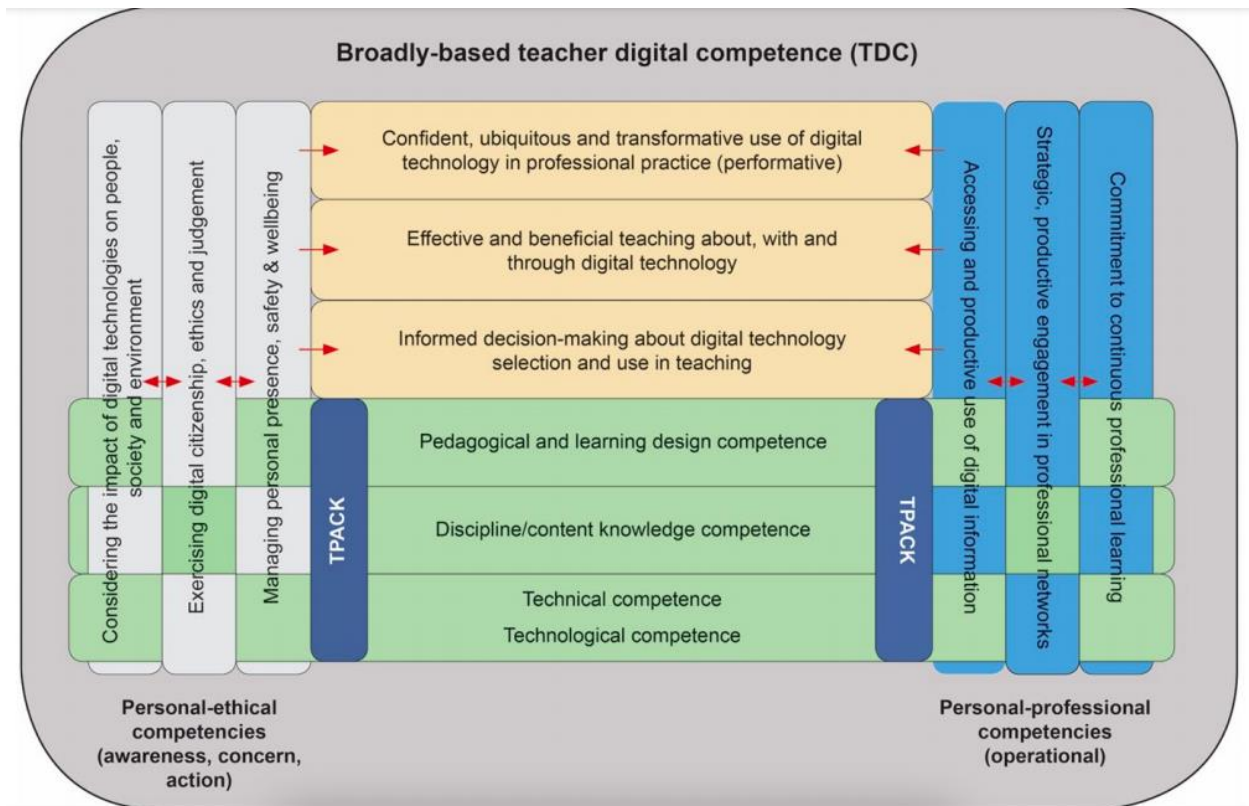


Figure 9. Falloon’s Teacher Digital Competency (TDC) framework (2020).

Falloon's model includes TPACK (green), highlighting the need for technological knowledge (TK), pedagogical knowledge (PK) and content knowledge (CK). He incorporates Janssen et al.'s building blocks (yellow) that he slightly adapts and broadens. Falloon also includes personal-ethical (white, on the left) and personal-professional (blue, on the right) competencies. Then, by interweaving these blocks and adding the red arrows to show how things are shared and relate to one another, he works to present a broad model. This framework was chosen because we felt it tried to capture everything we believe teachers need to possess as part of their skillset - and more importantly, as part of their belief system.

Why is there a gap between meaningful technology implementation in classrooms?

When asked about their opinions surrounding EdTech, survey respondents reported they felt that a gap existed in their EdTech education and did not feel they were adequately prepared by their university education program. Lack of proper instruction and training at university teacher education programs has been researched as a factor in why there exists a gap in the meaningful integration of technology in our education system. E. Dianne Looker and Ted Naylor, editors of *Digital Diversity*, put it this way: "prior to a focus on teacher use and practice, what is required is a more systemic educational and pedagogical consensus around the links between ICTs, teaching practices, and educational outcomes, including post-secondary teacher training programs" (2010). Despite the fact that 58% of survey respondents reported that they had been enrolled in an educational technology course, many believe that this was not sufficient enough to prepare them for proper EdTech usage. One respondent wrote "I wish I learned more about how to use technology to really benefit the learners (I.e., not just using technology for the sake of technology)". Part of the issue appears to be that students are not being taught using an integrated approach. Authors Foulger et al. put it this way: "When technology integration is

taught as a subject matter in and of itself, alignment to content such as science, mathematics, literacy, or social studies is lacking, and technology often drives the curriculum[...]. This is contrary to the idea of ‘integration’” (2017). They add on that “[t]he ultimate goal for teacher preparation programs should be a technology infused program that provides a more concerted effort to address teaching with technology throughout the curriculum” (Foulger et al., 2017). It is not enough to have knowledge of the curriculum (CK), or knowledge of the technology (TK), or knowledge of how to teach (PK) - pre-service teachers need to be taught how to integrate these models together by means of a technology infused program that provides a more synchronised effort to address teaching with technology throughout the curriculum. This aligns perfectly with Fallon’s TDC framework. TPACK is a large part of his framework, but it goes beyond that to include ethical and privacy concerns, continual personal and professional development, knowing which technology to choose, when to use it, how to learn more about existing and new technology, and how to integrate everything teacher candidates learn into one holistic approach in their future classroom. As evidenced through our results, pre-service teachers are not adequately trained in the use and implementation of educational technology in teacher-training university programs leading to a gap in meaningful implementation of education tech in our classrooms. There is a lot of research in this area, and while our survey respondents are still pre-service teachers, they have had experience observing their host teachers struggle to implement educational technology in their practices. One pre-service teacher noted that “teachers have to be extremely creative in order to make any use of [technology]. This forced creativity comes across to the student and results in an unnatural process.” Another respondent observed that “many times teachers end up paying for a lot of websites and it can hamper the use of technology.” In both situations - a lack of teacher training and lack of teacher funding for EdTech - it indicates an overall absence of adequate support and development at the school level. Similarly, a 2015

study of Prince Edward Island schools found that “there exists a pressing need for school leaders and teachers to learn how to effectively use these expanding technologies within classroom settings” (Preston et al.). From this research, it appears that teachers and school leaders are not learning how to effectively use these technologies in the classroom. One big reason for this at the school level seems to be a lack of time. According to Preston et al. “Participants identified lack of time as a possible reason why some teachers were not incorporating technology into student learning” (2015). Our own survey research and external research points to several additional reasons, including: lack of accessibility to the technology itself, connectivity and technical difficulties, and a lack of user ability with the tech. All of these combine to create a culture in the schools where teachers are ill-equipped to meaningfully implement educational technology in their classrooms.

Overall confidence, or lack thereof was identified as the final reason there appears to be a gap in meaningful implementation of EdTech in schools. While confidence building commences in childhood, it continues on into the individual’s life as a university student, pre-service teacher, and eventually into an individual teacher’s confidence in the classroom. As Looker et al. articulates, “it is also important to consider the extent to which individuals develop confidence and skills with the technology and how they actually use it” (2010). As stated in the results, when asked to rate their level of confidence in integrating technology slightly more than one third (38%) agreed with the statement, while the second highest group (32%) selected “neutral” . Additionally, when asked to describe their knowledge of EdTech, close to half of our respondents (46%) identified themselves as “average”, stating they could demonstrate a general competency in a number of technologies. Confidence varies depending on a person’s upbringing

and experiences, so a respondent that identifies as “advanced” in their knowledge and confidence of EdTech could be completely unrelated to their university education and the skills learned there. Which brings us back to the problem of teacher education programs in general. Ideally, being near the end of teachers college as many of our respondents are, one third of respondents would not rate themselves as “neutral” about feeling confident using EdTech meaningfully in the classroom. Authors Peterson and Bierlein Palmer (2011) put it this way:

One way to build such confidence and competence is to ensure pre-service teachers understand the material and are able to complete assignments in their technology courses (Karabenick & Newman, 2006). As students are introduced to new technologies, some may face new problems. For example, when a new software program is needed to complete an assignment, students may have difficulties mastering the organization and command options of that software. Yet, previous research has revealed that when faced with new problems, many learners hesitate to participate in the learning process because they lack confidence to solve such problems (Karabenick & Newman, 2006).

This type of support is needed at both the university and the legislative level in order to improve the confidence levels in our future educators. More research is needed regarding the technology-usage confidence and competence of pre-service teachers. Teachers need more than just software training or access to technological resources; they must first learn how to learn using technology, gain interest in using it, and feel comfortable trying new things (Preston et al., 2015). Just like pre-service teachers, in-service teachers need to develop this confidence, and be able to trust that the school environment they are in will support them as they try, make mistakes, and try again.

How can we close this gap?

We asked our respondents what they wished they had learned more about regarding educational technology in university. Their top responses included wishing they had learned: new programs, tools, and resources, integration/implementation of EdTech in the classroom, specific curriculum-based integration, and how to use it genuinely and usefully. All of these “wishes” we believe could be improved through introducing and upgrading existing EdTech courses at university. We believe the courses should be applicable and inclusive of everything teacher candidates need to know to teach effectively in classrooms, including: relevant frameworks or models like TPACK, SAMR and TPC, laws and policy revolving around the use of technology in schools, and avenues to continue learning about EdTech once they are in their own classrooms. This list covers nearly everything Falloon includes in his TDC framework. Confident, constant, transformative use of EdTech, effective and beneficial teaching about, with, and through EdTech, and informed decision-making about EdTech selection and use in teaching. Courses at the university level that cover these three things (the yellow bars in the TDC framework) are needed to ensure teacher candidates know how to use new programs and tools, and know how to integrate it naturally in their subject areas. Additionally, an applicable EdTech course would give students the CK, TK, and PK (the green bars in TDC framework) they need to fulfill their top EdTech “wishes”. Last but not least, a thorough university EdTech course would give teacher candidates the knowledge around personal - ethical competencies and how to be safe online (grey bars in the TDC) as well as personal - professional competencies and how to continue learning about EdTech effectively throughout their career (blue bars in TDC)

Alongside quality EdTech courses at the university level, creating a culture of training, support, encouragement, and choice at the individual school level would help to close the gap in meaningfully implementing EdTech in classrooms. As Looker et al. say, “To date, use remains largely at the level of low skills and tasks, not deeply integrated into curriculum and pedagogy as originally imagined by proponents of ICT integrated education” (2010). Authors Rizk and Hillier (2020) did a study on the use of educational technology in summer learning programs. In this case, they interviewed a teacher asking about the implementation of EdTech in the classroom:

[SLP is] more flexible because you’re not covering curriculum, and you’re not under a time-crunch to cover everything. I think you have the freedom to try something that you’ve never tried before. And if it doesn’t work, well that’s okay. Tomorrow’s a new day, and we’re moving on. – Lucy, teacher” (Rizk and Hillier, 2020).

Preston et al. argue that there is a need to “have teachers understand that it is important to take risks (and make mistakes) as they make decisions about, and play with, technology and teaching” (2015). They also say that “one of the most effective ways for school leaders to promote digital usage in the classroom is to invite teachers to select their own technological focus with regard to learning objectives, content, activities, and assessment” (Preston et al., 2015). Likewise, another author says: “Among the issues faced by teachers when attempting to integrate ICT into their classrooms are gaps in ICT knowledge and skills, lack of training and inadequate support and scaffolding” (Saxena, 2017). From these studies, it becomes apparent that meaningfully implementing EdTech is a challenge due to the need to cover curriculum, time-crunches, risk of failure, lack of teacher choice, as well as a lack of training, knowledge, and support. What these studies say is that changing the culture at schools - and by extension perhaps at the board level is needed. Preston et al. highlight two things to create this culture: e-leadership and meaningful

professional development days. They describe e-leadership as “the effective promotion and integration of technological learning and literacy into and within school environments” (Preston et al., 2015). They suggest that schools should invite teachers to become “e-leaders”, including “enticing teachers who are not self-confident or interested in technology to embrace traits of e-leadership” (Preston et al., 2015). They also highlight a concept called “reverse mentorship” which looks like “teacher e-leaders training more experienced school leaders about how to promote e-pedagogy in classrooms” (Preston et al., 2015). Preston et al. comment on PD programs by saying that “because teachers appeared to be stretched for time [...] teachers who attended professional development (PD) events often had only their most urgent technological needs answered” (2015). These authors articulate the need for PD events that are thoughtfully organized to really teach teachers how to use new and existing technologies meaningfully in their classrooms, rather than simply being a forum for answering urgent tech questions from time-stretched teachers. Another researcher in this field adds, “Professional development programs (PDP) should be organized for the teachers in which emphasis should be laid down on the development of ICT-pedagogical competencies” (Husain, 2010). Professional development needs to be given proper time and space, and teachers need to feel like they have time to engage and truly learn from the experience, not just answer pressing questions. Changing and improving the school culture to be more inclusive, supportive, encouraging, and open by raising up e-leaders, improving PD, giving teachers more time to learn, and leaving space for choice and mistakes would all go a long way to enabling teachers to close the gap and meaningfully implement EdTech in their classrooms.

Last but not least, building confidence in pre-service teachers and current teachers is essential for closing the meaningful digital implementation gap in classrooms. This specific point would largely be fulfilled by the proper creation and implementation of the first two points. That is, having good quality EdTech courses at the university level to fully equip pre-service teachers with a TDC framework in mind alongside changing the culture in schools to provide support, meaningful professional development, choice, and training e-leaders would very reasonably result in confident, competent teachers. Giving teacher candidates and teachers the support and education they need will in turn build confidence as they are allowed room to grow and develop as educators in today's technological classrooms.

Conclusion

In conclusion, we set out to analyse the gap in meaningful implementation of educational technology in the classroom by trying to answer why a gap exists, and how we can work to close it. We found that teacher education courses in EdTech were either missing or insufficient to prepare teacher candidates, that teachers need to have a healthy school environment to understand and implement EdTech meaningfully, and that confidence in themselves and their ability to use EdTech needs to be both explored further and built up in teacher candidates and teachers.

Our Takeaways

Our findings showed us that there is a lack of EdTech in our university teacher education courses. This did not come as a surprise, as we both felt it was lacking already as neither of us feels fully competent in implementing EdTech in a meaningful way in our future classrooms. We both wish we had learned more about EdTech implementation during our program, and this paper confirmed it. Our survey showed us that our peers feel the same way. Both of us agreed

that before working on this project we would have rated ourselves as quite competent at implementing EdTech meaningfully. However, after this project and what we learned during our research, we believe we have a lot of room to grow, and we wish that we had someone to help us on our journey. Hopefully having a growth mindset (see below) will help us as we try to grow in this area, and maybe one day we will end up working in a school and have a good support system there to engage with it further.

We both felt that the confidence area of teacher competence would be an interesting topic to further explore. We are both interested in this connection, which was unexpected. Confidence in EdTech seems to be related to something we have worked on previously in a group project, the concept of having a growth mindset. We both enjoyed learning about growth mindset, and we feel it is related to a teacher's likelihood to try a new technology in their classroom. People with a growth mindset are okay with making mistakes and have the confidence in themselves to try and not be afraid of failing. Exploring the concept of overcoming learned behaviours and personality dispositions and its effect on a teacher's willingness to try new EdTech would be fascinating to study (sort of studying psychology and its intersection with education). This entire topic and how it relates to EdTech implementation in classrooms would be interesting to learn more about.

I (Bethany) would be interested in doing another study on this similar topic at a later date. Given more time and less time-constraints, I would like to survey teachers and ask them similar survey questions we asked the teacher candidates in this study. Likewise, I would love to follow up with TC's in future years whom we surveyed in 2021 for this study and see what their experience with EdTech in their own classroom has been.

I (Logan) would find it interesting to explore the dynamic between willingness and confidence in integrating technology across grade and curricular subjects. From conversations with classmates, and in-service teachers, I have noticed that there is a large disparity between the recognition and utilization of technology in STEM courses, where it is seen more frequently, and arts courses, where we typically see more traditional methods of teaching. If given the chance, I would also have loved to further explore the roles students play in technology integration. If demographics like age, location, race, religion, or more have any roles to play in the integration and uptake of EdTech in the classroom.

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Appendix

1. What school do you attend?
2. How many years of post-secondary education have you completed? (College, University, Masters, B.Ed, etc.)
3. What education stream are you in, if any?
4. What year were you born?
5. Gender: How do you self-identify?
6. What grade/and or subject have you had experience teaching?
7. How would you describe your level of knowledge regarding educational technology (EdTech)?
 - Unfamiliar - I have no experience with EdTech
 - Newcomer - I have attempted to use EdTech, but still require help/education

- Beginner - I'm able to use basic tech in a limited number of ways
- Average - Demonstrate a general competency in a number of technologies
- Advanced - Confidently use a broad spectrum of EdTech
- Expert - Extremely proficient in using a wide variety of EdTech

8. How often have you observed educational technology on your placements or previous teaching positions?

- Never
- Rarely
- Occasionally
- Frequently
- Almost Always
- All the Time

9. What (if any) EdTech have you observed on your placements or previous teaching positions?

10. Have you had a course on educational technology in your program?

11. Have any of your classes talked about integrating technology in the classroom?

- None of my classes have really talked about it
- 1-2 classes have discussed it
- 3-4 classes have discussed it
- It's brought up in every course

12. Have you found that technology has increased or decreased engagement in your classroom?

13. How would you rate your experience with implementing technology (ie. teaching a new software program/app, introducing a new hardware technology like an iPad) in an in-person or virtual classroom?

14. What barriers have you or do you face with technology in your classroom?
15. What do you wish you knew/learned more about regarding educational technology?
16. I feel confident using technology in a meaningful way in my classroom?
17. I feel like I received adequate education on how to implement and use a variety of educational technology in a meaningful way.
18. Do you feel like there is a gap in your EdTech education?