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DAZED AND CONFUSED: A COMPARATIVE CASE STUDY OF UNCERTAINTIES IN
TECHNOLOGY USE IN EDUCATION

MA thesis

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Abstract

Teacher training is vital to ensure the effective integration of technology into teaching practices. The aim of this research study is to explore the uncertainties that exist when teachers and trainers engage with educational technology. This is a comparative study of two educational technologists and their teacher training courses. A variety of qualitative research methods were used, including autoethnography, interviews, and focus groups. Research participants include teachers who identify as competent users of technology from a language institute, and secondary school teachers who identify as beginners in regards to their technology competencies. The conclusion of this study reveals that uncertainties are experienced by teachers, trainers and educational institutes in a wide variety of ways, that reflection is necessary to identifying and externalising these uncertainties, and that uncertainties can be used to promote improved teaching practices in regards to technology use in education with guidance and support.

Keywords: uncertainty, teacher training, educational technology, reflection, uncertainty, technology use

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Introduction

Uncertainty is a fundamental element of teaching. Educators are constantly making decisions regarding their teaching practices and student learning; the state of uncertainty is constant and unavoidable. The sudden shift to online learning during the COVID-19 pandemic in early 2020 forced educational communities to work from home and embrace technology. As a result, educators previously hesitant to engage with new technology tools no longer had a choice. There was little time or space for reflection, as teachers shifted to online teaching almost overnight. While internet-based communication and online learning tools have been widely available for some time, educational institutes were in unfamiliar territory, evaluating the most effective way to meet educational needs in an acutely uncertain world. Presently, in 2022, we find ourselves somewhat more open to using technology in education; questions about uncertainty have not disappeared, rather forms of uncertainty have evolved.

While uncertainty is widely accepted as being a part of the developmental process, (Campbell, 2017) in educational technology, the term uncertainty refers to those episodes in which teachers express their insecurities and opportunities. In both cases, they are still undecided and, therefore, open to further development. The different educational actors have to face not yet settled issues and questions. Things in educational technology “are not set in stone once and for all. They are changeable, because there is no user guide to rely upon. Indeed, from time to time things are somehow settled. Negotiations, agreements, and expectations slowly appear on the horizon. There are things that become certain” (Bardone, 2022), with the rapid shift to online learning exacerbating existing anxieties and uncertainties within education. This abrupt transition showed the limitations of traditional learning methodologies when applied to simple communication tools. The absence of established methodologies and educational technologies for online education based on empirical data impacted the readiness for such a transition for the local pedagogical communities. If at the national level there were normative and platform solutions for distance learning, then among the local pedagogical communities there was a sharp stratification in terms of the level of technological equipment and readiness to rebuild the traditional educational process.

Teachers' ability to adapt themselves to rapidly developing technologies applicable to learning environments is connected with technology integration (Bentham, 2013; Ortega & Fuentes, 2015). Technology integration in education has a multidimensional structure comprised of various components and indicators. In this vein, the factors influencing technology integration include human resources and technological resources. Technology integration is defined as an efficient and effective use of technology embracing all aspects of learning and teaching processes including learning and teaching environments, curriculum, and infrastructure (Çoklar & Yurdakul, 2017).

During the technology integration processes, a variety of issues may cause problems, including teachers' limited access to the internet (Clark & Boyer, 2015; Khlaif et al., 2019), time constraints (Çoklar & Yurdakul, 2017), teachers lack of basic technological skills and attitudes towards technology integration teacher attitudes towards technology integration (Zhu et al., 2021), school culture (Leuverink & Aarts, 2021), and teachers' need for professional development regarding technology integration, with a lack of skills being the prominent obstacle to effective use of technology (Skantz-Åberg et al., 2022). The situation shows that teacher efficacies play a central role in influencing the effectiveness of technology integration in education; examining the role of doubt, insecurities and choice in these situations is consequentially, considering the role of uncertainty in developing teachers' relationship with technology.

In order to ease common problems such as a lack of basic skills, negative attitudes, and need for professional development and enable teachers to use technology effectively in their own teaching, pre-service education should equip teacher candidates with knowledge and skills that enable them to use technology. Therefore, it is important that teacher training institutions include technological tools appropriate to the subject and provide teachers with quality training programmes (Ugras et al., 2012).

For this study, we define uncertainty as the inconsistencies, insecurities, and doubts surrounding technology use in education. Uncertainty also suggests a lack of knowing, which, despite the connotations, is not necessarily a negative thing. From uncertainty, openness to development, discussion, and reflection is born. It can stimulate opportunities

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and promote learning opportunities, however, uncertainty is paradoxical; when avoidance becomes a response to feelings of uncertainty, consequently killing an otherwise rich opportunity to grow.

This thesis investigates the different uncertainties that exist when educators engage with technology. This study began as a comparative study of two teacher training groups who self-identified as either beginners or competent. Throughout the process, it soon became clear that uncertainty was present throughout the process; for educational technologists, teachers, and at an institutional level. While we accept uncertainty as an integral part of the teaching process there has been little research or attention focussed on the role of uncertainty for technology use in education . However, less is known about overcoming teacher's uncertainty in the successful technology integration process.

The purpose of the study is to answer the following research questions:

- What uncertainties are experienced by educational technologists when working with teachers?
- How do teachers experience uncertainties regarding the use of technology in the classroom?
- How do educators respond to uncertainties?

This thesis consists of a theoretical overview that examines the role of uncertainty in teaching and technology use, a method to detail our study and research methods, results of Daria and then Dannielle's study, and a discussion to reflect on the meaning of the results and the implications for teachers, educational technologists and institutions.

Theoretical overview

Uncertainty is omnipresent in the teaching profession (Campbell, 2007; Jordan & McDaniel, 2014; Labaree, 2000; Sieber, 1968). In fact, Helsing (2007) suggests that uncertainty may be endemic to teaching because there are no clear messages about what the job involves, what is expected, and how teachers are assessed” (p. 60). It is for these reasons that uncertainty, as a concept, can be somewhat difficult to define and understand. A great deal of previous research has focussed on uncertainty as an adversity that should be reduced, however, research also suggests that “the virtues of uncertainty are obscured by its negative connotations” (Floden, Buchman, 1993, p. 377).

This chapter will explore the nature of uncertainty as a concept, its relevance to the teaching profession, how uncertainty is articulated in relation to the use of technology in education, and the value of opportunities presented by uncertainty. The disruptions of the pandemic in recent years has provided an opportunity for teachers to reconsider their relationship to technology as an educational tool (Eradze et al., 2021; Yurtseven et al., 2020). This interruption of routine has produced a great deal of uncertainties, though there is a limited amount of literature on the topic of uncertainty and technology use in education. The aim of this chapter is to frame our current understandings of uncertainty and teacher education in teacher training courses in using technology, including the role of uncertainty for those educational technologists working with teachers.

Defining uncertainty

We can understand uncertainty at its essence as simply that which is unknown. It is not a revolutionary idea in any sense, though the application of the concept evolves, expands, and matures as contexts change. The Romantic poet John Keats (1795-1824) contemplated the idea of uncertainty as part of his theory of negative capability, which can be condensed as an argument against the quest for knowledge, logic, and reason, rather favouring the pursuit of beauty, wonder, and contentment in the realm of the unknown (Hebron, 2014). In describing

negative capability, Keats wrote of it as a quality in which “Shakespeare possessed so enormously... when a man is capable of being in uncertainties, Mysteries, doubts, without any irritable reaching after fact & reason” (Keats & Rollins, 1958, pp. 193–4). While Keats' romantic notion of uncertainty may seem a world away to educational technology, it serves as evidence that attitudes and approaches to uncertainty have long been reflected on and queried throughout disciplines and ages (Scoones, 2019).

Managing uncertainty is present throughout all professions, though it is considered as more imperative in disciplines such as medicine (Brashers, 2001; Lygo-Baker et al., 2015). Understanding and accepting that uncertainty is prolific, how can we define uncertainty within the realm of education? In “Variation in students' propensities for managing uncertainty” (2015), Jordan defines uncertainty as “an individual's subjective experience of wondering, doubting, or being unsure about how the future will unfold, what the present means, or how to interpret the past (p. 99). A recent publication by Bardone et al. (2022) defines uncertainties as “what students and teachers experience and articulate when being in a situation that is not yet determined and still open to further developments” (p. 5). It can link uncertainty to decision-making processes (Jordan et al., 2014), variety (Eradze et al., 2021), and ignorance (Smithson, 1989), making it somewhat ambiguous to identify and articulate forms of uncertainty. According to Brashers (2001), “understanding various types of uncertainty enhances our ability to describe and explain its influences on behaviour and to develop strategies for improving people’s lives” (p. 479). The way uncertainty is conceptualised in education is evolving, particularly because of the rapid and urgent evolution of technology use in education. Therefore, the exploration of uncertainty in education deserves consideration and contemplation.

Uncertainty in teacher education

Teaching has, and will undoubtedly always be, infused with a multitude of uncertainties. McDonald “characterises uncertainty as the tension that lies at the heart of all teaching” (as cited in Floden & Clark, 1988, p. 9). There are varying stances towards uncertainty; that it is something that should be reduced or eliminated by seeking greater certainty, or that it can be

seen as an opportunity. The nature of teaching is emotional; teaching requires skills of both emotional management and labour (Labaree, 2000), besides a litany of expectations and obligations. Considering this, the role that uncertainty plays in teaching can be viewed as undesirable and destabilising, particularly in teacher training or for beginning teachers. On the varieties and forms of uncertainty, such as its association with negative emotions, Campbell (2015) writes:

Uncertainty may also centre on a teacher's questioning of his or her own professional competence, capacity for effectiveness and responsiveness to students, and even personal identity as a teacher. Further uncertainties that reflect larger external realities in a societal sense are present in every classroom and play out in the interpersonal and emotional relations among teachers, students, and others actively involved in the processes of schooling" (p. 2).

Uncertainty can also lead to feelings of guilt, prompting teachers towards an "avoidance of uncertainty and tension" (Campbell, 2015, p. 2). A literature review conducted by Helsing (2007) found that "some researchers suggest that teachers have negative emotional reactions to the uncertainties in their practice, experiencing fear, anxiety, and frustration" (p. 34). Sources of uncertainty as noted by Helsing relate to ambiguities of roles and expectations, questions regarding their own effectiveness and efficacy beliefs, doubt, institutional and psychological boundaries. The specific cultural context may influence negative associations with uncertainty, and "an orientation toward uncertainty is more likely to be devalued or seen as an indication that one is not teaching well" (p. 33). Uncertainty is inevitable, but therein lies the problem: avoiding instances where uncertainty (or doubt) may occur overlooks "doubt as a basic feature of the learning process" (Gabella, 2014, p. 237). An avoidant approach to uncertainty risks overlooking meaningful learning opportunities. Education is riddled with complexities. As such, any approach to learning should show a recognition of this certainty.

There are arguments for avoiding and embracing certainty, though what is deemed best will likely come down to the individual nature of the teacher and the specific context under investigation. According to Floden & Clark (1988) "Uncertainty has virtues that are obscured

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by the negative connotations of the word. (p. 9). The power of perception is unequivocal, and new habits and routines can be difficult to form, particularly when teachers feel emotionally safe with the certainties generated by routine, structure, and the *known*. On the tension between certainty and uncertainty, Floden and Buchmann (1993) wrote:

Too much uncertainty may be disabling, but too much certainty can lead to boredom and stagnation or to the mistaken sense that teaching is mechanical. Suppose that instead of 'uncertainty', one spoke of 'openness', 'awareness of possibilities', 'fluidity' or 'freedom from rigidity' (p. 377).

The negative connotations associated with uncertainty eclipse its virtues. It can be tempting to present uncertainty as a dichotomy, particularly for beginning teachers. On the word itself, Rogers (2016) suggests that “humans have the ability to act in unpredictable ways then there is no other word that sums up this essential component of the teaching profession” (pp. 9-10). Notwithstanding, “the capacity for reducing uncertainty, however, needs to be supplemented with ways to cope with residual uncertainties and tempered with a critical view of the single-minded pursuit of certainty” (Floden & Clark, 1988, pp. 8-9). Floden and Buchman (1993) suggest that:

Being prepared for uncertainties includes understanding them. Apart from its intrinsic value, understanding is important for developing an appropriate stance toward uncertainty, maintaining openness and flexibility, and deciding when uncertainties might be reduced through study and effort (p. 377).

Research reveals that greater understanding of the various elements of uncertainty in teaching is needed. This will encourage a culture where the anxieties born of uncertainty can be soothed, while an open mindset, conducive to furthering teacher education, can be facilitated and nurtured.

Uncertainty and teacher's use of technology

What is clear in discussions of uncertainty, is that teaching has become increasingly complex, exacerbated by the rapid shift to emergency online teaching. Eradze et al. (2021) comment that although teaching technologies have been widely available for some time, “educational technologies before Covid-19 did not have the innovative or educational impact expected” (p. 404). While tools existed before the pandemic, it prompted teachers to abruptly reconfigure their pedagogy to include online tools. In relation to the specific context of the pandemic, Bozkurt et al., (2020) writes:

With the uncertainty that characterises this period of human existence and the resulting anxiety and trauma that learners, teachers and parents are experiencing, the theme of a pedagogy of care has surfaced within educational institutions” (p. 4).

The disruption caused by the pandemic meant that, while it created an opportunity for change, growth, and pedagogical reflection, the “rapid and underprepared transitions for all teachers/instructors, students, and families, causing considerable stress and uncertainty” (Bozkurt et al., 2020, p. 93). A study by Eradze, Bardone, and Dipace (2021), refers to unorganised variety as contributing to uncertainty. In this context, “unorganised variety refers to the fact that teachers and other educational actors could entertain options that they could have never contemplated without the suspension of all in class activities” (p. 409). This requires a great deal of coordination and organisation between teachers and institutions, with the “increase of unorganised variety” (p. 409) generating uncertainties.

Research indicates that teachers need the support of the institutions they serve in order to use technology effectively (Ottenbreit-Leftwich et al., 2010). Olga Pirk (2020) argues that institutional support is “a substantial requirement and should not be overlooked by the administration of any school” (p. 28). Consequently, there is a need for institutional support to ensure that the role of technology in teaching and expectations of teachers are clear. The context in which technology is used can be highly motivational for teachers (Backfisch et al., 2021; Scherer & Teo, 2019; Teo, 2011), though there is a need to evaluate and reflect on the

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role of uncertainty in regards to teacher's use of technology. Uncertainties should be communicated and identified. Floden & Buchman (1993) suggest that teachers can reduce the stress created by uncertainties by communicating with their colleagues. They suggest that this can result in relieving feelings of guilt and failure, aid in understanding uncertainties as "an essential driving force in teaching, not merely a deficiency and worry" (p. 380), and also the communication "might reduce inappropriate pressures for certainty (p. 380). Leadership has a role in controlling or limiting uncertainties with the decisions that they make regarding managing people. This is also something that is reflected in the research.

Uncertainty as opportunity

Accepting that uncertainty is embedded in education and that it can cause immense stress for teachers (Bozkurt et al., 2020), it could be beneficial to frame the uncertainties of technology use as an opportunity. According to Eradze et al. (2001), "uncertainty also means sensing and seizing opportunities – options that now the teacher can entertain precisely because of the temporary disruption" (p. 414). In 'Raising the teacher's voice and the ironic role of theory', McDonald (1986) asks, "what if theorists recognised that intimate knowledge of this uncertainty was exactly what was missing from both their theories and the policies these theories provoke?" (p. 362). This thought entertains the notion that uncertainty is not simply a feeling that should be avoided, but rather embraced as a potential space for growth. There are creative opportunities that might emerge from the space generated by uncertainties, though it can also be debilitating for teachers and stunt growth and willingness to approach new opportunities. While uncertainty can be a practical thing, it can also be a particular mindset; accepting the role of uncertainties in teaching and education can bring up all sorts of vulnerabilities. Managing people and vulnerabilities can be a difficult thing, so the tendency to try to limit or avoid uncertainties is understandable.

This theoretical overview shows that while research exists on the role of uncertainty in teaching, there is a research gap for how uncertainty presents in technology use in education. The accelerated move towards technologies forced by the pandemic has radically transformed teacher's relationship to technology. Through a variety of qualitative research methods, this

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study will explore the nuances of uncertainties in technology use in education, exploring how uncertainties are experienced, identified, and perceived by teachers and educational technologists.

Methodology

As outlined in the introduction, the goal of this research is to investigate the different uncertainties that exist when educators and educational technologists engage with technology. This study uses qualitative research methodologies, as this research aims to describe the behaviour of human beings within their own contexts through in-depth studies (Lichtman, 2012). We deemed qualitative research methods as the most appropriate as our research question looks into how teachers describe the uncertainties that they face when working in the classroom, integrating new technologies. This study employed a qualitative research design using autoethnography, focus groups, and semi-structured interview study elements. Interviews are among the most familiar strategies for collecting qualitative data (DiCicco-Bloom, 2006). Semi-structured interviews are often the sole data source for a qualitative research project and are usually scheduled in advance at a designated time and location outside of everyday events (DiCicco-Bloom, 2006). We will describe the studies, course design, and research methods further throughout this chapter.

The study design

In this study, a set of predetermined, open-ended questions were created to analyse what kind of hurdles might emerge before, during, before, during and after the technology training courses. The research material is the collection of feedback, reflections, and answers of participants who were students of the two separate courses conducted. We aimed both courses towards teachers who wanted to improve their use of technology and develop their skills and knowledge in this field. They had the intrinsic motivation to improve their teaching and learning practices through the use of technology, though they needed professional development in order to obtain support and further their skills development.

While designing the course, we emailed the participants, asking for feedback to help us design the most effective courses and address their preferences and priorities. The question was simple - *what would you like to know?* The original study was going to compare and contrast experiences felt by teachers *during* these two courses, though it became clear that

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there were a multitude of uncertainties experienced by both the educator participants and the educational technologists *before, during, and after* implementing these courses. While our initial plan for this study was a comparison of uncertainties of technology use observed between participants in the two courses, it soon became clear that the uncertainties were also experienced by the educational technologists throughout the course. Our study widened to include us as educational technologists, with autoethnography used as a research method.

After we completed our study, we realised that a great deal of uncertainty generated was because of role ambiguity or the way that leadership were managing people. We therefore decided to include leadership in our studies to gain another perspective.

Course design

The two courses designed were aimed at secondary-school teachers with the purpose of developing their skills of using technology in the classroom, though the contexts and content differed in response to the experience level of the participants. The first course, hereafter referred to as Daria's course titled 'Presentation, Collaboration, Inspiration', was designed to teach to language teachers who identified as *confident* in terms of technology experience. These teachers could already work with educational technology such as interactive boards, some educational platforms and applications for special educational interactive software, and they participated in the two day course.

The second course, Dannielle's course, 'Technology Use in Education for Beginners', was designed for a group of secondary school teachers from across the disciplines. These teachers self-identified as *beginners* who felt unconfident and inexperienced; essentially, they wanted to know the basics. This course was run face-to-face as a half-day professional development course. All participants in both courses were volunteers.

Both groups were recorded when engaging in discussion questions as the introduction or opening to the course. The intention behind the questions was to get students to share what technology they use, get a sense of their attitudes towards technology, and also to promote a space that facilitates sharing and openness. We both gave our own anecdotes when asking these questions. The discussion questions consisted of the following:

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- What kind of technology do you use in the classroom?
- How and when do you use it?
- What applications would you like to use? What do you think prevents you from using them?
- What makes you feel uncertain (uncomfortable) using technology in the classroom?
- What would be a perfect support for your class in educational technology?
- What are your expectations from this course?

We came back to the course participants with follow-up interviews, eliciting feedback on the course and further reflection. Considering the institutional and contextual uncertainties that emerged, we decided to interview a senior member of leadership within the institutions to ask more general questions pertaining to the context of technological integration. In addition, we self-reflected with journaling and note-taking as part of the autoethnographic research, also using Microsoft Teams chat function, Zoom, and WhatsApp to share our reflections with one another.

Methods for obtaining data

Participants

The 12 teacher participants in Daria's course were from four different languages: English, French, Turkish and German. In the second course, the 13 teachers taught a range of subjects, including Science, Mathematics, English Language, English Language and Literature, Humanities, and Visual Arts.

Data gathering and analysis

The research data in this thesis is drawn from a variety of sources and situations:

- participants' comments in the the Reflection forms before, during and after the course (text submitted in Google documents) for Daria's course

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- participants' oral comments during and after the courses
- focus group and semi-structured interviews that were conducted with course participants after the completion of the course
- Individual interviews with the school administration
- Autoethnography

Autoethnography

In “Autoethnographic Journeys in Learning and Teaching in Higher Education” (2013), Trahar writes about her own experiences of autoethnography and her justification for choosing this research method. She writes:

Good academic writing demonstrates a balance between consideration of the words and ideas of others and critical reflection on the extent to which they apply – or not – in one’s own context and experience. It also necessitates the ability to question and challenge existing knowledge and the social order. (p. 367)

When we were deliberating on potential methods for qualitative research, we initially did not consider autoethnography as an option. However, when we recognised the role or emotions in our own approach to designing the course. Essentially, we decided to play to our strengths, and we found that we were unable to separate our emotions and sensitivities from the study, and that it might be advantageous or beneficial to include ourselves in the study, as observers and participants. Autoethnography has been criticised as being somewhat sentimental and romantic. Trahar argues that “if, by sentimental and romantic, we recognise the place of emotion, of affect, in research, in learning and teaching, as in life, then autoethnography is certainly sentimental and romantic” (p. 371). Teaching, after all, is an empathetic profession. We decided that, rather than dismiss emotions and subjectivity, we would embrace this as part of our study.

Results

When reflecting on the research and data, we identified that uncertainties were ubiquitous in both studies and also within our own autoethnographic reflections. A confused and tangled picture emerged, reflecting complex conceptual and emotional uncertainties regarding the use of technology in an educational setting. Interestingly, for many participants involved in the two studies, expressions of uncertainty took the form of fear, ambiguity, and contradictions regarding the use of technology and the role of the teacher. The pervasive nature of these uncertainties can be difficult to identify or articulate. This in itself, presents as a form of uncertainty. We decided to group our uncertainties by topic, focussing first on Daria's and then Dannielle's study.

Daria's study

Uncertainty related to course population and design

While planning the course design, I had doubts about where to find teachers to train. I had a connection from a company I previously worked in, where I trained teachers to use interactive boards, and approached the head of a language school in Moscow. I was familiar with some members of the school and had positive memories of friendly teachers who were eager to learn. I remember them as confident technology users. When I contacted the head, Anja, she was happy to support the idea and invited me to a meeting to discuss the content of the course; she wanted to ensure that my goals as a trainer and researcher were met in accordance with her objectives for the school. Here, uncertainties presented as different options, though they were reduced and managed through collaboration between me, the educational technologist and Anja, as a school leader. The infrastructure of the school supported technology use; a time and financial budget for training and interactive boards in each classroom meant teachers identified as confident users. The head and I agreed that the course would focus on improving presentation skills, organise collaborative activities, and

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inspiring staff by presenting three tools: Miro, ReClipped and Padlet.

My familiarity with these tools, the offline format, and the agreed outcomes meant that my own uncertainties as an instructor and researcher were reduced. This training course was also mandatory. Resources and time were also allocated by the head. The confidence of the participants, institutional infrastructure and support were in place to support the effective use of technology, effectively reducing barriers. I also had teachers complete a questionnaire on Google Forms related to uncertainties. This also provides me with an opportunity to pre-empt and reduce any identified uncertainties.

A question that I struggled with both before and during the course was whether to allocate time for tinkering, or whether to pack the course with structured activities. Tinkering would allow participants the time to play and explore the tools, though I had uncertainties related to the cultural context. A more Russian approach to education is to keep the students busy at all times and give them many clear instructions on the way, whereas the European way is more to trust enough and provide space for discovery and reflection, as facilitated by tinkering. I did not know any of the participants at this stage, and I was afraid that they would not need time to tinker, or respond positively to the opportunity. In “Tinkering with a chance”, Bardone (2020) writes that “the absence of a plan and the consequent activity of tinkering with chance events makes one be particularly attentive to whatever comes in handy”. I took a chance with tinkering, both to give these experienced technology users an opportunity to play, but also because I was unsure whether I would have enough time to teach all three tools. Although I had created my plan for the course, I was still insecure about student participation and abilities, and so I developed a backup plan with some ready-made activities should I encounter any issues on the day. Here, I planned to ensure I would not have to confront uncertainties relating to participant expectations.

Teacher's uncertainties before the course

In the pre-course questionnaire, most teachers wrote that they used technology to support their teaching and they did not have concerns related to the use of technology. They also

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mentioned that technology use is mandatory at their school. They cited the applications they used, highlighted some situations in the online classroom, and showed their confidence with educational technology. One teacher, Ivan, referred to using “technology in every class with both children and adult students... so that students practice better grammar”. Teachers spoke of their proficiencies in using technology in both face-to-face and online contexts, with Maria commenting that “in the classroom, I use smart boards that have many educational resources. In online class, I give remote control to students, and they take part in games”.

Participants were eager to present their knowledge and practices. Ivan wrote:

I do use technologies, such as word wall, Quizlet, Kahoot, British Council (there you can find some interesting activities and games to do). Speaking about the description, I would shortly name it a bright useful thing which makes the learning process more effective and entertaining.

Ludmilla presented the same positive recounts of their technology skills:

We prepare presentations or we have already prepared presentations, so we present them to our students as our lessons. Then we involve students in the process of education. We use the Internet for some websites, we open videos on YouTube, and our students are allowed to use mobile phones for Kahoot games, for instance.

Some teachers admitted the problems they face regarding subscription fees and in-app purchases as what made them feel insecure about using technology. One teacher also expressed concerns about the acceptance of the technology in collaboration with other teachers and students: (other teachers, students in the classroom), though the primary concerns were related to practical issues, such as “the internet connection, some defects and problems... this kind of concern that technology can let you down”. Ivan said that “it may be difficult to find useful sources. Sometimes technical errors spoil time and students may lose their interest in the task”. Luka was confident about their lack of concerns, “I don’t have any

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doubts concerning the use of technology. I find it's normal in our day and age to use technology in every aspect of our life, so why not in education?"

The participants responded with concision regarding their uncertainties as related to practical uses, with one participant denying any uncertainties. There was an air of avoidance in response to the question of uncertainties and technology use; all participants focussed on presenting their skills rather than what they were *unsure* about.

My own uncertainties

Are they even comfortable mentioning their uncertainties? That was my thought after I read their expectations before the course. The teachers *seemed* like confident technology users and they mentioned some really practical things that they do in the classrooms each day. It is said that practice makes perfect, and performing routines can strengthen skills and boost self-esteem, but I was also asking myself whether they could think critically about their own use of technology. Were they challenging themselves enough to experience doubts and concerns which are a part of every professional growth? I was unsure.

I also thought that perhaps their confidence might be an overstatement of reality. To apply to work in this school, technology competence is a must. The interactive boards and educational software in each classroom were a huge investment for the school, and leadership mandates its regular use. Considering this, I questioned whether teachers were too scared to admit if they were not good at something concerning technology use, instead were eager to show their confident skill rather than doubts - even though I was asking specifically about the doubts. I was uncertain about whether I had made my questions clear enough. Their responses were full of praise and gratitude for their workplace, as Vanka wrote:

I've been working in the school for one year. My job requires using technologies (smart board presentations, games etc). For me it's much more comfortable, entertaining, bright and effective. Though I can't compare because this is my first job

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as a teacher. But I wish I had had something like that during my student life.

Floden & Clark (1988) advocate for increasing the time devoted to professional conversations for teachers, writing that “School structure and the facts of classroom life inhibit teacher talk. Moreover, social norms discourage admission of uncertainty, treating it as an unacceptable fault. Educational scholars often reinforce this view” (p. 15).

My participant responses reveal both a desire to show their confidence and an inability to articulate or confront uncertainties. This is perhaps a reflection of their own desire to appear confident and competent, but is also a possible response to being unfamiliar with publicly sharing their uncertainties. Either way, this response shows that they saw uncertainties as undesirable and thus to be avoided. I was unsure whether I was providing a space where they felt they could express these concerns. I felt as though teachers were afraid of admitting uncertainties, as their job requires them to learn how to overcome those they might encounter. In the past, I received feedback as a language teacher that my strength is to make people feel relaxed and secure, promoting an atmosphere where students are motivated to speak. However, I did not know these teachers and our interactions were limited to the two full-day sessions. Perhaps greater rapport (and time) is needed to change attitudes and mindsets.

Avoiding uncertainties

After reading the participant reflections, I concluded that the group avoids expressing uncertainties in favour of seeing possibilities – a positive response to doubts and questions. As mentioned earlier, it is possible that their comments could have been more candid if we had more time together. It is also possible that they felt that I could have reported them to leadership, as confidence with using technology is part of their job requirement. Some teachers explained that they found Miro too complex and they were afraid it would be too messy to use during class. The price was also a concern. There was also a general pattern where once teachers had mastered the basic functions of a tool, they did not choose to develop their understanding further. They dealt with uncertainties by limiting complexities.

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I also saw a tendency to avoid uncertainties at the institutional level. My follow-up interview with the head of school revealed that there was a large amount of support for effective technological integration at the school. The main points I learned were that:

- Teachers are introduced to new processes gradually, with a series of tutorials and workshops.
- Teachers are provided with ready-made materials.
- Teachers are supported by an educational technologist instead as well as an IT team.
- Teachers are trained to use all the elements of the learning process: focus on the learner, friendly and open atmosphere, technology, bright content, materials to master the knowledge.

The head of school also revealed that they have a policy of hiring teachers who are under the age of 35, as they are “better at mastering technology”. I interpret this age bias is an attempt to limit uncertainties relating to technology use and skills acquisition.

Uncertainty after the course

Russia’s war on Ukraine began on the 24th of February and I was scheduled to interview the participants on the 28th. I felt guilty about approaching the group to ask them questions when their situation was so horrible. Being Russian myself, I knew about the experience of a lot of people that are leaving the country in panic and that all made me feel uncomfortable approaching my group again. Questions about educational technology seemed to be insignificant in comparison with the war.

I came back to the teachers with the follow up questions at the end of February as planned. The main conclusion of this follow up is that teachers were only really drawn to Padlet, with 10 out of 12 people stating they were satisfied and so were their students. Miro was “too complicated”, and there was a problem with the “whole structure”. ReClipped received little to no attention, with nine teachers ignoring it entirely. On embracing Padlet,

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Layla wrote:

There are a lot of possibilities. I think the visual part is also very important and you can find it in Padlet. A lot of creative tools, pictures and even GIFs. This is essential to keeping students engaged, to have an interesting conversation to improve your speaking.

I was immensely grateful to the teachers for sharing with me, given the context. Although some teachers were happy to discuss what they had done with Padlet, it all became irrelevant as companies had decided to stop operating in Russia. In an instant, they had to switch to Russian tools, many of which did not work well or were simply non-existent. Teachers were not searching for opportunities now, rather trying to figure out ways to continue to use technology within Russia. Padlet, Worldwall and Kahoot were no longer working. When they tried to access Kahoot, Russian teachers could only read a written statement that said “We stand with Ukraine”, and would no longer be operating in Russia.

While I was initially searching for uncertainties related to technology use, by the end of my study, the participants were facing a lot of uncertainty about their future in general. The sunny, confident participants were understandably anxious and no longer focussed on the possibilities of educational technology. As a Russian, I understood and shared their uncertainties. Our world, once again, changed in an instant.

Dannielle’s study

Uncertainties related to expectations

While designing my half-day teacher training course, I focussed on anticipating teacher expectations and reducing any anxieties that might emerge. Leadership gave me the option to make this training mandatory for all staff, though I insisted on working with those who felt

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insecure and lacked basic skills. Colleagues were quietly enthusiastic about the idea of participating in the course, and a number of teachers articulated that they would feel comfortable working with me to get to know the basics. When asking a potential participant if they would be interested in attending my course, Blake responded, “I don’t even know where to start... I’m so embarrassed. I don’t know how to ask for help because I don’t even know what it is I need help with.” Helsing (2007) observed that “emotions that may cause teachers to have misgivings about their own capabilities as teachers” (p. 4). Blake is an accomplished and celebrated teacher; this conversation reinforced my understanding that insecurities were preventing teachers from using technology. Many felt overwhelmed by choice and some felt ashamed of not meeting perceived expectations.

My response to how teachers like Blake negatively experience uncertainty was to limit variety. By pitching the course to *beginners*, I was reducing the skills and potential expectations during the course, thus creating a sense of certainty and security for myself and the participants. When designing the course, I asked teachers to email me with a list of requests. I then created an unlisted YouTube channel with a *how to* video series to address their needs. Videos and skills included instructions on how to make educational videos, convert a document to a PDF, schedule send emails, make podcasts, make a Kahoot, use Canva, record audio on your phone, insert audio on Google Slides and more. Upon reflection, over-preparing was a response to my own uncertainties, and an attempt to manage those of the participants. Brashers (2001) wrote that “responses to uncertainty are shaped by appraisals and emotional reactions to the experience” (p. 481). I understood that my colleagues’ time was precious and I needed to reassure myself that the course would prove useful. I devoted the last phase of my course to individual learning. As there was no budget for this course, I purchased a cheap set of headphones for each participant and brought in my own laptops and tablet to share. Computers are not issued to staff at this school, and so I borrowed student laptops and chargers in case someone did not have their own equipment.

My course design reflected my uncertainties related to expectations. I devoted the first portion of the course to a discussion session. This was a space where I shared my insecurities and hesitations when using technology in the classroom and I was candid when answering their questions. Teachers were curious about how long it took me to produce content and

learn how to use certain programmes and tools, and responded with gratitude to my frank responses. I found myself repeating the phrases “don’t worry, this is totally normal”, “please don’t be afraid to just ask me for help”, and “I’m more than happy to help”. By expressing my own uncertainties and offering support, I aimed to establish an atmosphere where fears and concerns could be shared without shame. The discussion evolved organically and was based on six questions, as presented in the methodology.

What surprised me during this discussion was that teachers could not articulate their expectations of the course. When responding to this question, the answers were somewhat ambiguous, with one consistency being an underlying fear of student dependency on technology. Ellis explained:

For me though, the specific question is relevant to balance - what can I, from this session, use to help me inspire students to use technology when it’s really necessary but to not lose their ability to use their paper and pencil and creativity? In brief, how can I help my students to appreciate technology without becoming dependent on it?

Another participant, Jaime asked, “What’s out there? What am I lacking? Is it better than pen and paper? And that’s maybe what we need to gauge because at some point it has to come from within.” A theme of hesitancy and scepticism emerged, coupled with a general inability to articulate expectations of the course. Uncertainties relate to that which is unsettled; I interpreted this as a reflection on contemplating different options and trying to establish whether the investment in technology use was worth it. Essentially, the responses reflected that teachers were considering what would be lost, or what the trade-off would be in terms of the teacher-student relationship.

Uncertainty regarding the role of the teacher

A consistent theme throughout the discussion was the view that technology was a threat to teacher’s relationship with their students. All teachers expressed frustration in response to

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student's inability to work effectively while online, feeling as though they had to compete against a computer to maintain student attention. Jules said:

I find myself saying please close your laptop because I know I'm no competition for that computer. I can sing, I can dance, but I'm no competition for the internet - and I don't intend to be. I'm not as flashy and new.

This comment generated a great deal of energy when shared with the group. Jules continued:

We talk about our reliance on technology and it's amazing - when the WIFI went down the other day and I couldn't show a set of slides I had for the class. And they weren't on my laptop - they were up there somewhere in the great unholiness of the sky... it was very, very upsetting to think of just how reliant we've become. And you know, we do our job through technology but we also need to show young people that there is a limit to how we can use technology to answer questions that you have in your life. And for me, that's what I think about most in terms of technology.

Another teacher, Camille, remarked:

All the distractions with the computer it's very scary - that's what scares me the most - to keep them focussed and doing what they're supposed to do instead of doing something else. So how can we manage this?

From this point, the conversation spiralled, with one teacher proposing solutions such as "mirrors on the walls" or a "programme that can monitor the students". Anxiety can be contagious, although while there was a nervous energy in the room, all teachers felt overwhelmed and frustrated by a feeling that technology was cumbersome and potentially not worth the effort, as reflected in Jean's comment:

What are we even doing with technology if the problem is just managing their behaviour and usage. Where is that communication, that thing that makes me want to teach? Where is the line of communication between the student and the teacher that

we use as a guide? If we're really at the point where we have to use surveillance to keep them on task, then we've lost the game. Really, that's how I feel.

There were two uncertainties on display here; teachers were unclear about their role as a teacher in guiding their use of computers, and whether students had the skills to use technology for effective learning. Unclear boundaries generated anxiety, and I observed teachers quickly become overwhelmed by the discussion. They lacked orientation for how to navigate their role in the classroom when students were using technology.

During this part of the discussion, I understood teachers lacked opportunities to express and reflect upon these uncertainties; this was the first time we were discussing technology as a teaching and learning tool in a training session. Indeed, they were experiencing frustrations and concerns, though their choice to invest their time into attending this training course shows a willingness to confront uncertainties. This can be seen as evidence of the contradictory nature of uncertainties and how we respond.

In a follow-up interview eight months after the initial training course, Claude said:

The uncertainty is whether students are actually doing the work and not getting distracted behind their screens, but it is nice that you can see what they write immediately as soon as they post something on Padlet and you can check with all the members of the group to see if they're working. That can be pretty effective, but you need time to go back through it afterwards and supplement misunderstandings, so there can be quite a lot of extra work on the side.

Claude discovered Padlet in the training course and had used it for several classes. Interestingly, once these teachers used digital tools, they understood students could be monitored and supervised should they so wish – it simply depends on *what* tools they use and *how* they use them. Once teachers began using technology more, they observed a change in the way they interacted with their students. Sasha explained:

I'm a dinosaur, as you know, so my big tech revolution this year is that I'm using the Google Drive with kids a lot more. I've got a different relationship with the students so this thing is set up so that I can pop in and pop out fairly quickly and I can see

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where the kids are at and how they're managing the things. That's worked quite well... But the tech offers variety for the students, and that's what's good about it. We can use it to harness the attention of the students.

Uncertainties related to human connection

In both the training discussion and the focus group, teachers expressed their concerns about technology acting as a barrier to human connection. Jules said, "The uncertain part is where the technology performs as a barrier between my connection with my students - and that's what I'm here for really". This uncertainty can also be connected to a lack of clarity regarding expectations and role ambiguity. Sasha said:

I'm happiest in the classroom when we're in dialogue. It's true in a sense that for kids that don't talk they can put it on a Padlet, but to me that's a failed class and I don't want to be in a class where people don't want to speak. I don't want to be in the classes where kids are zoning out. The tech is good if you've got kids who are sitting there sucking their thumbs, but if things are going well and they're chatting in groups organically we shouldn't need it.

All teachers expressed that the human connection is what they cherish in teaching. Uncertainties in this regard were tainted by their own personal relationship to their phones and concerns about their own children's behaviours and response to technology. In fact, this is something that was made clear in both discussions; teachers presented uncertainties regarding technology as a threat to humanity. Uncertainties remained, though their disposition had evolved; in the months since the first training session, there was more of a sense of openness and acceptance of anxiety born of change, as evidenced by their increased use of technology and comments.

Uncertainties regarding institutional support

Significant institutional barriers remained a concern throughout the study. Teachers expressed their desires, such as “having a school computer” or “not having to pay for my own Padlet”. Certainly, the lack of financial support was clear, meaning teachers had to rely on their own motivation and initiative if they wanted to explore technology beyond classroom projectors. While a lack of time was the primary frustration, reliability of the existing infrastructure was most often cited as the reason for not using technology. Jaime explains that “assuming everything goes according to plan, I’ve already lost seven minutes waiting for things to load. And oh boy, you’ve got to just hope the WIFI is working”. Doubt and a lack of faith in the infrastructure and support were prevalent, if not predominant, concerns. Sasha explained:

It’s a goal to have more technology but the problem is where can we even find five minutes? But technology to me is about creative teaching, not just technology itself, but even teaching creatively, it’s hard to find time for even that. We have no time to meet our colleagues, let alone learn how to use new programmes.

After I had conducted all of my interviews with participants, I interviewed a member of the senior leadership team to examine uncertainties from an institutional perspective. Lou said that “there’s a big time investment, not just budgetary. And there’s a big risk. We need a new role, someone to assist teaching and learning with the IT [information technician] support.” Leadership was experiencing uncertainties related to decision-making processes. For Lou, their “biggest concern is that we don’t train teachers”. When questioned as to why they did not factor this into the decision-making process, they replied:

A lot of the decisions we are not involved in. A lot of these things come from up the food chain – the investors – and they are communicated to us. These guys are making decisions without input from teachers or considering pedagogy. I wrote to the director recently and said they need teacher input. No one stopped to ask teachers what they

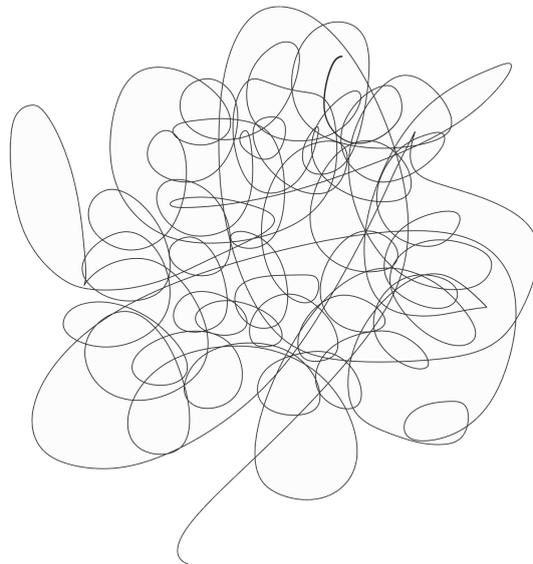
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need... There's an arrogance there that they don't need to ask teachers about teaching because they went to school once so they know what it is.

Evidently, uncertainties were present at each level of the organisation. Organising people, whether it be leadership, teachers, or students, is laden with inescapable uncertainties. This idea was presented by Floden & Clarke (1988), as “uncertainties of knowledge are inevitable because teaching involves humans, beings who are ultimately unpredictable and unknowable” (Floden & Clarke, 1988, p. 3). Institutional uncertainties aside, Lou communicated that both the senior leadership team and investors were struggling to “map out a five-year plan for the school infrastructure when the tech landscape will definitely change every two years.” Uncertainty seems to be the only certainty. As there will always be a multitude of options and considerations that are constantly evolving, a picture of uncertainty would most resemble endless, intertwined loops.

Figure 1

A diagram of uncertainty



Discussion

Our research problem sought to understand what uncertainties are experienced by teachers and educational technologies. When conducting the research, we found that uncertainty was unavoidable, and its effects felt by teachers, trainers, and the institutions themselves. The results indicate that uncertainty is inevitable, and it is necessary for teachers to have a space to articulate and share their reflections on uncertainty. Both Daria's *confident* and Dannielle's *beginner* course participants experienced uncertainties, though there was no clear pattern discernable. When reflecting on the results, we often found it difficult to structure the topics related to uncertainty, as they intertwine. Our own experiences were also difficult to define. Daria began to question the purpose of using online tools when participants would master a basic set of skills, preferring to remain comfortable - in a *safe space*. Dannielle questioned what certainties might be necessary to alleviate the debilitating anxiety felt by her participants that limited exploration and use of technology.

Both participant groups struggled to articulate uncertainties for different reasons. Daria's *confident* teachers chose to see the opportunities of the tools presented rather than discuss uncertainties, however, the context meant that an expression of uncertainty may be seen as a threat to their job. When questioned, Dannielle's *beginner* teachers were drawn to expressing their fears about losing the human connection that they love about teaching. While Daria's teachers were concerned about the practical elements of using technology, Dannielle's were concerned with the conceptual framework of educational technology, and the pedagogical impacts of its use. One consistency between the two studies was that teacher reaction to uncertainties was a reflection of the institutions they served, and how their leadership managed staff. Our study found that creating certainties, in the form of clear expectation and resource allocation may promote more technological competence, though it can also stifle creativity. Conversely, a lack of investment in teacher training and resources, as with Dannielle's school, may result in negative or fearful attitudes towards technology. To this end, it is necessary for teachers to be provided with opportunities and resources to develop a basic digital skill set.

In the follow-up interviews, Daria and Dannielle's participants had increased their use of tools in the classroom, though it can be seen that the beginner group had made more progress;

their digital competencies had improved, as well as their attitude. Much of this can be attributed to the space given to reflecting on technology use in the course and in the following months, or, providing opportunities to express uncertainties. This idea is also presented in the work of Floden & Buchmann (1933): “Being able to talk about one's doubts and fears with one's comrades is a relief... their conversations can remind teachers that uncertainty is an essential driving force in teaching, not merely a deficiency and worry” (p. 380). For us as autoethnographers, having a partner who we could share our own uncertainties with was a liberating and stimulating experience. Both our results and experiences as observers and participants indicate that expressing and reflecting on uncertainties is beneficial for all stakeholders, as it encourages a space for critical reflection on practices and fosters a culture where communication and collaboration improves teacher confidence and engagement.

In sharing and reflecting with each other, we identified that uncertainties, while largely influenced by the context, are also largely unique to individuals - how we respond to new, sometimes stressful situations, and how we manage variety. Just as we scaffold for students, we should consider these sorts of strategies also for teachers and teacher training programmes. More collaboration between leadership and members of staff is necessary in order to ensure the successful integration of technology into teaching practices. Leadership might consider it beneficial to share and articulate their own uncertainties with staff.

Our own uncertainties that were also subject to change depending on what was happening in the external environment. One example of this is leadership changes that were occurring at Dannielle's school. The lack of leadership and role clarity meant that one teacher's request for an individual Padlet subscription took four months to approve. Role ambiguity is also something that must be clarified in order to manage, or make the most of, uncertainties. When we were interviewing leadership, we also found that in Dannielle's school, surprisingly, many of the decisions that were being made were from the accounts department or upper leadership. It was not only that there was an absence of knowledge of teaching and learning, but a lack of pedagogy underpinning decisions that were being made. Because of this, a teacher's individual motivation was a key factor in the effective use of technological integration.

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Daria's study showed that even in the most ideal circumstances, there will always be uncertainty and a lack of control over the external environment. Considering this, it makes sense that teacher motivation or wariness might result in cynicism regarding change, new initiatives, or educational innovations.

The results produced by our study conform to the existing research on uncertainties, however, we found that uncertainties are more complex and far-reaching than the literature indicates. We found that uncertainty is vast and inextricably tied to context. There are an enormous amount of variables when studying uncertainty, making it somewhat difficult to ascertain *what uncertainties actually are* and what the implications are for teachers. This is a limitation that might be overcome by performing case studies with individual teachers in different contexts. Considering the emotive nature of uncertainties, qualitative research methods and reflective discussions would likely reveal insights into the relationship between uncertainty and teacher's use of educational technologies. As uncertainty is connected to leadership structures, examining how organisations manage people and uncertainties could also be a way to determine how uncertainties can be used as a positive force in education. An educational technologist might be in an advantageous position to conduct or participate in this research, considering their relationship to technology and communication with both teachers and leadership.

Conclusion

As the past few years have shown, everything can change in an instant. The pandemic and the war are examples of how the world is becoming less stable. One reflection from this study is that uncertainty can be a highly emotional state, though not necessarily something that should be reduced or avoided. Uncertainty can be embraced as an opportunity for growth, creativity, and reflection. Teachers are caring people; it makes sense that fear, anxiety, and stress are encountered in new contexts. The answer as to how to effectively integrate technology into teaching practices might be found in our common humanity.

Uncertainty is part of the process of successful technological use; we must look ahead with empathy, open hearts, and compassion when training teachers.

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Author's declaration

We hereby declare that I have written this thesis independently and that all contributions of other authors and supporters have been referenced. The thesis has been written in accordance with the requirements for graduation theses of the Institute of Education of the University of Tartu and is in compliance with good academic practices. The research and writing was divided equally between the authors, meaning that the whole thesis itself was a collaborative effort.



Dannielle Gadd

June 3, 2022



Daria Rosliakova

June 3, 2022



Emanuele Bardone

June 3, 2022

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