Looking in the Mirror of Authenticity: A Self-Study of Teacher Education Practice

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Abstract

This study explored the notion of authenticity within the context of teacher education. A qualitative research approach was chosen employing methods associated with self-study in order to explore the dissonance I experienced as a relatively new teacher educator. The purpose of the study was to explore the significance and potential of authenticity in teacher education. The study involved teacher candidates in an elementary science curriculum and instruction course that I was teaching. Teacher candidates reflected on their learning experiences in a course in which I intentionally applied the concept of authenticity. The study also involved experienced teacher educators whom I engaged in conversations as critical friends. Analysis of the teacher candidates’ reflections revealed that the notion of authentic learning resonated with these soon to be teachers. Analysis of the conversations with teacher educators revealed an important distinction between teaching the subject authentically and teaching the student authentically.
Acknowledgements

It has been said that learning to teach is a personal endeavour in which one’s past, present, and future are set in dynamic tension (Britzman, 1991). This study bears evidence that a similar tension exists for those who are becoming teacher educators. I am grateful for those who have walked alongside of me throughout this personal endeavour. Thank you to my supervisor, Dr. Xavier Fazio. From our first meeting to my defense, your patience, direction, and commitment have exemplified what it means to teach authentically. Thank you also to my committee members, Dr. Julian Kitchen and Dr. Wayne Melville, for your insights into self-study of teacher education practice and science education respectively. Thank you also to Dr. Maureen Connolly and Dr. Kevin O’Connor, who gave of their time and of themselves as external examiners.

It is my privilege to teach at Covenant Canadian Reformed Teachers College and I am grateful for the support and prayers of the Board of Governors and my colleagues. I would like to express my appreciation to the teacher candidates who willingly participated and shared their thoughts for my study: Elaine, Amelia, Jennifer, Phoebe, Johanna, Julia, Rachel, and Sandra. Thank you also to Reilly, Erin, and Jordan for accepting the invitation to be my critical friends—listening, challenging, and encouraging me as a fellow teacher educator.

Finally, I would like to thank my wife Patricia. Without your unconditional love and support I would not be who I am today.
Dedication

This work is dedicated to Benjamin and Jonathan, my sons. Apart from you I would not have fully known the significance of the assertion: “Behold, children are a heritage from the LORD” (Ps. 127:3a, NKJV). You have both demonstrated an enormous amount of patience these past years, giving up valuable time together to allow me the time to study. It is my hope that you will discover the blessings of learning, gaining knowledge and developing skills but also learning who you are and more importantly whose you are.

“But by the grace of God I am what I am …” (1 Cor. 15:10a, NKJV).
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CHAPTER ONE: INTRODUCTION TO THE STUDY

This study explored the notion of authenticity in and through teaching in teacher education. Authenticity in teaching refers to teacher educators striving for authenticity, avoiding complacency, becoming consciously aware of self, and being true to that self in teaching. Authenticity through teaching refers to the transformative potential of teaching and learning whereby teacher educators help teacher candidates develop greater authenticity as individuals and as teachers in the field of education. As a teacher educator, I detected in teacher candidates the same tendencies I had as a secondary school science teacher, focusing on intellectual knowledge and the routines of education while neglecting to think about how our students are striving to find meaning and purpose in and through their education. In this study a self-study methodology was used to address the dissonance I experienced as a researcher who recognized conceptually that each person is striving for authenticity, yet struggled as a teacher educator to translate this conceptual knowledge into practice. In this self-study I engaged teacher educators as critical friends to explore what authenticity might reveal about teaching and learning in teacher education, while also seeking to apply this concept in the context of a science curriculum and instruction course. This chapter outlines the backdrop to this study by establishing the problem context and presenting the purpose and rationale for this study.

Background of the Study

Remarkable changes have occurred within Western society over the past century. A shift has occurred from a modern age marked by industrialization and urbanization, to a postmodern age of technology, innovation, and globalization. In the midst of these societal changes, schooling has evolved, both shaping and being shaped by society
(Goodson & Marsh, 1996). Within the classroom a culture of teaching (Cuban, 1984) is being replaced by a culture of learning as is evidenced in Ontario in recent curriculum revisions (Ontario Ministry of Education, 2007) and assessment documents (Ontario Ministry of Education, 2010). In a 21st century classroom, teachers create an environment for learning, helping students to develop skills in communication and collaboration while nurturing the creativity needed to meet the demands of innovation. At the same time, education is acknowledged to be profoundly ethical, contributing to each child’s personal quest for authenticity. Starratt (2012) suggests that this quest challenges teachers to ensure that students can not only find the authentic subject and the integrity of the learning activity, but through their education can also find themselves. Attending to the personal quest for authenticity that each child is engaged in highlights a deep moral and ethical purpose to the teaching profession.

This perspective creates an implication for teacher education programs to impress this weighty nature of education upon teacher candidates while equipping them to plan, teach, and assess in a manner that honours the authenticity of each child. Teacher education in Ontario has its own relatively short history. Unlike other vocations—such as medicine, engineering, or law—teaching has often been characterized as a practical craft and not a learned profession (Robinson, 2017). Early forms of teacher education, ranging from apprenticeships to Normal schools, reinforced the former characterization of teaching. However, following World War II, governments came to recognize the important role of teachers in society and recommendations were acted upon to move teacher education under the auspices of universities (Kitchen & Petrarca, 2014). Faculties of education were created and education would be viewed as a respectable university discipline, and teaching would be recognized as a bona fide profession (Robinson, 2017).
Concurrent to these developments was a growing awareness of, and appreciation for, the way students learn. Learning was no longer thought to be simply a matter of conditioning a student or changing their behaviour; rather, learning is now focused on the changes that occur in a student’s mind (Martínez, 2010). These lessons about learning are equally valid for teacher educators as they are for teacher candidates. Through a teacher education program, teacher candidates will learn about curriculum, subject content, and develop skills in pedagogy; yet, as Britzman (1991) observed, learning to teach is also a personal endeavour in which “one’s past, present, and future are set in dynamic tension” (p. 8). Therefore, teacher education is also profoundly ethical, contributing in some ways to the personal quest for authenticity that each teacher candidate is involved in.

Conceptually it may be reasonable to state that the authenticity of each student is at the core of all teaching and learning activities in the classroom. A question follows: How does this ideal translate into practice?

Before exploring the question above, it will help to sharpen the context further from teaching and learning in general, to teaching and learning science and technology in an elementary setting. Within Ontario elementary classrooms, mathematics and literacy receive the lion’s share of time, with other subjects such as science receiving much less instructional dedication (Fazio & Karrow, 2016). At the same time, teacher candidates who enter an elementary teacher education program often do not have a positive association with science or they have a negative view of their ability to teach science (Gilbert, 2013). It is not difficult to extrapolate that science instruction in elementary classrooms can fall prey to what Starratt (2012) refers to as inauthentic learning where students “can find neither themselves, nor the authentic subject being studied, nor the
integrity of the learning activity” (p. 97). The ideal of attending to each child’s quest for authenticity through teaching and learning is certainly challenged under these conditions. Moreover, those who teach a science curriculum and instruction course for elementary teacher candidates do so knowing these conditions exist. In fact, the teacher candidates who are anxious about teaching science and technology are probably keenly aware that their own sense of personal authenticity is involved. The perspective that authenticity provides creates an implication for teacher educators to address these concerns with teacher candidates and to help them see the value of considering the authenticity of their students.

The question of translating authenticity into practice has become central to my personal story and interest in this study. I have worked with authenticity as an organizing concept with both in-service and preservice teachers and it has served as a rich concept, readily directing discussion to the personal nature of education. Every person wrestles with the twin questions of meaning and purpose. Perhaps we are most acutely aware of these questions during significant life changes (Bialystok, 2014). For example, 5 years ago I started teaching at the Covenant Canadian Reformed Teachers College (CCRTC). Crafting a science curriculum and instruction course for elementary teacher candidates after 16 years of teaching high school science was both interesting and unsettling. Planning the curriculum involved searching the literature and examining what teacher educators from other institutions had done. Over time, I made changes to subsequent course syllabi based upon my experience and students’ feedback. Nevertheless, I became more cognizant of the need to practise what I was preaching. If authenticity was an important concept for teacher candidates to consider and work with, I needed to find
ways to do so in courses like my science curriculum and instruction course. As a teacher educator, exploring this question of authenticity has become part of who I am, and who I am becoming.

**Statement of the Problem and Research Context**

Authenticity is a complex concept that has garnered attention in the literature in relation to teaching (Brook, 2009; Kreber et al., 2007; Oral, 2013), higher education (Cranton & Caruselta, 2004; Kreber, 2013), and teacher education (Oral, 2013; Sutherland & Markauskaite, 2012). In their comparative review of the literature, Kreber et al. (2007) demonstrate that authenticity in teaching is recognized as an important yet under-researched phenomenon. Given the complexity of this concept, authors have often tried to understand how educators conceive of authenticity. For example, Cranton and Carusetta (2004) identified five interrelated categories (self, other, relationship, context, critical reflection) while Kreber (2013) reduced 13 different features into six dimensions, which were then related to three philosophical perspectives (existential theory, critical theory, communitarian theory). Brook (2009) and Oral (2013) took a different approach by exploring the existential thinking of Heidegger relative to authenticity and making some practical suggestions for teaching. Of these studies, only Oral focuses specifically on teacher education, arguing that teacher candidates “cannot be expected to cultivate an authentic ontology (of the world of teaching)” (p. 236) apart from being immersed in the practice of teaching.

These studies and others, along with my own research experience (Huizenga, 2016) demonstrate that authenticity is often conceptualized with being and becoming more fully human. While the various conceptions that educators have attached to
authenticity have been well documented, the literature also reveals the need for further study of this concept in the context of education. As demonstrated, the literature also discusses authenticity in the context of higher education but there is a dearth of studies that explore the impact that authenticity could have in teacher education. Moreover, there is a significant gap in the literature when authenticity in education is considered from the perspective of a teacher educator.

I believe that authenticity, applied to the purpose and practice of teaching/learning, holds potential for teacher education. Yet as a teacher educator, I experienced dissonance between conceptualizing authenticity and realizing its potential in practice. This dissertation seeks to address the dissonance I experienced between the rhetoric surrounding authenticity and its application within teacher education. The overarching research question for this study was: What can authenticity reveal about teaching and learning in teacher education? To address this question I conducted an exploratory study that employed methods associated with self-study methodology.

**Purpose of the Study**

The purpose of this dissertation was to explore the significance and potential of *authenticity* in teacher education. This study was designed to explore answers to the following empirical questions:

1. How can authenticity illuminate being and becoming a teacher educator?
2. How can authenticity be translated into praxis in teacher education?
3. What are the benefits and challenges of an intentional focus on authenticity in a science curriculum and instruction course for elementary teacher candidates?
Rationale for the Study

This study seeks to build upon the work of Kreber (2013) and others who have worked with authenticity in the context of higher education. Specifically, this study explored the potential of authenticity within the context of teacher education. This study moved beyond inquiring how educators conceptualize authenticity by discovering ways of applying this concept in a meaningful way with teacher candidates. In this way, this study extends the work of Brook (2009) and Oral (2013) regarding their initiative to articulate methods of translating this concept into practice in teaching. Finally, this study also contributes to the literature on self-study for teacher educators.

Over the past 30 years, self-study has grown as a methodology employed by teacher educators to critically examine and improve their practice. It is often used by those who are new to the academy (Kitchen et al., 2008; Loughran, 2005) and who are experiencing a variety of tensions in this transition. This study’s unique contribution to the field of self-study includes focused attention on the concept of authenticity within teacher education.

As a relatively new teacher educator, this study has given me the opportunity to critically reflect in a systematic way on the nature of teacher education. Through self-study, I was able to wrestle with the dissonance experienced in “the space between self and the practice engaged in” (Bullough & Pinnegar, 2001, p. 15). I explored this space through the lens of authenticity, recognizing that the answers to my research questions did not lie within me. This study allowed me to engage with other teacher educators, to learn from them and through their experiences. Given the reciprocal nature of research (Kompf, 2009; Ng-a-Fook, 2007), I believe that those with whom I collaborated also grew as they reflected on their experiences as teacher educators. In addition, I hope the
teacher candidates benefited from my exploration of authenticity in teacher education. It is so important to communicate to teacher candidates that education is much more than knowledge acquisition and skill development (Loughran, 2006); It also is a means of equipping students on their quest for personal authenticity. This study draws attention to this ideal of education and therefore, benefits the larger field of education.

**Conceptual Framework**

Ravitch and Riggan (2017) define a conceptual framework for research as an “over-arching argument for the work—both why it is worth doing and how it should be done” (p. 8). Figure 1 is a representation of the conceptual framework for this study. The literature reveals a number of concepts and themes associated with authenticity in education; two are highlighted in Figure 1: (a) being and becoming, and (b) meaning and purpose. Each person—including teacher educator, teacher candidate, and elementary students—is on a quest for personal authenticity. As human beings on this quest, even if we are not conscious of it, we are confronted with two fundamental questions: Who am I? Why am I here? At the same time we are and are becoming. For example, I am a teacher educator but I have not arrived; I am still becoming a teacher educator. This quest for personal authenticity is not done in isolation; rather, we live within a context and wrestle with the questions of meaning and purpose within that context. The broad context is the 21st century society and culture we live in. For the purpose of this study the context narrows to the classroom, whether that is the teacher education classroom or the elementary classroom. The double arrows in Figure 1 represent the dialogical nature of teaching and learning through which both teacher and student travel together for a time on their respective quests for personal authenticity.
What can *authenticity* reveal about teaching and learning in teacher education?

**Conceptual Framework**

- **Context:** 21st century; post-modernism; knowledge society; teacher education in Ontario

- **Teacher educator** ↔ **Teacher candidate** ↔ **Elementary students**
  - Teaching/learning
  - Science methods ↔ Science & technology

- **Being & becoming** ↔ **Meaning & purpose**
The research design and methods for this study were chosen to address the overarching research question positioned at the top of Figure 1. Authenticity is emphasized as the theoretical lens that unifies the three empirical questions identified above. To address these questions, qualitative methods associated with self-study of teacher education practice were selected. Conversations with experienced teacher educators involved sharing experiences of being and becoming teacher educators. This focus is represented by the single arrow on the left side of the diagram. As I described efforts to apply authenticity in a science curriculum and instruction course I was teaching, the teacher educators also served as critical friends. These discussions involved all the elements along the top row of the diagram.

Figure 1 also captures the teacher candidates’ involvement in this study. The single arrow in the middle of the diagram represents the teacher candidates’ reflections on being and becoming a teacher. Similarly, as they learned about teaching science and technology in an elementary school classroom, the teacher candidates also reflected on who their students are and are becoming. This is pictured by the single arrow on the right side of the diagram. Together, all of the components outlined above and pictured in Figure 1 form the conceptual framework for this study.

**Organization of the Document**

This chapter provided the background for this study by presenting the broad context of teacher education. The statement of the problem narrowed the context by identifying the dissonance I experienced as a relatively new teacher educator. After specifying the overarching research question, the purpose of the study was stated: To explore the significance and potential of authenticity in teacher education. A rationale
indicated the potential contributions of this study and that led to the conceptual framework, an argument for why the study should be done and how it should be conducted.

Chapter 2 presents a description and critical analysis of the existing literature relevant to this study. The chapter is organized into three sections. The first section explores the theoretical foundation of this study: authenticity. This section examines the complexity of authenticity along with relevant studies of authenticity in education. The second section examines the end goal of education—a culture of learning. This section explores a shifting culture in education, from teaching to learning along with the concomitant developments in teacher education. The final section in this chapter develops the context for this study. In this section the literature relevant to the self-study of teacher educators is examined as is the literature pertaining to learning to teach science.

Chapter 3 positions the methodology of self-study chosen for this study within the broader research design of qualitative research. Site and participant selection outlines the invitation of three experienced teacher educators who contributed to my self-study as critical friends. The section also describes the invitation of teacher candidates from my science curriculum and instruction course. Data collection describes how data was collected from teacher educators and teacher candidates. Data analysis outlines the inductive method of distilling themes from the transcribed conversations with teacher educators and the teacher candidates’ reflections. The chapter ends with a discussion of trustworthiness and ethical considerations.

Chapter 4 presents the findings that emerged from data analysis. The chapter is organized into two sections. The first section, learning to be teachers, presents five
themes that were discerned from an analysis of the teacher candidate reflections. The second section, learning to be teacher educators, presents four themes that were generated from an analysis of the conversations with teacher educators. As both the researcher and the researched, this chapter also presents evidence of my personal reflective dialectic as I engaged with the findings and examined my practice so that I might improve the learning experiences of my teacher candidates.

Chapter 5 discusses the contributions and implications arising from the study. Following a brief summary of the study, this chapter provides a critical reflection of how this investigation into authenticity and teacher education contributes to the knowledge field. The discussion interacts with the contributions of other authors and is especially guided by Kreber’s (2013) distinction of authenticity in and through teaching in higher education. The implications of this study are described under three headings: implications for practice, implications for theory, and implications for future research. The chapter is drawn to a close with a final word for the reader to consider.
CHAPTER TWO: LITERATURE REVIEW

This study was designed to explore the potential of authenticity for teaching and learning within a science curriculum and instruction course. Learning is a significant theme in this chapter. Therefore, it is fitting that Ravitch and Riggan (2017) should say: “Above all, the purpose of literature review is learning” (p. 30; emphasis in original).

This chapter functions as an anchor for this study (Maxwell, 2006) by identifying (a) what others have learned about the concepts associated with the research problem; (b) how others have examined this topic; and (c) how this study will contribute uniquely to this discourse. This chapter is organized into four sections with each part reflecting elements of the overarching research question: What can authenticity reveal about teaching and learning in teacher education? With authenticity orienting the empirical questions for this study, the first section begins by exploring how scholars have conceptualized this “evocative yet elusive construct” (Kreber, 2010, p. 171) both inside and outside of the field of education. This study was positioned within teacher education; therefore, the second section focuses on learning in education, distilling two parts from the literature: (a) the emergence of a culture of learning in education; and (b) the impact this culture has had on teacher education. The context of this study is refined further in the third section by examining two relevant areas of teacher education in the literature: (a) teacher educators learning through self-study; and (b) teacher candidates learning to teach science. The final section of this chapter examines the preceding discussion retrospectively to demonstrate the potential this study has to contribute a unique perspective to educational scholarship.
Theoretical Foundations: Authenticity

It has been observed that in recent decades little attention has been devoted to philosophy of education (Siegel, 2010). Perhaps this is due in part to the societal emphasis on the “how” of education rather than the “why” (Knight, 2008). In the hurried pace of the classroom, experienced teachers are hard-pressed to ask questions about the purpose, nature, and problems of education. Although teacher education programs raise these questions, teacher candidates often are so consumed by the “how” questions that there is little time left for the “why.” As Matthews (1994) laments, “Notoriously, foundation studies are regarded by trainee teachers as the least relevant part of the program” (p. 199). This study is grounded on the proposition that authenticity provides a way of addressing philosophical questions that need to be asked within the field of education. The literature revealed that authenticity is a concept that arises in the discussion of ontology (Heidegger, 1953/2010), epistemology (Starratt, 2012), and ethics (Taylor, 1991). What follows is an overview of various conceptions of authenticity found in the literature, followed by a sketch of how authenticity is discussed within the field of education.

Authenticity Is a Complex Concept

In their comparative review of the literature on conceptions of authenticity in teaching, Kreber et al. (2007) conclude that authenticity is recognized as important to teaching and learning but its usefulness is complicated by the fact that conceptions of authenticity can be rather vague and complex. For example, Kreber (2013) distilled three philosophical perspectives underlying authenticity in the literature, each describing ways that lead to the formation of our being. The communitarian theory emphasizes that this
quest occurs in community and is shaped by the social context in which we live. Critical theorists concur but suggest that socially constructed norms, values, and ideals should not be uncritically assimilated; rather, we should develop and practice critical reflection to expose hidden assumptions. The final perspective, existential theory, emphasizes that we are authors of our own lives, regardless of the social dimension. Complicating our understanding of authenticity are colloquial uses of the word to refer to something or someone as genuine, sincere, original, or real. From authentic cafés to authentic athletic apparel, the pursuit of authenticity in our culture has been labelled an obsession (Poole, 2013).

Before returning to the more formalized use of authenticity, it is important to distinguish other ways that authenticity is invoked in the education literature. Kreber (2013) labels one such perspective as the correspondence view. Such uses of authenticity include: authentic pedagogy, authentic learning environments, and authentic assessment tasks. These constructs refer to the technical aspects of teaching and learning and how they correspond to the real world. Splitter (2009) argues that connections between what students do in school and what happens in the world beyond the classroom does not necessarily mean that teaching and learning are authentic. The correspondence view of authenticity is not necessarily incompatible with the focus on being that the other theories share. For example, an authentic assessment task may be designed in a way that is attentive to the developing person of the student. However, these connections should not be presumed simply because the word authentic is attached to a learning task. Similarly, Bialystok (2016) argues that the connection between personal authenticity and teaching is not necessarily direct. To illustrate, Bialystok (2016) reasons that although a painting can
be identified as an authentic Van Gogh does not mean that Van Gogh was an authentic painter. In a similar manner, a teacher who employs authentic pedagogy is not necessarily an authentic teacher. Bialystok (2016) infers that since “authenticity is a description of identity” (p. 314) then an “authentic teacher is an authentic person whose identity is expressed or confirmed in some necessary way through her teaching” (p. 317). Since authenticity and its derivatives are so prevalent in our culture and in the education literature, care must be taken to discern how authenticity is being used within a particular context.

In light of the above, it is necessary to clarify that this study will focus on what the literature refers to as the quest for personal authenticity (Starratt, 2012; Taylor, 1991). The early existentialist philosopher Soren Kierkegaard (1813–1855) wrestled with the idea of human existence and reasoned that “existence is not a state of being, but is a process, a becoming” (Zuidema, 1960, p. 15; emphasis in original). This becoming could be characterized as a project that each person is involved in. The 20th century philosopher, Martin Heidegger (1889–1976) would build on Kierkegaard’s thinking to question the meaning of being. In his discourse, Heidegger (1953/2010) distinguished two kinds of being: authenticity and inauthenticity. The former is consciously aware of self in the world while the latter is construed with being taken in by the world or everydayness. Therefore, the philosophical roots of authenticity are associated with the notions of being and becoming. While existentialists would emphasize the “self” in their quest, originating from a worldview that is anthropocentric (Kreber, 2013), others would argue that our search for self-knowledge and meaning in life need not be self-centred. Responding to the perceived radical anthropocentrism that has led to a society of
individualists, Taylor (1991) contended for the retrieval of authenticity as a moral ideal. This ideal recognizes that humans are fundamentally dialogical and therefore, our identity is formed and sustained throughout our lives in dialogue. Taylor summarized this perspective stating:

Only if I exist in a world in which history, or the demands of nature, or the needs of my fellow human beings, or the duties of citizenship, or the call of God, or something else of this order matters crucially, can I define an identity for myself that is not trivial. Authenticity is not the enemy of demands that emanate from beyond the self; it supposes such demands. (p. 40; emphasis in original)

Kreber demonstrated that these external demands were once part of how meaning and self-knowledge were attained in life. For example, in Ancient Greece, meaning and purpose were found in fulfilling one’s place in the cosmic order. This cosmocentric worldview gave way to a theocentric worldview in which these fundamental questions would be answered in relation to God. As we move on to consider authenticity as it is discussed within the literature in relation to education, we will note from the brief discussion above that: (a) authenticity is associated with the notion of being and becoming; (b) finding and sustaining meaning and purpose is a life-long project; and (c) this project is not monological but dialogical.

**Authenticity as a Concept in Education**

Starratt (2012) reminds us that education is fundamentally ethical, because “for every young person in the school, both male and female, the core moral agenda of their whole lives is to become richly, deeply human” (p. 87). While becoming more fully human is associated with authenticity (Brook, 2009; Kreber et al., 2007), when applied to
the field of education it becomes an imperative that reminds us of the person within the student. Building on Taylor’s (1991) assertion that personal authenticity is the most profound and fundamental ethical responsibility each person faces, Starratt (2012) captures the demands of authenticity:

To own oneself, to sing one’s song, to improvise one’s place in the drama of life, to be real instead of phony, to be a somebody instead of a cardboard character mouthing a script someone else has provided, is to be responsible to the truth embedded in one’s relationality. Being real, being authentic is the burden only each individual can bear. (p. 85)

For Starratt, the personal authenticity of each child becomes the driving force behind an ethical education, and as we will see below, the distinguishing characteristic of authentic learning. In a similar manner, following an examination of the philosophical discussion of human flourishing, Kreber (2013) proposes that “what is in the important interests of students, is their own striving for authenticity” (p. 45; emphasis in original). Therefore, in addition to what students will know and what they can do with this knowledge, there is a moral obligation associated with education to promote students’ quest for personal authenticity. A consideration of authenticity in the context of education provokes a discussion of the broader purpose of education—chiefly, who students are becoming.

In view of the moral purpose implicit in education, two themes pertaining to the self emerge from the literature in discussions of authenticity and education: autonomy and care. Aside from the fact that autonomy is frequently associated with authenticity, there are disparate views of how these concepts relate (Sarid, 2015). For example, Cuypers (2010) subverts authenticity to autonomy while Starratt (2012) seems to treat
these concepts as independent yet related. Bialystok (2014) associates autonomy with the Romantics’ account of authenticity, searching for the inner voice that guides the self. Bialystok and Cuypers both contend that it is impossible for someone to be truly autonomous. In reality, from our earliest moments we observe and learn from those around us; our self develops in dialogue with these external influences. As Taylor (1991) observed, humans are fundamentally dialogical, so we forge our identity and purpose in dialogue. Starratt (2012) identifies this as the paradox of autonomy, “one’s autonomy is as a cultural being” (p. 27), or as Taylor (1991) states: “If authenticity is being true to ourselves, is recovering our own ‘sentiment de l’existence,’ then perhaps we can only achieve it integrally if we recognize that this sentiment connects us to a wider whole” (p. 91). Cuypers suggested that there is a close relationship between autonomy and moral responsibility. In a similar manner, Starratt (2012) described the autonomous individual as someone who takes personal responsibility for their actions, contrasting with those “who act out of a mindless routine, or simply because others tell them to act that way” (p. 22). Education not only should form autonomous moral agents (Cuypers, 2010; Starratt, 2012) but also should place teachers and students in relationship to one another.

Those who have looked at conceptions of authenticity in education (Kreber et al., 2007; Sarid, 2015) also draw attention to the element of care: care for subject matter, care for others. For example, Palmer (2007) described the relationships that humans have “with history, with nature, with other people, with things of the spirit” (p. 57) as authentic relationships when there is a level of caring that does not destroy differences. Starratt (2007) described authentic knowing as a moral act of knowing in which “the knower accepts the responsibility of coming to the known carefully—that is, full of care for the
integrity of the known” (p. 176). Care emerges as a theme when authenticity is discussed in relation to education, ensuring that the perspective of our student is not limited by test scores, subject matter, or any other educational construct. Noddings (2010) captured the motivation for such a caring approach: “To recognize in another a better self, struggling to realize itself is indeed a lovely act” (p. 14).

With the self at the fore, discussion of authenticity in the education literature is not limited to the student’s self but also involves the teacher’s self. Teacher authenticity or authenticity in teaching has been acknowledged as an under-researched phenomenon (Kreber et al., 2007). Of those who have researched this phenomenon, two themes emerge. The first is an understanding that teachers strive to be authentic in their teaching, or as Bullough (1994) envisioned, to achieve “congruence between metaphor and practice” (p. 109). This goal can be challenging, especially for new teachers who are navigating the expectations of their particular school or administration and their own self-imposed expectations. Donnell (2010) described this through the tension she experienced between accountability and authenticity. Kreber (2013) echoed the sentiment that teachers strive to be authentic in their teaching but added that through their teaching teachers may also become more authentic. The second related theme that emerged from the literature on authenticity in teaching connects with the previous discussion of care. For example, Rabin (2013) concluded that authenticity—defined as knowing and being one’s self—played a critical role in helping preservice teachers care for their students. In a similar manner, Kreber observed that there are ways that teachers engage with their teaching to help their students move towards greater authenticity. As Akoury (2013) concluded, teacher authenticity involves an intentional caring attitude for the well-being
of not only oneself but also of others. Perhaps Oral (2013) captured this sentiment most succinctly: “Being a teacher is primarily about helping one’s students become someone—achieve their own singular being—through the concrete encounter between his/her singular being and theirs” (p. 220).

The End of Education: A Culture of Learning

The link between education and the needs of society extends as far back as Plato and Aristotle (Gutek, 1988) and a close examination of curriculum and related documents in Ontario going back a century tends to confirm this. For example, in an early curriculum document published first in 1937, Programme of Studies for Grades 1 to 6 of the Public and Separate Schools, the authors write:

Two considerations must govern the framing of a programme for the elementary school. The first consideration is the kind of society in which the child lives and for which he is being prepared, the second is the nature of the child’s development. The schools of Ontario exist for the purpose of preparing children to live in a democratic society that bases its way of life upon the Christian ideal.

( Ontario Department of Education, 1960, p. 5)

As the millennium drew to a close, the Royal Commission on Learning (1994) connected educational reforms to needs manifesting in society, stating “the real crisis in education is caused by large-scale societal changes” (p. 9). This connection between education and the needs of society happens against the backdrop of worldviews that have shifted from religious to secular (Brehaut, 1984) and from modernism to postmodernism (Kreber, 2013). Although it is difficult to tease out direct lines of correlation, a concern that develops within the literature is that our current educational climate is often one of
bureaucratization and standardization (Rabin, 2013) and instrumental reasoning (Drake et al., 2014). To make matters more complex, students (and their teachers) are impacted by the explosion of information technology that connects us to an expanding range of people. With a plurality of voices vying for our attention, our self is a constant site of construction and reconstruction. Writing at the turn of the century, Gergen (2000) predicted that the technology of social saturation will invite us to “willingly though shamefully forsake the path of authenticity” (p. 150).

Within this milieu, there are reminders that education needs an ethic of care (Rabin, 2013) and that education has a fundamentally moral purpose (Starratt, 2012). These reminders echo the sentiment of 20th century progressivists as captured in this statement from the Hall-Dennis Report: “that the child should not be treated as an isolated entity, but educated for life in a society which recognizes his individuality” (Provincial Committee on Aims and Objectives of Education in the Schools of Ontario, 1968, p. 67). Acknowledging the experiential focus of pragmatists and the existentialists’ attention to the individual, the committee argued that education must be for the whole child. Today in Ontario, care is among four ethical standards that the Ontario College of Teachers (OCT) has developed as guidelines for educators, noting that “at the heart of a strong and effective teaching profession is a commitment to students and their learning” (OCT, 2018, p. 4). This commitment to students and their learning is a trend that has come into focus in education. This section develops the historical context for this study by examining the impact that changing conceptions of learning have had, both in education and in teacher education.
Towards a Culture of Learning

At the dawn of the 20th century, modernism had taken root as a dominant worldview emphasizing objective truth and rational foundations of knowledge (Gergen, 2000). The scientific zeal for empirical evidence would impact learning in the classroom through the pioneering work of educational psychologists such as William James (1842–1910), John Dewey (1859–1952), Jean Piaget (1896–1960), Lev Vygotsky (1896–1934), and many others who have contributed to our understanding of how students learn (Santrock et al., 2010). Within this field, behaviourism was the first learning theory (see Table 1) to be developed as a “study of learning in humans and animals as understood through the analysis of behaviour rather than thought or feelings” (Martinez, 2010, p. 6). Learning was equated with conditioning, a change in behaviour brought about by events in the learner’s environment. Within the classroom, learning was overshadowed by what the teacher was doing and saying.

Towards the latter part of the 20th century, interest in the cognitive processes began to open up new opportunities to understand how students learn. Santrock et al. (2010) explain that “psychologists began to acknowledge that they could not explain children’s learning without referring to mental processes such as memory and thinking” (p. 250). The cognitive approach to learning (Table 2) focused on what was happening in the student’s mind and characterized learning in at least two different ways. The first approach compared the human mind to a computer in which short-term memory (i.e., RAM) processed information and sent it to the long-term memory (i.e., hard drive) for storage. Learning occurs when information is moved from working memory to long-term memory (Martinez, 2010).
Table 1

*Behaviourist Learning Theory*

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning</td>
<td>Learning is characterized as the accumulation of stimulus–response associations</td>
</tr>
<tr>
<td></td>
<td>Learning occurs by accumulating atomized bits of knowledge</td>
</tr>
<tr>
<td></td>
<td>Learning is tightly sequenced and hierarchical</td>
</tr>
<tr>
<td></td>
<td>Learning occurs best through repetition and memorization</td>
</tr>
<tr>
<td></td>
<td>Transfer is limited; rote recall is emphasized</td>
</tr>
<tr>
<td></td>
<td>Tests should be frequent to ensure mastery</td>
</tr>
<tr>
<td></td>
<td>Motivation is external based upon positive reinforcement of many small steps</td>
</tr>
</tbody>
</table>

**Table 2**

*Cognitive Learning Theory*

- Learning is movement of information from working memory to long-term memory
- Learning is more effective when new knowledge is connected to prior knowledge
- Learning is an active process of mental construction and sense making
- Learning is also socially dependent
- All students can learn
- Learning should be authentic—connected to world outside of school
- Assessment is for learning

*Note.* Content of table derived from Shepard (2000) and Martinez (2010)
Within the cognitive paradigm, others suggested that students “learn best when they actively construct knowledge and understanding in light of their experiences” (Santrock et al., 2010, p. 290). This forms the basis for the second approach, constructivism, which recognizes the student as an integral participant in the teaching–learning relationship. Piaget viewed opportunities when new experiences do not fit neatly with our past experiences as powerful moments for learning to take place. The mind changes to accommodate the new information. At this level, constructivism is a very personal process for the learner. Yet, Vygotsky advanced a social aspect to constructivism recognizing that learning benefits from others (Martinez, 2010). This perspective is evident as Rabin (2013) argues for an ethic of care in teacher preparation so that the social construction of knowledge is not overlooked. From this brief overview of changing conceptions of learning, we begin to see that the cognitive learning theory helped to shift attention from what the teacher was doing to how students learn.

Learning is a complex process for which one model cannot do justice. Just as scientists needed more than one model to describe light, educational psychologists have posited a number of ways to understand the process of learning. Each of these facets, behavioural or cognitive, personal or social, have corresponding implications for educators. Within the classroom behaviourism reinforced the traditional role of the teacher and student. Under this paradigm, classrooms could be characterized as teacher-centred where teacher talk exceeded student talk, instruction was largely whole class, the teacher determined the use of class time, and students sat in rows of desks, sometimes bolted to the floor, facing a blackboard (Cuban, 1984). In student-centred classrooms, students talk at least as much as teachers do, students may work in small groups, and
students may help to choose and organize content. This kind of classroom environment is more conducive to the ideals of constructivism, where the focus is on the learner’s active and social involvement in learning (Santrock et al., 2010).

To nurture a culture of learning where students and teachers function together in a joint venture, it is important to begin by acknowledging the experiences of the past and recognizing the lingering effect these experiences continue to have. Nowhere is this clearer than when examining perspectives on testing and assessment. Shepard (2000) captures this sentiment: “Any attempt to change the form and purpose of classroom assessment to make it more fundamentally a part of the learning process must acknowledge the power of these enduring and hidden beliefs” (p. 7). Bloom et al. (1971) demonstrated that historically education and testing functioned as a gatekeeper. However, Bloom et al. went on to argue that “quite in contrast to the notion of using schools for selection purposes is the view that education has as its primary function the development of the individual” (p. 6). They envisioned a broader purpose of assessment, namely to improve teaching and learning. In their international survey of the state of assessment for learning, Birenbaum et al. (2015) point to the work of Bloom et al. as a watershed moment that brought formative assessment to the foreground of educational discourse. Shepard (2000) demonstrates that to align with cognitive and constructivist learning theories, assessment needed to change as well. Assessment would need to be ongoing, used formatively to support student learning, and be used by teacher and student alike. Learning would become the fundamental purpose of education (Earl, 2003).

In Ontario, evidence for the broader purpose of assessment and a culture of learning is found in Growing Success, the Ontario Ministry of Education’s (2010) policy
document that presents guidelines for assessment, which claim: “The primary purpose of assessment and evaluation is to improve student learning” (p. 6). With this statement the government signaled that learning is fundamental, not only for school but also for life. Through the lens of Heidegger’s phenomenology, Brook (2009) suggests that “learning is an essential characteristic of the being of humans” (p. 47). In other words, a culture of learning is rooted in the nature of human beings. Starratt (2007) suggests that the kind of learning that recognizes that students are discovering who they are and what their responsibilities are within the natural, social, and cultural worlds is authentic learning:

By authentic learning I mean a learning that enables learners to encounter the meanings embedded in the curriculum about the natural, social, and cultural worlds they inhabit, and, at the same time, find themselves in and through these very encounters. (p. 165; emphasis in original)

The encounters that students have with the curriculum are dialogical, a conversation between the knower and the known (Palmer, 2007). In contrast to the epistemology of the isolated knower—inhherited from Descartes—knowing is viewed as a relational activity, or as Starratt (2012) labels it, authentic knowing. Too often learning does not recognize this relationship and in the hurried pace to meet curriculum expectations and assessment requirements, inauthentic learning becomes the norm. Starratt (2012) refers to this as triple jeopardy where students “can find neither themselves, nor the authentic subject being studied, nor the integrity of the learning activity” (p. 97). When inauthentic learning becomes the norm, Starratt (2012) warns, students leave school each day and at the end of each school year with feelings of emancipation: “They are free to be themselves” (p. 86).
Starratt (2012) labours to demonstrate that the “authenticity of the learner is at stake every day at school” (p. 96). From the discussion above, authentic learning could be defined as learning in which students can find more about (a) themselves, (b) the authentic subject being studied, and (c) the integrity of the learning activity. This working definition of authentic learning also accounts for the correspondence view introduced earlier. For example, Lombardi (2007) links authentic learning to the training of apprentices for a particular field or trade, an approach more recently embraced by programs within colleges and universities. van Oers and Wardekker (1999) show that the aim of authentic learning is both personally and culturally relevant:

Authentic learning is a dynamic relation between a personality-under-construction and cultural practices-being-reconstructed, which is aimed at developing an authentic and autonomous person able to participate in a competent yet critical way in cultural practices. (p. 231)

Authentic learning practices give students a measure of responsibility for learning within a simulated domain of learning that allows them to find the authentic subject being studied and the integrity of the learning activity. van Oers and Wardekker illustrate with an example from mathematics:

For instance, authentic mathematics learning is not just a personal discovery of some mathematical rule or concept; mathematical learning at school can only be called authentic if the organization of this learning activity conforms in some honest form to the dynamics of the activities of the mathematical community. (p. 235)

Within a contextually relevant learning environment, students are engaged in learning more about themselves including their rights and responsibilities as members of the
worlds of culture, nature, and society (Starratt, 2012). Creating and sustaining the kind of classroom environment where a culture of learning can flourish requires a commitment by teachers to these ideals. For teachers this means being committed to ongoing professional learning (Hargreaves, 2003) including the assessment literacy associated with assessment for learning (Birenbaum et al., 2015). As we will explore in the next section, a commitment to students and their learning should also be a part of how teacher education programs prepare the next generation of teachers.

**Teacher Education: Learning to Teach and Teaching to Learn**

Creating and nurturing a culture of learning in classrooms requires a commitment by teachers to students and their learning. This commitment involves how teachers view the purpose of education, how children learn, and what the roles of teacher and student are. However, the literature reveals that for a variety of reasons, change is slow to occur in the classroom. Teachers teach as they were taught (Cuban, 1984) and the orthodoxy of teaching and assessment manifests as a type of social inertia in the world of education (Broadfoot, 2001). Shepard (2000) laments that “dominant theories of the past continue to operate as the default framework affecting and driving current practices and perspectives” (p. 4). These beliefs are strongly influenced by how teachers themselves have been taught. Cuban (1984) identifies this as a culture of teaching noting that “teaching is one of the few occupations where one learns firsthand about the job while sitting a few yards away, year after year” (p. 244). Lortie (1975) described this as an apprenticeship of observation, an often overlooked way in which more than 12 years of formal schooling prepare individuals to become teachers. While not fully appreciating everything a teacher does behind the scenes, students observe the habits of teachers and
develop an image of a teacher based upon their experiences. For teacher candidates, learning to teach begins by understanding that teaching is likely different than their perceived image.

Beyond the personal apprenticeship in teaching that every student experiences, there are also social myths that help to promulgate images of who teachers are and what they do. Robinson (2017) concludes that there are two prevailing ideas in society: teaching as a practical craft and teaching as a learned profession. As with other professions throughout the centuries, teacher education began informally as a sort of apprenticeship. Robinson notes that this system was present in 19th century England, where students would begin a 5-year apprenticeship in a pupil-teacher system that began as early as age 13. Suffice to say that under the conditions in which these teacher candidates learned their craft, much of their learning would have been practical in nature with little theoretical understanding. So-called Normal schools were established in Ontario in the middle of the 19th century with a focus on subject content and pedagogical training for elementary and then secondary education (Kitchen & Petrarca, 2014). Although teacher education for secondary teachers would move to the University of Toronto at the beginning of the 20th century, it would take another 50 years for similar programs to be established for elementary teachers. Nevertheless, with this move, education would become viewed as a bona fide discipline of academic study (Robinson, 2017) and teachers would earn respect in society as autonomous professionals. While teachers had earned the status of professional, in large part due to their university education, the autonomy that came with this status had only reinforced the culture of teaching (Hargreaves, 2000). However, this became untenable in the 1980s and 1990s as
rapid changes occurred in society and in the field of education. In education, the cognitive paradigm introduced new ways to think about how students learn and the culture of teaching began to be influenced by the culture of learning. Hargreaves (2000) demonstrates from this period that in order to keep up with the proliferation of teaching methods, the inclusion of diverse learners, and the growth of technology, teachers needed to develop professional learning cultures. Teachers began to embody life-long learning. Teachers have worked hard to establish the professional nature of their calling against a backdrop of teaching as a practical craft. In the midst of these varied influences, teacher education programs are called upon to equip teacher candidates for their professional role.

Imig and Imig (2007) capture a critical focus of the literature on teacher education: “A constant for us is to seek agreement about the ends of teacher education—what is it that we want the graduates of our programs to know, to believe, and to be able to do” (p. 99). The literature addresses three questions about teacher education programs: What are teachers learning as they learn to teach? How do teachers learn to teach? Who am I and who am I becoming as I learn to teach? Taking the first two questions together, it is worth noting that the theoretical and practical components of most teacher education programs have remained largely unchanged over the past century (Kitchen & Petrarca, 2014). Britzman’s (1991) critical assessment traces this conformity to the origins of teacher education as a vocational model of teacher training and to the behavioural model of learning. Teacher learning was equated with the acquisition and refinement of key teacher skills (e.g., teacher praise, questioning, directions). However, if one of the fundamental ends of teacher education is to equip children, elementary and secondary, to
be life-long learners, then teacher candidates will need to learn about and model learning. 

Darling-Hammond (2006) captures the potential of such a teacher education program:

Thus, schools of education must design programs that help prospective teachers to understand deeply a wide array of things about learning, social and cultural contexts, and teaching and be able to enact these understandings in complex classrooms serving increasingly diverse students. (p. 302)

This broader focus also reflects the influence of the cognitive model of learning on teacher education. For example, Russ et al. (2016) observe that the attention given in recent decades to written reflections, interviews, and classroom observations is evidence that educational researchers are trying to understand the underlying mental processes of teachers. Another observation that Russ et al. make is that “the sheer volume of learning required by teachers makes the need for personal construction even more clear” (p. 400).

A cognitive constructivist mindset helps to describe how teachers learn and adds credence to the implication the authors make that much of teacher learning occurs during the act of teaching.

A final element addressed in the literature on teacher education programs can be framed through the existential questions introduced earlier: Who am I? Why am I here? In addition to the Piagetian influence on how teacher candidates learn, other researchers have also given attention to Vygotsky’s theory that learning does not occur in isolation but rather in community. From this perspective, classrooms become “communities with cultures and histories in which groups of individuals interact with and learn from each other” (Russ et al., 2016, p. 403). Researchers have studied the experiences of teacher candidates as their role changed from university student to teacher candidate to novice teacher (Nolen et al., 2011). Other studies have looked at ways of helping teacher
candidates change their focus, from “How did I do?” to “What did my students learn?” (Pelton, 2007; Ryan, 2007). Teacher education programs expose teacher candidates to the complexity of teaching—pedagogical and content knowledge, methods of teaching, theories of education and learning—while at the same time introducing them to the rights and responsibilities of the teaching profession. Britzman (1991) describes learning to teach as both a personal endeavour, where “one’s past, present, and future are set in dynamic tension” (p. 8), and as a social process, as one enters the teaching profession with all its rights, responsibilities, and history. To appropriate the metaphor introduced by Fine and Sirin (2007), student-teachers are living on the hyphen: “Marginally situated in two worlds, the student-teacher as part student and part teacher has the dual struggle of educating others while being educated” (Britzman, 1991, p. 13). Student-teachers are wrestling with the question, “What does it mean—for me—to be a teacher?” However, teacher education programs often do not deal with the tension of being and becoming a teacher (Britzman, 1991) or teacher identity may be acknowledged but not dealt with in an intentional manner (Schultz & Ravitch, 2013).

Beijaard and Meijer (2017) suggest the need for a pedagogy of identity learning that addresses beliefs about what teachers do and who they are, while acknowledging that these beliefs will change in time through the many interactions student-teachers have with peers, teacher educators, and students. Some approaches employed in the area of teacher identity include narrative inquiry (Clandinin & Connelly, 1996), core reflection (Korthagen & Vasalos, 2005), as well as promoting authenticity through an ethic of care (Rabin, 2013). These means aim to help teacher candidates theorize about their work and intentionally think about being and becoming a teacher.
Teaching Students of Teaching: Context

This study was conducted within the field of teacher education where teacher educators help teacher candidates learn about being and becoming a teacher. As we saw in the previous section, becoming a teacher can be characterized as a learning continuum that begins with the apprenticeship of observation (Lortie, 1975) during Grades K–12. The continuum proceeds through teacher education, induction, and extends to include ongoing professional development. Abell et al. (2009) hypothesize that a parallel learning continuum exists for teacher educators. Many teacher educators’ professional learning begins in the elementary or secondary classroom, continues throughout their doctoral preparation, and extends into their initial years as a teacher educator. Yet as Loughran (2014) pondered, how do teacher educators continue to hone their skills as those who teach students of teaching? To address this question, the first part of this section presents a review of the literature on a developing area of research known as self-study of teacher education practices.

This study, which employs methods associated with self-study, was conducted within the context of science teacher education. In a recent comprehensive review of the literature on self-study conducted by science teacher educators, Bullock (2020) acknowledges the “relative paucity of literature that explicitly focuses on science education and self-study” (p. 937). Nevertheless, Bullock observes that some of the major ideas in self-study methodology developed when teacher educators explored questions arising from science teacher education (Berry, 2007; Munby & Russell, 1994). Similarly, this study involved teacher candidates who were learning to teach science in the elementary classroom. Therefore, the second part of this section will present a review of the literature relevant to learning to teach science.
Teacher Educators Learning Through Self-Study

In recent decades, teacher educators have been interrogating their own practice of teaching through an emerging field of research known as self-study. Research in this field is driven by a common desire to help teacher candidates learn about being and becoming a teacher. Loughran (2005) observed that students who enter a teacher education program often expect to be told how to teach, yet soon discover as students of teaching that telling does not necessarily lead to learning. The sense of dissonance that develops requires teacher educators to be good teachers of teaching, which leads Loughran (2005) to state: “Being a good teacher of teaching requires much more than being a good teacher, and this is where self-study begins to ‘bite’ as an important shaping force in teacher education practices” (p. 7; emphasis in original). The literature reveals that the “bite” or impetus for self-study emerges in a variety of ways in the life of the teacher educator as dissonance between rhetoric and practice (LaBoskey, 2004). For example, Brown (2012) felt that dissonance when teaching about constructivist learning theory using methods that were not consistent with this theory. Self-study occurs in the gap between theory and practice where the focus is “not on the self per se but on the space between self and the practice engaged in” (Bullough & Pinnegar, 2001, p. 15). It is also evident from the literature that self-study is often employed by those who have recently become teacher educators. For example, as a new teacher educator Donnell (2010) examined the tension between accountability and authenticity while Kitchen et al. (2008) report on a study of nine new faculty members who used self-study to advance their teaching and research on teaching. For those who are new to teacher education, self-study is a means of helping teacher educators learn to teach about teaching. Bullough (1994) captures this sentiment as the
distinction between a teacher trainer—teacher as teller—and a teacher educator who leads teacher candidates as they discover all of the rights and responsibilities of being a teacher.

If the motivating factor behind self-study arises from the historical struggle in teacher education of making connections between theory and practice, then the purpose of self-study is to reduce this problem (LaBoskey, 2004). The literature reveals that the aims of self-study are twofold: to improve teaching about teaching and to advance teacher education research (Bullough & Pinnegar, 2001). The first aim is related to the “desire of teacher educators to better understand the nature of teaching about teaching” (Loughran, 2002, p. 245). The driving force of a self-study originates with the researcher yet the “self” in self-study does not suggest an individualistic orientation. The literature is clear that self-study must go beyond personal reflections of practice (Loughran, 2005) to effect educational change and contribute to the field of teaching about teaching (Loughran, 2002). Effecting educational change begins locally with the teacher educator’s students. There is an implicit responsibility to teacher candidates and to their students (LaBoskey, 2004). Yet self-study is also recognized as a means of contributing to the field of teacher education by “moving the research conversation in teacher education forward” (Bullough & Pinnegar, 2001, p. 20). The learning that takes place by teacher educators through self-study holds potential for a pedagogy of teacher education (Loughran, 2005) that will benefit others in the field of teacher education.

Within the self-study literature for teacher education, a secondary benefit emerges as authors describe the learning that occurs through these studies as transformative (Bullough, 1994; Donnell, 2010; LaBoskey, 2004). In the literature on adult learning, Mezirow’s (1978) transformative learning theory is used to describe the transformation
that occurs when adults intentionally reflect on core presuppositions that they may have assimilated since childhood. For example, Kreber (2013) describes a scenario whereby through dialogue with others, select reading, and reflection, she may come to critically examine her assumption that entry to higher education should be based on previous academic merit alone. This may lead to a transformation in her perspective on the matter which Mezirow would call transformative learning. Interestingly, Cranton and Carusetta (2004), as well as Kreber, describe the development of authenticity as an outcome of transformative learning. New teachers tend to teach the way they were taught but through experience and encounters with the unexpected they may begin to question their previously held assumptions. Acting upon these new perspectives is a transformative process that helps these teachers develop authenticity (Cranton & Carusetta, 2004).

Moreover, the literature also reveals that developing our authenticity is inextricably linked to helping others become authentic (Brook, 2009; Cranton & Carusetta, 2004; Kreber, 2013). In a similar manner, LaBoskey (2004) observes that “we engage in self-study to both orchestrate our own transformations and to monitor and understand our progress in facilitating the transformations of our student teachers” (p. 832). Helping students develop an understanding of self as teacher is an aim that Bullough (1994) has for teacher candidates and is modelled through his own self-study as “part of my on-going quest for authenticity in teaching” (p. 109). The potentiality of self-study lies not only in the transformative learning that occurs but also in the development of authenticity for self and others.

From a methodological perspective, self-study does not have the same historical grounding as other research traditions. Bullough and Pinnegar (2001) state it rather abruptly: “Self-study is a mongrel: The study is always of practice, but at the intersection
of self and other, and its methods are borrowed” (p. 15). The literature bears this comment out, as self-study draws upon a number of traditions including critical reflection, action research, and narrative inquiry (Loughran, 2002). The interactive nature of self-study is also a unifying factor within the literature. LaBoskey (2004) positions self-study within a social constructivist learning theory framework that corresponds with the interpersonal methods employed. For example, Kosnik et al. (2009) outline the use of semi-structured interviews, while Kitchen et al. (2008) describe authentic conversations that new faculty had as part of a collaborative component to their study. A defining characteristic of self-study is the involvement of a critical friend who will ask provocative questions and provide constructive critique to help the researcher assess and reframe their interpretation of experiences (Loughran & Brubaker, 2015). These interactive techniques help to avoid the limitations of individual interpretation (LaBoskey, 2004) while acknowledging the need for other voices to ensure that the purpose of self-study remains improvement-oriented (Kosnik, et al., 2009). Nevertheless, self-study does imply that the teacher educator’s self is being studied; therefore, critical reflection of experiences is a fundamental activity (LaBoskey, 2004). Whether through reading journals (Kitchen, 2005a) or reflective logs (Kosnik et al., 2009), the researcher’s reflections move past looking back at experience to critically reflect on assumptions and presuppositions (Mezirow, 1998). For the teacher educator, these varied methods are harnessed for the purpose of improving teaching about teaching and thereby helping teacher candidates become teachers.

Learning to Teach Science

This study was set within the context of a course in which elementary teacher candidates are learning to teach science. Although we may take for granted that science is
a distinct subject, along with mathematics, language arts, and other subjects, Goodson
and Marsh (1996) would have us re-examine this notion; in fact, they warn that through
the study of school subjects “we rapidly come to understand them as the most
quintessential of social and political constructions” (p. 1). It was the state that organized
schools for mass education, establishing the curriculum along with its distinct subjects.
Although teachers are presumed to have autonomy in reorganizing and redirecting school
knowledge, in effect school subjects set the parameters for the nature of schooling
(Goodson & Marsh, 1996). As a subject, science would take some time to enter the scene
of school curriculum. The pure sciences received the support of state (Layton, 1973) and
universities would set the discourse around science, ensuring the esoteric nature of the
subject (Goodson & Marsh, 1996). Moreover, the short duration of education for
elementary students limited attention to reading, writing, and arithmetic. However,
according to Layton (1973), some innovators in the 19th century began to introduce
rudimentary elements of science. On the basis of children’s inquiring nature, Rev.
Charles Mayo and his sister Elizabeth designed object lessons with the “aims of
quickening the powers of observation of their pupils” (Layton, 1973, p. 24).

In Ontario, the explosion of technology in the 1980s and 1990s ensured the
establishment of science in the curriculum for elementary schools. Mathematics, science,
and technology would be one of four core program areas in *The Common Curriculum*
(Ontario Ministry of Education and Training [OMET], 1993) introduced in this last
decade of the millennium. Interestingly, within the four broad subject areas, the
curriculum was integrated in an effort to prepare students for a world in which “different
areas of knowledge and different components of reality (the environment, people, events,
processes, etc.) do not exist in neat, separate compartments; instead they are found
together and are connected in many complicated ways” (OMET, 1993, p. 9).

Economic downturns during the final decades of the millennium would serve as an impetus for society to blame education for the crisis. Hargreaves (2003) demonstrates that reports like *A Nation at Risk* in the United States were representative of studies throughout the world, all of which contributed to a culture of dissatisfaction with education. Governments would intervene through standardization and regulation. After only 5 years, the Ontario government released *The Ontario Curriculum* (Ontario Ministry of Education, 1998). The integrated nature of the previous curriculum was replaced by traditional subject specific learning outcomes organized by grade. For the first time in Ontario education, learning expectations were prescribed by grade, which Anderson and Ben Jaafar (2003) observed were welcomed by elementary teachers for their greater clarity. Nevertheless, if we heed Goodson and Marsh’s (1996) warning, reverting back to a subject specific curriculum has implications for how new teachers think about teaching. For example, as a subject, science can be viewed as a topic neatly divided into specialized areas: matter & energy, Earth & space systems, living systems, structures & mechanisms (Ontario Ministry of Education, 2007). Each area is composed of key concepts and bits of knowledge acquired in an organized manner over 8 years of schooling. Melville and Bartley (2013) refer to this as the contemporary discourse of science, which emphasizes the conceptual knowledge of science, a discourse that has “pedagogical implications for science teachers” (p. 174) restricting their conception of what science is and how it should be taught.

Against this backdrop, elementary teacher candidates enter a teacher education program in which they are called upon to be specialists in a variety of subject areas. Fazio
and Steele (2019) note that “most elementary teachers do not have an undergraduate science background and have had little science education preparation during their teacher education program” (p. 122). The literature is replete with concern about early science education (Fazio & Karrow, 2016; Gilbert & Byers, 2017; Tosun, 2000) owing to a host of factors. Within the North American context, science education has received short shrift in the face of greater attention given to literacy and mathematics (Fazio & Karrow, 2016; Gilbert & Byers, 2017). Student interest in science has waned and consequently negative attitudes towards science in elementary school adversely affect learning of science throughout a student’s academic career (Chiarello & Czerniak, 1987). Following that trajectory, it is not surprising that when these students become teachers (Geddis & Roberts, 1998) their attitude toward science can be characterized as less than enthusiastic. This perpetuates a negative cycle when elementary teachers who harbour a dislike for science avoid teaching science (Tosun, 2000) and consequently limit their students’ opportunities to engage with science. Reflecting on Starratt’s (2012) warning, these students are unable to find the authentic subject, nor the integrity of the learning activity, therefore hindering the discovery of their selves.

In recognition of the consequences of this negative cycle, the literature reports on a number of initiatives to develop teachers who are more confident about teaching science. Researchers have looked at beliefs of preservice elementary teachers toward science and science teaching (Tosun, 2000) as well as their lack of confidence (Avery & Meyer, 2012). Others have looked at ways to improve the teaching and learning of scientific inquiry and the nature of science (Fazio & Melville, 2008), as well as the role the practicum plays in developing inquiry-based practices (Fazio et al., 2010). What is
striking within this discourse is that self-efficacy stands out as a common measure associated with the attitude that teachers have towards science and science teaching. Bandura (2006) postulated that the development of self-efficacy is part of the construction of the self. Self-efficacy is “concerned with people’s beliefs in their capabilities to produce given attainments” (Bandura, 2006, p. 307). Those who have low self-efficacy in science will tend to dislike teaching science as a result (Tosun, 2000). In some cases, the low self-efficacy that teacher candidates have for teaching science is associated with science anxiety (Bursal, 2012). As the seminal author on science anxiety, Mallow (2010) defines this phenomenon as “a debilitating interaction of emotion—fear, with cognition——science learning” (p. 1). These debilitating emotions manifest in science classes but not in other subjects, including mathematics. Although science anxiety has been observed in elementary school children (Chiarelott & Czerniak, 1987) the literature is also clear that adults can suffer from it. In fact, Mallow (2006) observed that, “Among the most science anxious students are our education majors, still almost all female, the teachers of the next generation” (p. 7). Science anxiety can be alleviated to varying degrees by certain practices, many of which are associated with the learning environment (Mallow, 2006). This is in keeping with findings from similar studies that have explored the relationship between learning environment and mathematics anxiety (Taylor & Fraser, 2013). For teacher education programs, one conclusion is to include “explicit discussion of these attitudes and anxieties in the classroom, as part of a general discussion of meta-cognition—how one learns science” (Mallow, 2010, p. 8).

What these studies demonstrate is that learning encompasses much more than simply changes in behaviour or cognition. Citing Hilgard’s (1980) trilogy of the mind,
Martinez (2010) describes the mind as composed of three parts: cognition, affect, and conation. Cognition encompasses the rational thoughts, affect refers to emotions, and conation “refers to purposeful striving toward valued goals” (p. 153), which includes motivation and volition. The previous discussion of attitudes, self-efficacy, and anxiety demonstrate that in addition to cognition, learning must also attend to affect and conation.

Melville and Bartley (2013) draw attention to this need in relation to teacher identity formation, arguing that a poststructuralist’s perspective “offers new insights into the challenges faced by teachers in challenging the contemporary discourse, given that the role of the emotions in teacher change is overlooked” (p. 175). In their study, they observed that the emotional concern teachers had for their students’ learning in science emboldened the teachers to challenge the contemporary discourse of science. A novel attempt to help preservice elementary teachers overcome anxiety and negative attitudes towards teaching science was recently explored through the use of wonder (Gilbert, 2013; Gilbert & Byers, 2017). Arguing that wonder is often relegated by traditional approaches to teaching science, Gilbert and Byers (2017) sought to employ wonder to help create positive experiences for their preservice students. Their findings suggest that wonder could be used as a pedagogical tool to positively impact how preservice teachers viewed themselves in relation to teaching science. Among other things, this study demonstrated that attending to the emotions of elementary preservice teachers may help to encourage them as they plan to teach science and that this will also have a positive impact on elementary students.

The discussion of the challenges and opportunities of preparing elementary teachers to teach science leads to a number of implications for learning in a teacher
education program. For example, Fazio and Steele (2019) suggest that in order to teach science effectively, elementary teachers require a significant level of science pedagogical content knowledge. Russ et al. (2016) describe pedagogical content knowledge as a construct that developed in teacher education towards the end of the millennium in midst of a greater emphasis on cognitive learning theory. Recognizing that general pedagogy and subject-matter knowledge are not sufficient, pedagogical content knowledge refers to the specialized knowledge of teaching a certain subject such as science or math. Teacher educators who are helping elementary teacher candidates learn about teaching science are also confronted with the reality that many of their students do not have a positive attitude about science. The challenge for teacher educators is to help these teacher candidates recognize the contemporary discourse associated with teaching science. Moreover, Melville and Bartley suggest that to combat the contemporary discourse teachers need to understand the processes of science and to see the potential power of curriculum documents to challenge the contemporary discourse. The discussion above is also a reminder that learning involves both cognition and emotion. This applies as much to teacher candidates as it does to elementary students. Therefore, for the student of science, authentic learning about science and the processes of science will also allow students—teacher candidates or elementary—to learn about themselves (Starratt, 2012). The literature demonstrates the need to find ways that bring teacher candidates from a place of hesitation about science to one in which they can inspire their students. As Bursal (2012) summarizes, the need is pressing:

Science methods courses in teacher preparation programs are maybe the last opportunity for future elementary teachers to develop teaching strategies and
potentially gain positive attitudes toward science and teaching before starting their teaching careers. Therefore, the main task of teacher educators should be designing science methods courses that will be beneficial to prospective teachers in various aspects. By the end of these courses, all prospective teachers’ self-efficacy levels should be high enough to deliver high-quality instruction in schools and they should be able to overcome any anxiety toward science. (p. 43)

Chapter Summary: The Potential of Authenticity

Bursal’s (2012) statement that “the main task of teacher educators should be designing science methods courses that will be beneficial to prospective teachers in various aspects” (p. 43) is a fitting summary of the purpose of this study as demonstrated throughout this literature review. From the outset, authenticity has exhibited the potential of guiding the direction of this study to contribute to the questions of educational philosophy regarding the purpose, nature, and problems of education (Siegel, 2010). Authenticity has been shown to be a current and relevant theme in research on education (Akoury, 2013; Bialystok, 2016; Brook, 2009; Cuypers, 2010; Sarid, 2015), higher education (Cranton & Carusetta, 2004; Kang, 2013; Kreber, 2013; Kreber et al., 2007), and teacher education (Oral, 2013; Rabin, 2013; Sutherland & Markauskaite, 2012). Of the latter group of studies, Sutherland and Markauskaite (2012) took the correspondence view of authenticity, employing authentic learning experiences as they examined the transition of teacher candidates from student to professional. Rabin (2013) found that by preparing teacher candidates for an ethic of care, authenticity was determined to be a core dimension of teachers who care. Oral (2013) presented an exposition of Heidegger with respect to authenticity and advocated for an emphasis on practicum over classroom theory, arguing that in order to become a teacher you need to be a teacher. Although these
studies of teacher education have engaged with authenticity as a concept, none have considered authenticity in relation to teaching and learning in teacher education.

Brook’s (2009) application of Heidegger’s phenomenology to teaching and learning affirmed the potential authenticity has for this study. Brook posits five possible ways of “constituting an authentic interpretative praxis” but concludes that “Heidegger’s notion of authenticity, however, contains such rich possibilities for thinking about teaching practices that this paper could only hope to scratch the surface” (p. 57). It is this potential of authenticity that was central to this study. This potential was echoed by Kreber et al. (2007) who acknowledged that authenticity in teaching was an under-researched area in education. This literature review has demonstrated that learning is fundamental to the nature of human beings and that education should serve each person’s quest for personal authenticity (Starratt, 2012). This perspective creates implications for teacher education, implications that have not been explored. For example, Beijaard and Meijer (2017) have suggested the need for a pedagogy of identity learning for teacher candidates but there is a dearth of scholarship examining how an intentional focus on authenticity might help meet that need. Similarly, in the context of discussing an awareness of the emotional aspects of teaching, Melville and Bartley (2013) remind us that “Hardly ever discussed in the science teacher preparation literature is an explicit focus on ontological development as it specifically relates to the worth of a student” (p. 188). The literature has not revealed how authenticity might address the ontological development of students, particularly in the context of teaching and learning elementary science.

Teacher educators, especially those new to teacher education, have benefited from self-study as they examined the gap between rhetoric and practice. It has been shown that this transformative learning experience not only contributes to the development of their
authenticity but also is inextricably linked to helping others become authentic (Brook, 2009; Cranton & Carusetta, 2004; Kreber, 2013). Moreover, Bullock (2020) demonstrated that in some cases, “work done within the crucible of a science teacher education classroom by a science teacher educator engaged with self-study methodology produced a useful research tool” (p. 946). The literature does not address how an intentional focus on authenticity might facilitate the self-study of a new teacher educator who teaches science to elementary teacher candidates. Therefore, in summary, this literature review revealed that this study can contribute to the scholarship in education by exploring the significance and potential of authenticity in teacher education. The next chapter will outline the research design, methods used to collect data, and the steps taken to analyze the data.
CHAPTER THREE: RESEARCH METHODS

This research study is founded upon the premise that each person’s life involves a personal quest for authenticity, and that this creates implications for teachers and teacher educators. The purpose of this study was to explore the significance and potential of authenticity in teacher education. The preceding literature review has demonstrated that authenticity is a relevant and current concept in education and higher education, yet is underexplored in relation to teacher education. The review revealed some studies where authenticity was conceptualized in the context of teacher education, but none have intentionally considered authenticity in relation to teaching and learning in teacher education. This study arose out of the dissonance that I have experienced as a teacher educator. As a concept, authenticity appeared to have potential for teacher education; however, I struggled to translate this potential into practice with teacher candidates. To mitigate this dissonance I chose to utilize a qualitative methodology that employed methods associated with self-study. This chapter begins with a description of the research design, followed by an introduction of the participants involved in this study. The qualitative methods used to collect data and address the research questions are then described. Data analysis outlines the process by which themes were derived from the collected data. The chapter also includes a description of how the criterion of trustworthiness was addressed throughout the study. This chapter concludes with a description of the research ethics considerations relevant to the consenting participants.

Research Design

A qualitative research approach was selected for this study to address the overarching research question. Creswell and Creswell (2018) assert that the selection of a
research approach is influenced in part by the researcher’s philosophical assumptions. Therefore, it is important for the researcher to make explicit the philosophical ideas that inform the selection of a research approach. As I examined the philosophical worldview options presented by Creswell and Creswell in light of my previous research experience (Huizenga, 2016), it became clear that I have a predilection for a social constructivism methodology. As a researcher I am interested in how individuals “seek understanding of the world in which they live and work” (Creswell & Creswell, 2018, p. 8). The development of subjective meaning of experiences is forged through discussion and social interaction. While I have positioned this research as a self-study, as a constructivist researcher I recognize the importance of dialogue with others to help me negotiate an understanding of authenticity within teacher education.

Context is not dismissed since historical and cultural experiences shape the world the participants live in. This study is set within the world of teacher education where teacher educators are introducing teacher candidates to the world of teaching and learning. As the discussion in Chapter 2 has made clear, these worlds have a history that has shaped understandings (and misunderstandings) about the purpose, nature, and problems of education. A social constructivist also interprets the findings to inductively develop a pattern of meaning (Creswell & Creswell, 2018). In summary, the characteristics of a social constructivist are quite compatible with the aims of a qualitative researcher who “is interested in how meaning is constructed, how people make sense of their lives and their worlds” (Merriam & Tisdell, 2016, p. 25).

The exploratory nature of this research aligned well with qualitative research designs. Examination of some of the features of qualitative research designs led me to
conclude that a basic qualitative research study was most appropriate. Merriam and Tisdell (2016) explain that a basic qualitative research study “would be interested in: (1) how people interpret their experiences, (2) how people construct their worlds, and (3) what meaning they attribute to their experiences” (p. 24). As I will describe in more detail below, the key person whose experiences and world I sought to explore was myself, as a relatively new teacher educator. A basic or generic qualitative design offers flexibility to the researcher whose research study is broadly exploratory so the researcher “can deviate in ways that they see as necessary to fulfill their goals” (Kahlke, 2018, p. 1).

Other qualitative research designs add another dimension to the basic qualitative study’s goal to uncover and interpret meaning of an experience. For example, phenomenology explores individuals’ lived experience of a phenomenon (Creswell & Creswell, 2018), ethnography seeks to understand the interactions of individuals with each other and the surrounding culture (Merriam & Tisdell, 2016), while the breadth of grounded theory aims to develop a substantive theory (Kahlke, 2018). My study intended to explore the significance and potential of authenticity in teacher education. Although I interacted with others about authenticity, this study was not designed to describe their individual lived experiences in order to discover the essence of those experiences, nor did it aim to explore the interaction amongst participants as is the case in ethnography. Similarly, my study did not generate a substantive theory but involved an inductive process of gathering information, working from the particular to the general to develop patterns of meaning (Creswell & Creswell, 2018).

Pinnegar and Hamilton (2009) demonstrate that within the field of qualitative research, teacher educators joined other qualitative researchers in the pursuit of ways to
interpret meaning from their experiences. Within the postmodern milieu of the late 20th century, self-study of teacher education practice took shape as a means of understanding teaching and teaching about teaching. In their systematic literature review of self-study of teacher education practices, Vanassche and Kelchtermans (2015) identify four distinguishing characteristics: “self-study focuses on one’s own practice; for this reason, it privileges the use of qualitative research methods; collaborative interactions play a central role in the research process; and its validation is based on trustworthiness” (p. 508). This study satisfied all four characteristics. First, as I explored ways of enacting authenticity within a science curriculum and instruction course for elementary teacher candidates, my goal was to improve my teaching practices and to help future teachers. Second, I employed a number of qualitative data methods including but not limited to journal writing, field notes, collaborative conversations, and documents. Third, in light of the social constructivist learning theory that undergirds this study, I collaborated with other teacher educators to engage with alternative perspectives and interpretations. Finally, as with other qualitative research designs, the criterion of trustworthiness was addressed in this study. These data collection practices will be elaborated upon in subsequent sections.

**Site and Participant Selection**

Collaboration among teacher educators has been identified as a hallmark of self-study (Donnell, 2010; Kitchen et al., 2008) and as a form of reflective practice that “involves a collaborative unpacking of assumptions and a willingness to challenge and have challenged deeply embedded beliefs and routines of practice” (Davey & Ham, 2009, p. 188). This form of interaction can involve a critical friend (Loughran & Brubaker,
or a community of practice consisting of four or more colleagues working within the same institution (Kitchen & Ciuffetelli Parker, 2009) or in different institutions (Placier et al., 2005). Towards that end I engaged three teacher educators in conversations oriented around my research questions. A fundamental aim of the self-study of teacher education practice is to improve the learning experiences of teacher candidates as they learn about teaching (LaBoskey, 2004). During this study I taught a science curriculum and instruction course for eight elementary teacher candidates at Covenant Canadian Reformed Teachers College (CCRTC) where I am a full-time lecturer. As I taught this course, I embedded authenticity as a guiding theme for discussions, reflections, and other teaching/learning activities. Throughout the course, I collected exit cards and notebook reflections from the teacher candidates as they reflected on their learning experiences (LaBoskey, 2004). Therefore, in this study I interacted with educators from both ends of the experience continuum: experienced teacher educators and teacher candidates.

**Teacher Educators**

Having received research ethics clearance from the Brock University Research Ethics Review Board (file # 19-151), I invited three experienced teacher educators to participate as critical friends for this study. Each of these teacher educators consented to participate. To ensure that their identity was protected I assigned gender-neutral pseudonyms. Each of the critical friends had served as a teacher educator for at least 10 years. As professing Christians, each teacher educator could relate to my role as a teacher educator in an independent Christian teachers college serving Christian schools. Reilly is a teacher educator in a public university. Our educational paths crossed almost 10 years ago in an additional qualification course for special education. Although we lost touch
during the intervening years, our common faith commitment and task as teacher educators ensured that we could have open dialogue. Jordan recently retired after being a teacher educator in an independent, accredited Christian university in Ontario. I did not know Jordan prior to this study but our shared experiences teaching science and technology to elementary teacher candidates contributed to collegial discussions. Erin is a colleague at CCRTC and we have worked together for more than 5 years. Our common goal of preparing teachers for Reformed Christian schools served as an underlying theme for our conversations. Each teacher educator contributed a unique perspective to the conversations we had and together these conversations were a source of rich data for this study (see Table 3).

**Teacher Candidates**

In keeping with CCRTC’s protocol for research, I presented a copy of the approved research ethics review by Brock University Research Ethics Review Board and subsequently CCRTC granted permission to conduct research. The eight teacher candidates enrolled in my science and technology curriculum and instruction course (DT 410) were invited to participate in this study. A neutral third person presented the letters of invitation and informed consent and then collected the responses. These were placed in a sealed envelope and held by that person until I had submitted all final marks for DT 410. At that time it was revealed that all eight had consented to be participants in this study. There are two teacher education programs at CCRTC. Seven of the eight teacher candidates in DT 410 were in their final term of a 3-year postsecondary diploma of teaching program. The remaining teacher candidate was in the first year of her 2-year postgraduate diploma of education program.
<table>
<thead>
<tr>
<th>Pseudonym</th>
<th>Affiliated institution</th>
<th>Current status</th>
<th>Prior experience</th>
</tr>
</thead>
<tbody>
<tr>
<td>Erin</td>
<td>CCRTC—an independent, non-accredited teachers college</td>
<td>Full-time teacher educator</td>
<td>Independent Christian school elementary teacher and principal</td>
</tr>
<tr>
<td>Jordan</td>
<td>Independent, accredited Christian university</td>
<td>Retired teacher educator</td>
<td>Public school secondary science teacher; science consultant</td>
</tr>
<tr>
<td>Reilly</td>
<td>Public university</td>
<td>Full-time teacher educator</td>
<td>Public and independent Christian school teacher</td>
</tr>
</tbody>
</table>
Each of the eight teacher candidates was enrolled to teach in an elementary school in the primary/junior (P/J) division. To protect their identity, pseudonyms were also assigned to each of these female teacher candidates. The experiences of these teacher candidates, being and becoming teachers, also served to inform my own exploration of the space between self and the practice engaged in (Bullough & Pinnegar, 2001).

**Data Collection**

Drawing upon a number of traditions including critical reflection, action research, and narrative inquiry (Loughran, 2002), self-study employs a variety of qualitative research methods to collect data and address the empirical questions (Vanassche & Kelchtermans, 2015). These methods include journal writing, field notes, correspondence, conversations, interviews, and documents. It is worth noting that collecting data through these means is an interpretive process, one that involves the subjectivity of the researcher. For example, Clandinin and Connelly (2000) coined the term “field texts” in narrative inquiry, to distinguish data that is created by researchers and participants from data that is found or discovered. In a similar manner, it is important to acknowledge that data collected through this self-study is never entirely objective.

Throughout this study I employed journaling or as Samaras (2011) described it, cataloguing. Cataloguing is “a data-gathering technique to memo and document the self-study teacher researcher’s metaconversation to him- or herself and to critical friends of the unfolding of understandings and shared insights of his or her self-study research project” (p. 175). My journal functioned as a resource where I documented new questions and ideas to explore, wrote brief reflections on articles I was reading, or recorded interesting points to ponder. I also used my journal for deeper reflections. For example, after sending a follow-up question to one of my critical friends, I used my journal to
contemplate and respond to that very question (see Appendix D). Throughout this self-study, my journal was often a place where I drew together and recorded the ideas that were emerging from teacher candidate responses and conversations with teacher educators. Figure 2 captures components of data collection, illustrating the research questions addressed, along with the central role of myself as teacher educator/researcher. In the remainder of this section, I will describe the data collection methods employed to address the empirical questions as I interacted with teacher educators and teacher candidates.

**Collecting Data From Conversation With Teacher Educators**

Self-study of teacher education practices often benefits from discussions of the experiences of others (Kitchen et al., 2008). Towards that end I engaged three teacher educators in conversations over a period of 6 months. Prior to each conversation I would email an invitation to the teacher educator with a conversation starter (see examples in Appendix B) to help establish the context and provide a bit of direction for the conversation. The conversation starters for each of the three conversations were loosely related to a corresponding empirical question (see Figure 2). A list of questions was not prepared in advance since it was my desire to maintain the integrity of these discussions as conversations, not interviews. The first conversations were each conducted in-person. Due to the unexpected disruption of COVID-19, the remaining conversations were conducted online. All conversations were recorded with an audio recorder. Throughout the conversations I shared stories from my concurrent teaching and learning experiences in DT 410 and I solicited feedback from these experienced teacher educators. The transcripts of these conversations along with the follow-up email correspondence became a rich source of data.
Figure 2

Data Collection and Analysis Framework

1. How can authenticity illuminate being and becoming a teacher educator?
2. How can authenticity be translated into praxis?
3. What are the benefits/challenges of a focus on authenticity in S&T methods?

Teacher educator
- 3 participants
- 3 conversations
- 9 transcripts

Self
- journal entries
- course syllabi

Teacher candidate
- 8 participants
- 8 exit cards
- 10 reflections

What can authenticity reveal about teaching and learning in teacher education?
Collecting Data From Teacher Candidates’ Reflections

A central feature to this study were the observations made through the teaching and learning experiences of my science curriculum and instruction course for elementary teacher candidates. These students of teaching were informed of my quest to explore the significance and potential of authenticity in teacher education. Loughran (2006) captures the potential benefits of involving teacher candidates in such an experience:

When teacher educators demonstrate for their students of teaching how they anticipate and deal with uncertainty in their own practice and when they make explicit how they respond to the contradictions and constraints of their own program structures, they demonstrate scholarship. In so doing, they also offer a window of opportunity for students of teaching to consider the value of adopting a similar position in terms of their own professional learning. (p. 164)

Teacher candidates’ reflective reactions to our practice and their learning is an important element of self-studies by teacher educators (LaBoskey, 2004).

There were two means of collecting insights from the teacher candidates: (a) exit cards and (b) notebook reflections. Throughout the winter term, spanning January to May, eight exit cards and 10 notebook reflections were collected from each of the teacher candidates. This resulted in a total of 64 exit cards and 80 notebook reflections that were read, coded, and analyzed (see Appendix C). The course is normally conducted in-person on campus through two 90-minute classes per week over the span of 12 weeks (see Appendix A). The course is interrupted at approximately the midway point by a 5-week teaching practicum. This year students did not return to campus after the practicum due to new restrictions in place because of COVID-19. As a result, the final session after
practicum was conducted through asynchronous distance-learning. Although I could not formally analyze the exit cards and notebook reflections until I had submitted the final grades for DT 410, I did read them so that I could give feedback to the teacher candidates. As Samaras (2011) summarized: “Self-study research is a hermeneutic process: a dance of data collection and data analysis” (p. 197; emphasis in original).

**Data Analysis**

Figure 2 also communicates the data analysis framework for this study, comprised of the following elements: the empirical research questions, the data sources, theoretical frame, and the self-study methodology. My self is pictured at the centre of the diagram as both the self conducting the study and the self being studied. Double arrows represent the dialogical and concurrent nature of data collection and data analysis as I engaged with both teacher educator and teacher candidates. The three research questions are positioned somewhat over the source most responsible for providing answers to the question, although the self is clearly engaged with all three questions. Authenticity, evident in the research questions, is the theoretical frame used to interpret data. Finally, the self-study arrow is a reminder that analysis and interpretation not only addresses the overarching research question but is directed toward understanding and improving practice as a teacher educator (Pinnegar & Hamilton, 2009).

As a qualitative research design, interpretation and meaning-making are at the core of data analysis for self-study research (Kosnik et al., 2009). For teacher researchers, Samaras (2011) provides a helpful analogy to the recursive activity of data analysis:

You sort and classify information all the time for your students to help them understand material instead of just presenting it as a series of facts. That’s why reading and rereading your data and taking notes on issues or events that stand out
and are repeated or patterned in some way are so useful to you. During the process of your reading and analyzing your data you are making meaning of your data. (p. 198)

Creswell and Creswell (2018) suggest that it is helpful to conceptualize qualitative data analysis as involving two layers. The first layer follows the general pattern of data analysis for qualitative studies while the second layer involves steps associated with the specific qualitative design. This study has been positioned as a self-study with the purpose of improving my practice through constructing meaning (Samaras, 2011). Therefore, as I proceeded to analyze and interpret the data collected, I was not only interested in addressing the research questions; I also considered the question: “What have I learned from this study that can improve the learning experiences of my teacher candidates?” Towards that end my research journal served an evolving purpose as a place to write analytic memos. Saldaña (2016) captures the purpose:

Analytic memo writing documents reflections on: your coding processes and code choices; how the process of inquiry is taking shape; and the emergent pattern, categories and subcategories, themes, and concepts in your data—all possibly leading toward theory. (p. 44)

Analytic memo writing helped in the process of generating themes. In this way my journal functioned as a forum for dialogue between my sources of data, myself, and the literature (Pinnegar & Hamilton, 2009).

Data analysis of the teacher educator conversations and the teacher candidate reflections were conducted independently but followed a similar pattern (see Table 4). Through a process of constant comparison, codes that emerged through analysis were compared to new data collected (Samaras, 2011).
Table 4

_Data Analysis: From Text to Codes_

<table>
<thead>
<tr>
<th>Data source</th>
<th>Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teacher educators (conversations)</td>
<td>- Listen and transcribe</td>
</tr>
<tr>
<td>- total of 9 (3x3)</td>
<td>- Read and record notes in the margin</td>
</tr>
<tr>
<td></td>
<td>- Summarize key discussion points</td>
</tr>
<tr>
<td></td>
<td>- Member check summary and solicit feedback</td>
</tr>
<tr>
<td></td>
<td>- Code and analytic memos</td>
</tr>
<tr>
<td>Teacher candidates (exit cards)</td>
<td>- Read</td>
</tr>
<tr>
<td>- total of 64 (8x8)</td>
<td>- Record notes in the margin</td>
</tr>
<tr>
<td></td>
<td>- Compile margin notes for each exit card</td>
</tr>
<tr>
<td></td>
<td>- Code and analytic memos</td>
</tr>
<tr>
<td>Teacher candidates (weekly reflections)</td>
<td>- Read and provide feedback</td>
</tr>
<tr>
<td>- total of 80 (10x8)</td>
<td>- Read a second time and record notes in the margin</td>
</tr>
<tr>
<td></td>
<td>- Organize margin notes in a table</td>
</tr>
<tr>
<td></td>
<td>- Code and analytic memos</td>
</tr>
<tr>
<td>Self (research journal)</td>
<td>- Read</td>
</tr>
<tr>
<td></td>
<td>- Record notes in the margin</td>
</tr>
<tr>
<td></td>
<td>- Analytic memo writing</td>
</tr>
</tbody>
</table>
The codes generated in this study included *in vivo* codes (i.e., using words from participants’ own language) and descriptive codes (i.e., a label summarizing a basic topic; Miles et al., 2020). The list of codes was reviewed to eliminate redundancy (Creswell & Creswell, 2018). As described below, the remaining codes were used to construct concept maps from which themes could be generated from each data source. Thematic analysis involved discerning or generating themes by interpreting the codes in light of the research questions and conceptual framework (Saldaña, 2016). This inductive process allowed me to theorize about my work as a teacher educator. As Samaras concludes: “In self-study research, you are in essence generating a working theory grounded in the data of your practice and attempting to make meaning of it” (p. 209).

**Analysis of Teacher Educator Conversations**

The teacher educator conversations were transcribed shortly after having the conversation. A summary of the conversation was emailed to the teacher educator for member checking, along with a follow-up question or two. The responses were appended to the summary and transcript then saved until further analysis. At that time I began by re-reading conversation #1, highlighting text segments and salient quotes while also writing analytic memos. Codes were assigned to the text segments and these were recorded in a table. Once all three of the initial conversations were coded, the above steps were repeated for the remaining two conversations. The resulting code tables created for each teacher educator were composed of three columns containing the codes for each of the three conversations. Upon examining these tables for redundant codes, the remaining codes were transferred to a concept map. Samaras (2011) observes that concepts maps are a helpful tool for visualizing the relationships between big ideas. Transferring the
reduced codes from each teacher educator to one concept map provided an opportunity to compare codes across data sources. Similar codes were grouped together revealing a theme that represented a common idea. Through data analysis of the teacher educator conversations, four themes were discerned that will be elaborated on in Chapter 4 (see Table 7).

**Analysis of Teacher Candidate Reflections**

The teacher candidates’ reflections were collected by two means: (a) exit cards and (b) notebook reflections. The exit cards were analyzed first. This began with an initial read of the exit cards, highlighting text segments and salient quotes as I asked the question: What were my teacher candidates thinking? Following a second read, I compiled similar ideas and salient quotes into a table organizing one column per exit card. Puzzling over each of the eight columns, I identified one code per column to represent the main idea from that exit card. These codes were transferred to a new concept map along with examples of supporting text segments. While the exit cards allowed the teacher candidates to give a brief response to a prompting question in class, the notebook reflections gave the teacher candidates an opportunity to reflect deeply on an aspect of their learning.

Analysis of this rich source of data began by re-reading each reflection and highlighting text segments and salient quotes. The highlighted text segments and quotes from each reflection were transferred to a table composed of one column for each teacher candidate. Ten tables were created and analyzed, one for each weekly reflection. To manage the resulting collection of codes I organized the 10 reflection code tables into four groups (see Appendix C) according to the prompt for the notebook reflection: (a)
conceptual (reflections #1-3), (b) practicum (reflections #4-5), (c) science and technology strands (reflections #6-9), and (d) culminating reflection (#10). The codes were reduced to approximately five to six per group and these were transferred to a new concept map.

Four themes were generated through analysis of the concept map constructed from the notebook reflections. These four themes were then used to examine the codes on the exit card concept map. While many of the codes aligned with the four themes, further examination of the exit card concept map suggested a fifth theme. After returning to the notebook reflection concept map it was determined that a number of codes supported the fifth theme. Data analysis of the teacher candidates’ reflections involved examining codes within a data source (e.g., notebook reflection, exit cards) and then across data sources. Through this process, five themes were discerned that will be elaborated on in Chapter 4 (see Table 5).

**Trustworthiness**

All research, whether quantitative or qualitative, must be conducted in such a way as to convey a sense that the findings are trustworthy. Qualitative research exists in the shadow of the quantitative research paradigm. Thus, Creswell and Creswell (2018) encourage qualitative researchers to convey the steps that are planned to ensure accuracy (i.e., qualitative validity) and consistency (i.e., qualitative reliability). For similar reasons, Lincoln and Guba (1985) proposed a new set of criteria—credibility, transferability, dependability, and confirmability—to help qualitative researchers foster a sense of trust in their research. Lincoln and Guba captured the essence of the concern when they stated: “The basic issue in relation to trustworthiness is simple: How can an inquirer persuade his or her audience (including self) that the findings of an inquiry are worth paying
attention to, worth taking account of?” (p. 290). In the decades that followed, self-study of teacher education practices emerged on the qualitative research scene and these researchers were led to ask the same questions. For example, Feldman (2003) remarked: “We also must provide reasons why others should trust our findings” (p. 27). In view of the “self” in self-study, attending to trustworthiness, “establishes the difference between search (a personal or collegial experience) and research (the rigorous processing of data)” (Mena & Russell, 2017, p. 116). In this section I will highlight a number of ways that the criterion of trustworthiness was addressed throughout this study and in this report.

The conversations I had with teacher educators were valuable not only as a rich source of data but also as a means of testing out ideas. During these conversations I gave an account of current teaching and learning experiences in my science curriculum and instruction course. As critical friends, the teacher educators asked questions to probe my preconceptions or intentions. Listening to their experiences as teacher educators afforded me the opportunity to examine ideas from different perspectives. Hamilton et al. (2020) highlight the imperative of these interactions in self-study research, stating: “we consistently seek ways to consider multiple perspectives around the interpretations we make” (p. 321). To ensure the accuracy of my interpretations I employed member checking (Creswell & Creswell, 2018). After each conversation I sent a summary of our conversation to the teacher educators and they validated or modified my interpretations. Moreover, I used my research journal to document what I was learning from these conversations (Samaras, 2011).

Lincoln and Guba (1985) suggest that a research journal helps to address all of their criteria for trustworthiness, not only as a methodological log of activities and events,
but also serving a reflexive function by recording personal reflections, ideas, and insights. My research journal contains a detailed record of steps taken, along with findings, and initial interpretations ensuring that data analysis and reporting were based on accurate accounts. Feldman (2003) suggests that self-study researchers can increase the validity of their studies by providing a clear and detailed description of how data was collected. I have begun to do so in this chapter and will describe more details of data collection in Chapter 4. Such rich, thick descriptions help to “transport the readers to the setting and give the discussion an element of shared experiences” (Creswell & Creswell, 2018, p. 200).

Hamilton et al. (2020) also recommend the need to create clear paths for the reader of self-study research so they can “trace the path followed and the ideas revealed in the study” (p. 322). Integral to this effort is the need to ensure that assertions are grounded in the data. For example, in the preceding section I began to describe how themes were derived by converging sources of data or participant perspectives. Triangulating sources of data or perspectives from participants contributes to the validity of qualitative studies (Creswell & Creswell, 2018). In Chapter 4 more detailed evidence will be provided to demonstrate how themes were derived from corresponding codes (see Tables 5 and 7). This form of code mapping also enhances the trustworthiness of qualitative data analysis (Saldaña, 2016).

The teacher educator conversations and the teacher candidate reflections were important to ensure a multiplicity of perspectives for data collection and data analysis (Bogdan & Biklen, 2007). Engaging with these multiple perspectives also helped me to examine my own practice as a teacher educator. Hamilton et al. (2020) argue that trustworthiness in self-study of teacher education practice requires a willingness on the part of the researcher to be positioned as a learner rather than the traditional position of
researcher as authority. Towards that end, my research journal was a crucible for reflection to think about past decisions and preferences in light of new perspectives that emerged in conversation with critical friends or upon examination of teacher candidate reflections. Examples of such moments are provided in Chapter 4 and serve as an illustration of my commitment to position myself as a learner. This commitment is coupled with a humble acknowledgement that the product of this self-study is a living educational theory. Therefore, invitation replaces generalization, and the reader is invited to examine the findings of this study in the light of their experiences and judge whether it is informative and useful in their setting (Vanassche & Kelchtermans, 2015).

**Ethical Considerations**

This study followed the ethical guidelines established by the Brock University Research Ethics Review Board (file # 19-151). The teacher educators who participated in this study were invited to participate in one-on-one conversations with me. They were fully informed of the purpose of the study and the extent of their participation, and they were encouraged to participate only if they wished to do so. They were informed that they had the right to withdraw from the study at any time without penalty or refrain from answering any questions they may have felt uncomfortable to answer. The teacher educators were asked if I could record the conversation with an audio recorder. I only recorded with their permission. The teacher educators were assured that anonymity would be protected in any publications pertaining to the study. Specifically, pseudonyms were used in this report, and no information that could potentially identify them or their school was included.

After receiving permission from CCRTC, I provided a copy of the approved ethical review by the Brock University Research Ethics Review Board (file # 19-151), in
keeping with CCRTC’s protocol for research. The teacher candidates from CCRTC were invited to participate with a letter of invitation outlining the purpose, duration, and anticipated benefit of the study. The letter of invitation and informed consent forms were given to the teacher candidates by a neutral third person. Their responses were collected in a sealed envelope and held by that person for the semester. The teacher candidates were assured that anonymity would be protected in any publications pertaining to the study. Specifically, pseudonyms were used in this report, and no information that could potentially identify them was included. Once I had submitted all final grades, I was able to open the envelope and proceed with data analysis.

Chapter Summary

This chapter outlined the research methods employed to address the overarching research question: What can authenticity reveal about teaching and learning in teacher education? Conversations with three experienced teacher educators resulted in nine conversation transcripts and follow-up emails. The reflections of eight teacher candidates in a science curriculum and instruction course I was teaching resulted in 64 exit cards and 80 journal reflections. This chapter described the steps taken to analyze the transcripts and reflections. Chapter 4 presents the findings of this analysis organized into two sections. The first section, Learning to Be Teachers, presents the five themes that were discerned from an analysis of the teacher candidates’ reflections. The second section, Learning to Be Teacher Educators, presents four themes that were generated from an analysis of the teacher educator conversations.
CHAPTER FOUR: RESULTS

The purpose of this study was to explore the significance and potential of \textit{authenticity} in teacher education. The overarching research question was: What can authenticity reveal about teaching and learning in teacher education? To address the overarching research question, a qualitative research approach was selected employing methods associated with self-study of teacher education practice. This chapter presents the analysis of the findings organized into two sections. The first section (Learning to Be Teachers) presents five themes that were discerned from an analysis of teacher candidates’ reflections: (a) learning with authenticity, (b) reflecting about being a teacher, (c) concern for future students, (d) perspective on science and technology, and (e) contemplating the teaching/learning activity. The second section of this chapter (Learning to Be Teacher Educators) presents four themes that were generated from an analysis of the teacher educator conversations: (a) engaging with authenticity, (b) becoming a teacher educator, (c) being a teacher educator, and (d) learning from lived experiences.

As both the researcher and the researched, this chapter also presents evidence of my personal reflective dialectic as I engaged with the findings and examined my practice so that I might improve the learning experiences of my teacher candidates.

Learning to Be Teachers

In this section, findings are presented from an analysis of the teacher candidates’ reflections. As described in Chapter 3, this involved both in-source and cross-source analyses. These findings begin to address two of the three empirical research questions: How can authenticity be translated into praxis in teacher education? What are the benefits and challenges of an intentional focus on authenticity in a science curriculum and instruction course for elementary teacher candidates? After providing a brief description
of the context, the remainder of the section will present the five themes that were discerned from this analysis.

**Establishing the Context**

The teacher candidates in my science curriculum and instruction course (DT 410) were introduced to authenticity as a concept in several ways. The first 3 weeks of classes were organized around three elements of authentic learning inferred from Starratt’s (2012) description of inauthentic learning: (a) the subject, (b) the learner, and (c) the learning activity. We focused on science and technology education during the first week, considering the nature of science and technology while also examining the goals and expectations of the Ontario science and technology curriculum for Grades 1 to 8. During the second week of classes we spent time considering the learner in the context of science and technology education. In addition to reviewing and applying aspects of learning theories, we also gave attention to the concept of scientific literacy. In the third week, the teacher candidates learned about science inquiry methods and gave focused attention to one of the goals of science and technology education, relating science and technology to society and the environment.

To help prepare teacher candidates for their winter practicum, the lessons in weeks 4 and 5 were crafted around planning a science and technology lesson. I adapted one of Brook’s (2009) five ideas of working with authenticity in teacher education by inviting teacher candidates to reflect about and discuss planning with authenticity in mind. Thus, in the first half of the course, the concept of authenticity was intentionally considered in several lessons. After practicum we shifted to student led presentations and the concept of authenticity was not intentionally addressed in these lessons. Nevertheless,
teacher candidates continued to work with the concept in the responses they wrote in their notebook reflections and exit cards.

In the remainder of this section, findings are presented from an analysis of the teacher candidates’ reflections recorded in their notebook reflections and exit cards. The following sub-sections correspond to the five themes that were discerned (see Table 5). The first theme captures the ideas that emerged as teacher candidates interacted with the concept of authenticity through their learning experiences in DT 410.

**Teacher Candidates Learning With Authenticity**

The first class of any new term is always characterized by introductions. In our small teacher college setting the teacher candidates and I did not need to be introduced but they did need to be introduced to the course outcomes and expectations. In light of the focus on authenticity, I drew their attention to the following learning outcome in their course syllabus: “By the end of the course, students should be able to use the notion of **authenticity** to reflect on becoming a teacher who teaches science and technology” (see Appendix A; emphasis in original). This subsection examines three aspects of the theme “teacher candidates learning with authenticity”: (a) personal conceptions of authenticity, (b) authentic learning, and (c) benefits and challenges of learning with authenticity.

**Personal Conceptions of Authenticity**

Not wanting to impose my definition of authenticity on the teacher candidates, I presented a broad overview of the purpose of my research which they had been invited to participate in (see Chapter 3). At the end of the first class I asked the teacher candidates to respond to an exit card with a question prompt: “What is authenticity?” Their responses (see Table 6) demonstrated that each teacher candidate had their own preconceptions of authenticity.
### Table 5

**Teacher Candidate Reflections: Codes, Themes, and Meanings**

<table>
<thead>
<tr>
<th>Theme</th>
<th>Codes</th>
<th>Meaning of theme</th>
</tr>
</thead>
</table>
| Teacher candidates learning with authenticity | EC: authentic learning; true to reality, true to self; a way of being  
NR: authentic learning; authentic teaching | Evidence that teacher candidates were working with the concept of authenticity                                                                   |
| Teacher candidates reflecting about being a teacher | EC: authentic teacher revealed  
NR: teacher attitude; teacher effort; purposeful planning | Indicators that teacher candidates were reflecting on their teacher identity.                                                                   |
| Teacher candidates’ concern for their future students | EC: being, becoming, belonging  
NR: whole child; student attitude; self; mandate; child of God; prior knowledge | Teacher candidates being mindful of the student as a person.                                                                                     |
| Teacher candidates’ perspectives on science and technology | EC: scientists (lab coats)  
NR: science is; scientific literacy; wonder; abstract; relevant; potential | Perspectives on science as a school subject.                                                                                                     |
| Teacher candidates contemplating the teaching/learning activity | EC: what, how, who, why; careful instruction  
NR: going deeper; pedagogy; wonder (awe, curiosity); learning mix; learning goal; choice | Envisioning how learning will take place.                                                                                                          |

*Note. EC: codes from exit cards; NR: codes from notebook reflections.*
<table>
<thead>
<tr>
<th>Response to: What is authenticity?</th>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Real</td>
<td>100</td>
</tr>
<tr>
<td>True</td>
<td>71</td>
</tr>
<tr>
<td>Genuine</td>
<td>28</td>
</tr>
<tr>
<td>Original</td>
<td>28</td>
</tr>
<tr>
<td>Honest</td>
<td>14</td>
</tr>
</tbody>
</table>

*Note.* Seven exit cards were collected.
As one teacher candidate stated, “authenticity is the real truth that (continues to grow) surrounds an individual, to which they must respond based on values and conscience” (Anonymous, Exit card #1, 2020-01-06). These personal conceptions of authenticity were evident again three weeks later in responses to the following exit card prompt: “Do you think authenticity might be a value that could guide scientists? Why or why not?” All of the responses were in the affirmative, but it was noteworthy that their justification included familiar words: real, reliable, truthful, trustworthy, and original. These early indicators provided evidence that teacher candidates were applying their own personal definition of authenticity as they were learning about teaching science and technology.

**Authentic Learning**

Another way of applying authenticity to teaching and learning is through the notion of authentic learning. To develop this idea I first introduced teacher candidates to Starratt’s (2012) argument that inauthentic learning occurs when students “can find neither themselves, nor the authentic subject being studied, nor the integrity of the learning activity itself, in what they are made to do in school” (p. 97). When prompted the teacher candidates recounted inauthentic learning experiences in science and technology, including heavy reliance on textbooks, worksheets, and not actually doing science (Research journal, 2020-01-06). This discussion became a launch point for the following working definition of authentic learning; authentic learning occurs when students are able to:

1. Discover more about the authentic subject;

2. Experience the integrity of the learning activity;

3. Find out more about themselves (i.e., meaning and purpose) in what they do at school.
As a class we interacted with these three elements of authentic learning as big ideas throughout the first 3 weeks of DT 410.

Authentic learning resonated with the teacher candidates and they referred to the expression naturally in their reflections. For example, following those initial weeks, the teacher candidates were prompted to write a notebook reflection on their learning experiences in DT 410 in view of our working definition of authentic learning. While some teacher candidates framed their reflection using the three parts of the definition above, others, like Julia, equated authentic learning with “preparing students for the real world” (Notebook reflection, 2020-01-29). Similarly, Sandra provided direct feedback to me stating: “It is harder to learn about science authentically through these lectures” and Jennifer added that she “hoped there would be more authentic learning activities” (Notebook reflections, 2020-01-29). My feedback to Sandra captured an aspect of the dissonance I have teaching this course: “Touché. I agree, yet I wonder how to convey some of the underlying principles of the first term in a other-than-lecture kind of way. Ideas?” A consideration of authentic learning not only helped these teacher candidates to think in new ways about their plans to teach science and technology, it also became a way in which they could examine their own learning experiences.

At other times throughout the course, teacher candidates wrote about authentic learning even though they were not asked to explicitly reflect upon it. For example, in a lesson prior to their winter practicum, the teacher candidates were prompted to imagine their associate teacher informing them that they were responsible for a unit in science and technology. We brainstormed a list of things they would need to plan for. The list the teacher candidates generated (see Figure 3) included: textbooks, resources, learning objectives, student needs, and learning activities.
Figure 3

Ideas for Planning a Science and Technology Unit

- cross-curricular connections
- overall objectives (big ideas, Christian perspective
- textbook
- specific daily focus
- learning goals
- assessment (summative, formative)
- student needs (accommodation, modifications)
- govt. curriculum
- exp.
- how many classes? length?
- prior learning
- - materials
- - field trips
A little reflection led us to concur with Brook (2009) that most of the ideas were about planning to teach content. Brook develops the theme of planning for authenticity and asks the question: “Can we plan so that outcomes and content are central without being essential?” (p. 54). We then revisited the planning scenario above but this time asked: “What is essential?” The teacher candidate responses (see Figure 4) reached a deeper level as they gave expression to ideas including: worldview, educating the whole child, and developing critical thinkers. In a subsequent notebook reflection, the teacher candidates were prompted to return to Brook’s idea of planning for authenticity in light of planning for science and technology class. In the resulting reflections, a number of the teacher candidates wrote about planning for authentic learning. The following excerpts by Rachel and Julia illustrate teacher candidates who applied authentic learning beyond science and technology:

I think that planning to do group activities that allow students to collaborate can be an effective way of planning for authentic learning. (Rachel, Notebook reflection #3, 2020-02-03)

When we speak about authentic learning, it doesn’t only have to be in science and technology, in fact, authentic learning should happen throughout each and every day, in every subject. (Julia, Notebook reflection #3, 2020-02-03)

As the term progressed, authentic learning continued to appear as a construct that the teacher candidates used to express their understanding of authenticity in relation to teaching and learning science and technology. Analysis of these reflections revealed at least three ideas that were discussed in relation to authentic learning: (a) learning about self, (b) choice, and (c) wonder.
Figure 4

What Is Essential When Planning a Science and Technology Unit?
The first idea associated with authentic learning is the way in which authentic learning in science and technology helps students to find more about themselves. The following statements by Amelia and Phoebe exemplify the association:

Authentic learning reaches beyond head knowledge and seeks to help the child learn more about themselves and the world around them. (Amelia, Notebook reflection #2, 2020-01-29)

I want authentic learning to take place in my classroom and I want students to find out more about themselves and their creator through daily lessons. (Phoebe, Notebook reflection #2, 2020-01-29)

Authentic learning occurs when students are able to find more about themselves. This was the third element of the working definition of authentic learning introduced to the teacher candidates in the first class. This element of authentic learning resonated with the teacher candidates.

The second idea associated with authentic learning was choice. On her practicum, Amelia’s associate teacher liked to give her students choice when it came to assessment tasks. Amelia affirmed this approach saying, “I would agree with this approach and I think it is also an important aspect of authentic learning” (Notebook reflection #5, practicum). Similarly, Jennifer observed a learning activity on practicum where students could choose to research a natural disaster they were interested in. Jennifer characterized these learning activities as authentic because they were “meaningful to the individual learner” (Notebook reflection #5, practicum). In a previous reflection about planning Jennifer had also wondered, “Could it be possible that authenticity relates to choice?” (Notebook reflection #3, 2020-02-03). Amelia captured the impact of providing choice to
students when she reflected: “Authentic learning ultimately shows the child that you care about them and their learning” (Notebook reflection #5, practicum).

The third idea teacher candidates associated with authentic learning was wonder. Sandra made this connection in her first reflection when she associated authentic learning in the science classroom with the social nature of the science community. She observed, “I think it’s also important that we make these lessons social lessons where the students can talk to each other and wonder about the subjects they are learning” (Notebook reflection #1, 2020-01-15). While on practicum, Johanna observed students designing, building, and testing balloon-powered cars. In addition to “learning about themselves and their strengths and weaknesses” Johanna concluded that, “Authentic learning activities like this one help science come to life for students by giving them the chance to wonder and discover the world of nature” (Notebook reflection #4, practicum). Jennifer took a particular interest in wonder as a means to approach teaching and learning science:

If you are discovering the subject through wondering, the student learns more about themselves and the Creator. Because of the increase in interest due to wonder then the learning activity also becomes meaningful. One teacher said she often uses sentences like “I wonder…” and has her students do the same. Another teacher focused on ensuring you grab onto student interest as this brings the authenticity into the subject. (Notebook reflection #5, practicum)

Upon close examination of this excerpt from Jennifer’s reflection it is evident that she is working with wonder and the concept of authentic learning, giving attention to the learner, the learning activity and the subject.
Benefits and Challenges of Learning With Authenticity

The final exit card and to some extent the culminating notebook reflection prompted the teacher candidates to reflect on the benefits and challenges of working with authenticity in this course. This specifically addressed the third research question which was framed as a final exit card prompt:

Looking back at our time together (… while looking ahead to teaching) in what ways has our interaction with authenticity been a blessing? In what ways might it have been inauthentic? (Exit card #8, 2020-04-29)

The teacher candidates’ responses to this final prompt revealed the benefits of their interaction with authenticity and specifically with authentic learning. The following teacher candidates’ excerpts also illustrate that our consideration of authenticity helped us to remember that our students are people:

Most of us have some idea in the back of our mind that we want our students to learn in an authentic way but we don’t really know how to articulate it, but this course helped us a lot with that, especially by thinking about the three different areas of the subject, learner, and learning activity. (Johanna, Exit card #8, 2020-04-29)

Our learning activities need to be authentic because we remember the learner throughout the process and how we can help each student learn. It has a danger of becoming inauthentic when we continue to use the same strategies to teach our students year after year and we don't take into consideration that we have a new group of students with different struggles. (Rachel, Exit card #8, 2020-04-29)

Planning and teaching with authenticity in mind helps us to teach the whole child—head, heart, and hands. (Julia, Exit card #8, 2020-04-29).
Our teaching of science should be authentic and should reach the head, heart, and hands of the child. (Amelia, Notebook reflection #10, 2020-05-05)

As Jennifer observed, moving to online learning because of COVID-19 limited our authentic learning experiences (Exit card #8, 2020-04-29). This was certainly true but as I indicated above, creating opportunities for teacher candidates to experience doing science is also an area I need to work on. Aside from this comment, as I analyzed the final exit cards I made the following observation:

In summary, our interaction with authenticity in DT 410 has been a blessing as it has helped us to be mindful of our students as humans with meaning (children of God) and purpose (to serve Him). (Research journal, 2020-06-22)

In the following sections we will consider four remaining themes that were discerned from the teacher candidates’ data. The first of these themes points to how authenticity helped teacher candidates to reflect about being a teacher.

**Teacher Candidates Reflecting About Being a Teacher**

As part of the introduction to the first class of DT 410, one of my first PowerPoint slides is entitled, “Becoming a teacher who teaches science and technology.” Before introducing the course syllabus, the topics, and planned assessment tasks, I intentionally wanted to establish that the learning experiences in this course are more than hurdles that need to be jumped over. My encouragement to these teacher candidates, most of whom would be teaching in their own classroom later that year, was to think about themselves as teachers through the planned learning experiences of this course.

Before presenting evidence that the teacher candidates were reflecting about being a teacher, I wish to acknowledge that this was not an emphasis in my first years as a teacher educator. As a high school science teacher my focus had been on equipping my
students with the skills, knowledge, and attitudes articulated in the curriculum
expectations of the respective courses. Reflecting on the first time that I planned for DT 410, I noted that “one of my first discoveries as a novice teacher educator was that the curriculum was really up to me” and that “this new responsibility was a bit intimidating, especially since I had not taught elementary science” (Research journal, 2020-07-30). However, after 2 years of focusing on what that curriculum might look like, by my 3rd year as a teacher educator I recall a shift:

I was becoming more intentional about linking teaching and learning. In other words, I wanted my teacher candidates to think as much about student learning as they might think about themselves teaching. I also wanted the teacher candidates to appropriate their professional identity as an elementary teacher, to begin to be able to articulate their personal perspective on these matters. (Research journal, 2020-07-30).

This excerpt is an indicator of my own growth as a teacher educator, as I began to think more about who the teacher candidates are and who they are becoming.

The exit cards and notebook reflections revealed that the concept of authenticity served as a catalyst for the teacher candidates to reflect about being and becoming a teacher. As illustrated by Johanna and Elaine, a number of responses revealed that as teacher candidates thought about their students they also learned something about themselves as teachers:

Starting out with really thinking about the learner and how we could help each individual in our class to succeed in science helped to not only think about teaching science, but also about ourselves as future teachers. (Johanna, Notebook reflection #2, 2020-01-29)
We always need to be working towards teaching in an authentic manner so that students can reach their full potential as stewards of God’s creation. Being authentic includes: knowing who we are and why we need to act the way we do. (Elaine, Notebook reflection #3, 2020-02-03)

Similarly, Julia examined her learning experiences through the first few weeks of the course and acknowledged that, “This has been authentic at times. We have learned a great deal about our role as teachers and the meaning and purpose of teaching science; it reveals something about God and ourselves” (Notebook reflection #2, 2020-01-29).

Many of the reflections, like these, reflected the Christian worldview of the teacher candidates.

As teacher candidates considered the various strands of science and technology, and anticipated teaching it, their individual attitudes towards these subjects were revealed. Some of these attitudes were quite positive: “I am really looking forward to teaching the Space unit” (Rachel’s notebook reflection #6, 2020-03-30). Others expressed some hesitancy towards a topic: “Structures and mechanisms is not a strong point or area of interest” (Johanna, notebook reflection #9). In a similar manner at one point I shared the following:

Today I mentioned that my zeal for physics and related topics is not great, whereas my teacher-efficacy for teaching biology and chemistry is high. This likely has impacted some of the choices that I have made in science and technology methods, tending to focus more on the science than technology. (Research journal, 2020-04-23)

I invited the teacher candidates to examine their own lack of zeal for certain topics and
reflect on how they might respond in order to create the best learning experience possible for their students in science and technology. Amelia acknowledged that it is okay to be open with your students:

This shows that you are transparent, that you have gifts and interests and it creates a connection to students. You can be honest with students, like you were with us, and let them know that you don’t enjoy this area as much. There could be a student who really thrives in that area that could end up helping you a lot in teaching but also in raising class interest. That is what authentic learning looks like. (Exit card #7, 2020-04-23)

It is noteworthy that Amelia linked being transparent with your students to authentic learning. While acknowledging a lack of zeal for a particular topic is a good first step, it is not enough. As Phoebe warned, “authentic learning is hindered by a lack of passion” (Notebook reflection #2, 2020-01-29). A number of the teacher candidates demonstrated their commitment to their future students and the need for renewed effort in areas where their knowledge or interest is lacking.

**Teacher Candidates’ Concern for Their Future Students**

As indicated above, the idea that authentic learning enables elementary students to learn something about themselves resonated with teacher candidates. During the second week of the term I gave the teacher candidates a cut-out of a young boy or girl and asked them to imagine this was one of their future students. They were prompted to reflect on the following:

Learning in science with the learner in mind:

- Who is this person?
• What are their qualities?
• Describe their relations.
• Imagine their apprehensions.
• What do they like to do?

After they had some to write a response, the teacher candidates introduced their student to another teacher candidate, talking together about how knowing these things about their students would impact teaching science and technology. At the end of class the teacher candidates were prompted to reflect on how this activity impacted their thinking about teaching/learning science and technology. Rachel and Jennifer’s responses illustrate the concern they had for their future students:

This activity was important because teachers should take into account the different types of learners in the classroom. (Rachel, Exit card #3, 2020-01-15)

We need to care for the emotions, physical, social, and cognitive aspects of the child so that we can help them to grow in their understanding. (Jennifer, Exit card #3, 2020-01-15)

The teacher candidates also acknowledged that elementary students might prefer one topic in science more than another. Johanna connected this idea to teaching and learning saying, “so all of our teaching has to allow them to be themselves—including science” (Exit card #3, 2020-01-15). Jennifer concluded that students will experience more or less authentic learning depending on how they relate to the topic. She shared the story of Grade 8 students on practicum who told her that they took mechanical things apart just so they could put them back together again (Notebook reflection #9, 2020-04-29). These reflections demonstrate that the teacher candidates were being mindful of who their students were as people.
Following this activity, I developed the idea that authentic learning helps students to discover their own personal meaning and purpose as they, along with each of us, search for answers to two fundamental questions: Who am I? Why am I here? As the following examples by Phoebe and Rachel illustrate, teacher candidates recognized that what we do together in class will not only help students find out more about themselves, but students also begin to discover who they are becoming:

We can help students discover more about themselves and perhaps what career they want to pursue by deepening their knowledge and understanding in science and technology and helping them find what sparks their interest, what they are passionate about. (Phoebe, Notebook reflection #10, 2020-05-05)

Through science, students are able to learn about their Creator. They learn about their role in society and the environment as caretakers of creation. (Rachel, Notebook reflection #10, 2020-05-05)

While these examples demonstrate that the teacher candidates were mindful of who their students are becoming, Rachel’s reflection also alludes to a sense of belonging.

In addition to honouring who the child is and being mindful of who the child is becoming, the teacher candidates expressed the importance of belonging. Rachel’s comment above highlights that for elementary students, part of discovering who they are becoming is learning about the responsibilities they have in relation to others in society and in relation to the environment. Julia reflected on the importance of relationships following the imaginary student activity described above: “[The activity] also made me reflect upon the impact that relationships have—the classroom atmosphere has a large impact on learning” (Exit card #2, 2020-01-15). Rachel’s comment also draws attention
to an overarching relationship that each of the teacher candidates spoke about naturally in connection to teaching and learning—a relationship to God. Sandra captured the essence of this when she said, “Each child is also a child of God who must know their Creator and so your lessons should reflect back and always point to God” (Exit card #2, 2020-01-15). Coming from Christian homes and having had Christian education through their elementary and secondary schooling, it was not a surprise that these teacher candidates viewed their students as children of God. But their reflections also revealed that as teachers they wanted to ensure their lessons would not hinder their future students from knowing that they are children of God. Jennifer connected this larger vision of Christian education to authentic learning:

Authentic learning involves teaching with origin and purpose in mind. We have to think about the content we bring to the students within the big picture. Our covenant students need to be able to connect what they are learning to who they are as created in the image of God, and their place as mandated on this created earth. (Notebook reflection #10, 2020-05) 

This big picture objective not only draws attention to the relationships these students have but also points to the need to make use of the subject to achieve this objective.

**Teacher Candidates’ Perspectives on Science and Technology**

Authentic learning enables students to discover more about the authentic subject. On the basis of this assertion, it was important for the teacher candidates in DT 410 to articulate what they thought science was. A group brainstorming session produced the following working definition of science that we adopted as a class: Science is discovering and investigating God’s creation and how we can take care of it (Research journal, 2020-
As a follow up, the teacher candidates were invited to reflect on the impact this definition would have on how and why elementary students should learn science. As the following excerpts by Phoebe and Elaine demonstrate, one aspect of science the teacher candidates focused on was stewardship:

Teaching science and technology should not seem like a burden for us but as an opportunity. This opportunity allows us to teach our students about the tools they can use, the many resources God has granted to us and what we need to do with those God given gifts. (Phoebe, Notebook reflection #1, 2020-01-15)

I will teach students about our duty as Christians to take care of the world around us. Through everything I teach in science, I am confident that there will be many connections to our cultural mandate. (Elaine, Notebook reflection #1, 2020-01-15)

In addition to stewardship, another implication of the definition of science emerged. As the following reflections by Rachel and Julia illustrate, through science teachers and their students can praise God as the Creator:

We study science to learn more about the Creator, how he continues to uphold creation and our responsibility towards his creation. (Rachel, Notebook reflection #10, 2020-05-05)

Science is an important subject to teach, especially as future Reformed teachers. In this subject, we can create an atmosphere that inevitably stands in awe of God as our Creator. (Julia, Notebook reflection #10, 2020-05-05)

It became clear from these and other entries that the teacher candidates’ conception of science was informed by their Christian worldview. The teacher candidates also had good
intentions of consistently applying their perspective of science in their future elementary science and technology classroom.

To further expose the teacher candidates’ perspective of science, I invited them to answer two questions on an exit card: What does a scientist do? What qualities must a scientist possess? The responses made me think of a scientist who is interviewed on television and dons her crisp, white lab coat. Hence, I coded these responses as “scientist (lab coat).” In addition to being open-minded, a risk-taker, and persevering, the highest frequency qualities included being patient, detail oriented, and curious. It was noteworthy that no one listed “authentic” as a quality that a scientist should possess. Yet, in a subsequent lesson as we considered values associated with science and technology, I invited the teacher candidates to respond to the following exit card questions: Do you think authenticity might be a value that could guide scientists? Why or why not? The class was unanimous that in their own minds, authenticity should be a value that scientists possess. As the following response illustrates, a number of the teacher candidates linked authenticity to the other values we had discussed:

Authenticity has to do with the other six values.

- Truth – What you do in science should be true/authentic and not misleading.
- Skepticism – Asking questions makes sure that you are being authentic.
- Originality – Being authentic to yourself, not just following what others say or do. (Anonymous, Exit card #4, 2020-01-29)

Reflecting on authenticity as a value that could guide scientists, one teacher candidate drew an interesting parallel between being a teacher who is a Christian and being a scientist who is a Christian:

Yes, authenticity will guide scientists, especially if they value a Reformed
perspective as a truth. Like God’s word ‘lives’ in us, it is not difficult to make connections throughout teaching, this would be similar to a scientist in his work as well. (Anonymous, Exit card #4, 2020-01-29)

These thoughts expressed by the teacher candidates began to show that they were thinking about the subject of science, in this case qualities of scientists, and that their consideration of authenticity gave them an opportunity to make connections that maybe they had not thought of before.

When the teacher candidates were asked about what scientists do on the exit card discussed above, they identified processes inherent to science such as investigating, observing, and hypothesizing. Nevertheless, a different picture emerged in the final weeks of the course when teacher candidates were invited to reflect on what students can learn about science as we teach through the different strands. The reflections revealed the teacher candidates’ thoughts about the topics within each strand. These ranged from their own recollections as students to how they anticipated teaching the topic to their elementary students. However, I observed little evidence that teacher candidates were thinking about science as a whole. This observation was captured in the following reflection:

It seems that when we get talking about teaching and learning science we tend to describe what science reveals about creation or the Creator. That’s good. But what are we teaching our students about … science? (Research journal, 2020-04-16)

I communicated this same sentiment to teacher candidates in my feedback to some of their notebook reflections:

As you have said, the study of science reveals the glory of the Creator and His creation. But what does the study of Earth and space systems reveal about
“science” … and what does that reveal about God? (Notebook reflection #6, 2020-03-30)

What exactly are they learning about science (e.g., how to make good observations … as they study their habitats or animals or plants)? (Notebook reflection #7, 2020-04-06)

Although we had discussed the nature of science in class, just talking about the nature of science was not effective at communicating the essence of the subject of science. This revealed an aspect of the authentic subject that my teacher candidates had not appropriated through their learning experiences in DT 410.

**Teacher Candidates Contemplate Teaching/Learning Science and Technology**

From the first class we had together where we considered inauthentic learning experiences it was clear that the teacher candidates viewed textbook learning and lecture-style teaching as a less than desirable approach for science and technology lessons. In contrast, Julia and Johanna’s reflective comments illustrate that the teacher candidates were intent on harnessing students’ natural curiosity in science:

We know that we can’t make students wonder about what the next page in a textbook is going to teach us, so let’s throw the textbook away and take the students outside. (Julia, Notebook reflection #4, 2020-03-03)

Since science is about exploring the wonders of the creation, this is best done by actually exploring the wonders of creation, not by reading a textbook to learn how someone else explored the wonders of creation. (Johanna, Notebook reflection #10, 2020-05-05)
It also became clear that as the teacher candidates thought about the abilities of their students they recognized the need for a balanced pedagogical approach to science education:

Science instruction is going to need to be differentiated just like any other subject. While science is a more discovery-based subject that involves experiments and tactile learning, we must also remember that some direct instruction will also need to be included in the teaching of the subject. Our students are all going to be different from each other and they will all learn in different ways. (Amelia, Notebook reflection #1, 2020-01-15)

Direct instruction and inquiry-based learning can both involve authenticity when we remember it is focused on the individual and those around” (Jennifer, Notebook reflection #3, 2020-02-03)

These findings suggest that the pedagogical choices that these teacher candidates would make depended upon both the nature of the subject and upon the nature of the learner. As the teacher candidates thought about the teaching/learning activity in science and technology, they expressed an overarching commitment to creating meaningful learning experiences. As the following reflections by Johanna and Sandra demonstrate, the teacher candidates acknowledged that creating meaningful learning experiences requires purposeful planning:

If we want our students to discover more about the authentic subject or to find more about their meaning and purpose through what they are doing, then that needs to be our goal right from the beginning. (Johanna, Notebook reflection #3, 2020-02-03)
It’s easy to get caught in the hurried pace of teaching within the school settings but I think it’s important for teachers to realize they need to slow down and ensure there is authenticity in their student’s learning. (Sandra, Notebook reflection #3, 2020-02-03)

It is noteworthy that in both of these examples the teacher candidates engaged the concept of authenticity in their reflection. What does authenticity in our students’ learning look like? Sandra suggested that we achieve this by “teaching for conceptual understanding. Students need to know more than the shallow facts. They need to dig deeper into the ‘why’ questions which leads to more/better understanding” (Notebook reflection #3, 2020-02-03). This idea of going deeper was often associated with the notion of wonder as Julia and Sandra’s examples illustrate:

Asking thought-provoking questions during an activity will cause the students to wonder and encourage deeper thinking! (Julia, Notebook reflection #10, 2020-05-05)

By creating a sense of wonder about space our students can dig deeper to find out more and so give honour and praise to the Lord. (Sandra, Notebook reflection #10, 2020-05-05)

The common element in all these examples is the role of the teacher in creating meaningful learning experiences in science by leading, creating, and inspiring.

The learning-at-home experience that was suddenly forced upon us by COVID-19 created a unique learning opportunity for our class. I challenged the teacher candidates to imagine that they were teaching when this occurred. How could they use COVID-19 as a current and relevant learning opportunity in science and technology? The following
teacher candidate excerpts exemplify the prevalent concern for the emotional and mental well-being of their students, especially during the COVID-19 pandemic:

With all the uncertainty in the world, it might be reassuring for students to learn about the virus and how it works so that there is at least one thing about the whole situation that [students] do understand. It definitely would give them a new appreciation for how important scientists are in this which is part of discovering more about the authentic subject of Science. (Johanna, Exit card #6, 2020-04-16)

I think this topic would definitely be authentic because it would also reach the hearts of students because it is relevant for them. (Amelia, Exit card #6, 2020-04-16)

You could have the students think about the effect of media on the people who watch and which articles are trustworthy. (Rachel, Exit card #6, 2020-04-16)

Learning-at-home themselves as students, the teacher candidates also stressed the need for flexibility, the importance of keeping learning fun, and recognizing the limitations that learning at home may have.

Summary of Findings

The first section of this chapter presented the findings derived from an analysis of exit cards and notebook reflections written by eight teacher candidates throughout an elementary science curriculum and instruction course that I taught. The findings in this section relate to two of the three empirical research questions: How can authenticity be translated into praxis in teacher education? What are the benefits and challenges of an intentional focus on authenticity in a science curriculum and instruction course for
elementary teacher candidates? Authenticity was presented as a concept that could help teacher candidates reflect on becoming an elementary teacher who is responsible for teaching science and technology. The findings demonstrated that the teacher candidates related to the notion of authentic learning. The five themes that were generated from an analysis of the exit cards and notebook reflections revealed how authenticity helped the teacher candidates to reflect on a number of aspects of being a teacher who teaches science and technology. The intentional focus on authenticity in this course also challenged me to examine my own practice as a teacher educator and the findings revealed areas that I will need to address. In the next section of this chapter, findings relevant to the teacher educators will be presented.

**Learning to Be Teacher Educators**

The conversations I had with three experienced teacher educators were facilitated by the concept of authenticity and framed around the empirical research questions. The empirical question most significantly addressed in this section is: How can authenticity illuminate being and becoming a teacher educator? The collegial nature of the ensuing discussions demonstrated the commitment these teacher educators had to teacher education in general and to my growth as a teacher educator in particular. The conversations occurred over a 6-month period which encompassed the same period that I was teaching the science curriculum and instruction course. The following subsections correspond to the four themes that emerged from an analysis of the conversation transcripts (see Table 7). The first theme to be explored involves the ideas relative to authenticity that were generated in conversation with the teacher educators.
Table 7

*Teacher Educator Conversations: Codes, Themes, and Meanings*

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<tr>
<th>Theme</th>
<th>Codes</th>
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<td>Teacher educators ponder authenticity in light of becoming and being a teacher educator.</td>
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<td>becoming a teacher educator;</td>
<td>Reflecting on becoming a teacher educator while helping others become teachers.</td>
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<td>Being a teacher educator</td>
<td>instructor’s role;</td>
<td>Reflections on being a teacher educator who helps others become teachers.</td>
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Teacher Educators Engaging With Authenticity

As with the teacher candidates, each of the teacher educators engaged in their respective conversations with their own conception of authenticity. Even though I had a working definition of authenticity from my past and present research experiences—*authenticity is the quality of knowing who you are and being true to that person*—I thought it would be important for the teacher educators to have the freedom to wrestle with this concept in their own way. Even so, authenticity was often associated with the humanity of the person under consideration, whether that person was a student, teacher candidate, or teacher educator. For example, Erin remarked:

> The term authenticity is new but in my own practice authenticity has always been there. I’ve always seen myself as an educator of the person; whether that was children in Grade 1 or teacher candidates at our college. The fact that I always thought holistically about teaching the person helped me to think about what does that then look like. (Conversation #1, 2020-01-24).

Likewise, arguing from the perspective that teachers and students are all “sojourners” where the teacher can be taught a lot by their students, Reilly commented:

> That’s another aspect of authenticity I really believe is to get to know the students’ names and a few things about them, just as I would as an elementary or high school teacher, modelling good practice; but it’s not just modelling good practice, it’s my deep-seated belief in the humanity of what teaching is all about, it’s a very relational vocation. (Conversation #1, 2020-02-13)

Reflecting together on critical incidents in our lives that can either “alter your trajectory or send you into a cycle of bitterness, anger, and ongoing disappointment” Reilly
concluded, “I don’t think we would be human, thinking about authenticity, I don’t think we would be human if we did not experience that and also say, ‘Okay, how do I reposition this? Where do we go from here?’” (Conversation #1, 2020-02-13).

Reilly and Erin’s comments also allude to the need for self-examination as teacher educators in order to remain authentic. In the same conversation with Reilly, as we talked about competing responsibilities, Reilly acknowledged:

But isn’t that an aspect of authenticity in itself, the idea that, when I think about authenticity it means to me that you are making wise decisions and sometimes that means you sacrifice—my paper is not A quality, but it’s okay; or even my church community it’s okay, if there is a crisis I will be there, that will get my full attention; I have wrestled with being okay with okay. (Conversation #1, 2020-02-13)

In a similar manner, Jordan shared with me that through self-examination, the decision to retire became clear:

Let me put it this way in the context of your thesis—I knew that to be/remain authentic I would have to revise my courses. I was beginning to be a bit bored of my courses and if I’m bored I can’t expect my teacher candidates to not be bored. I had learned from years of learning/teaching, I knew that a teacher has to be passionate about what they are teaching, even if pedagogically they aren’t the best skilled educator, if they have a passion for what they are teaching that passion will become visible to their students. (Conversations #1, 2020-01-24)

Although authenticity evoked different conceptual understandings for every person, it was a concept that the teacher educators could relate to and apply to their own development as a teacher educator.
It was interesting to observe that the teacher educators, including myself, created a mental picture of authenticity in order to work with the concept. For example, in our last conversation, Reilly reflected on our previous conversations and observed, “authenticity is a simple word but has so many aspects and complexities; it really gives us a hinge to have these conversations about” (Conversation #3, 2020-06-22). During our first conversation, as we talked about the person of the teacher candidate who is becoming a teacher, Erin introduced the idea of a Möbius strip. In a follow-up correspondence to our first conversation, Erin clarified that “in our conversation I intended to use it more as an illustration of how the Möbius strip itself IS authenticity: The deepening awareness of the inseparable facets of person/teacher” (Email 2020-03-04, emphasis in original). During my conversations with each of the teacher educators, I introduced my own mental image of authenticity using a mathematical representation. An excerpt from my third conversation with Jordan can illustrate:

I’ve described it to others, this notion of authenticity, as kind of like an asymptote on a graph—you are always approaching but never quite getting there. You might have different circumstances in life that draw you closer to that authenticity and different circumstances that push you away from that authenticity. (Conversation #3, 2020-06-26)

I shared this mental image after Jordan had observed that the challenge to be authentic working in a Christian institution was different than when working in a secular institution. After sharing the image of an asymptote in another conversation, Reilly provoked me with the following question: “Thinking about that line of approaching authenticity, did you see yourself as closer to that line of authenticity or further away from that line of authenticity, when you first started teaching?” (Conversation #3, 2020-
Acknowledging that my first year teaching chemistry in secondary school was modelled after my secondary school chemistry teacher, I responded: “I think I was still approaching authenticity because I was still trying to decide who I was as a teacher.” But I also acknowledged that as a first-year teacher educator:

… suddenly you have a blip in that curve and you are further away from that authenticity piece again, because you just can’t be authentic because you’re up to here trying to understand what the curriculum is and how the curriculum has to be taught.

In a similar conversation about becoming a teacher, Erin made the distinction that in time, “you deal with the subject in an authentic manner and you deal with your students authentically … when the two merge, that to me is where a model of authenticity can be fostered to the fullest in a sense” (Conversation #2, 2020-04-16). At this point I observed that this sounded like degrees or levels of authenticity and made the connection to the asymptote imagery.

In addition to the mental imagery of authenticity as a hinge, a Möbius strip, or an asymptote, we also used Kreber’s (2013) conceptual language of “authenticity in” and “authenticity through.” These expressions were embedded in the title of this study which the teacher educators would have read in the letters of invitation and informed consent: “Authenticity in and through teacher education.” That was certainly evident in my first conversation with Jordan who remarked immediately about the title and then part way through the conversation demonstrated that these expressions were shaping initial thoughts:

Okay, so authenticity in and authenticity through—is the difference that authenticity in is where the teacher educator is authentic as they deliver and teach people, and adjusts their own life so they would be authentic in what they are
doing with their teacher candidates; whereas, authenticity through is looking at 
the process through the teacher educator, the teacher candidates, I suppose 
through to their students? (Conversation #1, 2020-01-31)

I affirmed that this was a fair representation of these expressions which I had adapted 
from Kreber. However, I also explained to Jordan that there was a second viable 
interpretation of “authenticity through” when applied to the teacher educator: “As I teach 
as a teacher educator I think I become more authentic as a teacher educator—there is a 
being a teacher educator and still a becoming.” To illustrate this transformation I 
described an observable shift in emphasis that I had detected in myself over the past 5 
years. In my first year, I focused quite a bit on what I had to teach, which could be 
attributed in part to my time as a high school teacher. However, as I explained to Jordan, 
I feel that thinking about authenticity has helped me to focus a bit less on “What do I 
have to teach?” and more on “Who am I teaching?” This transformation is also something 
I strive to encourage teacher candidates to think about with their students.

I was reminded of this in the first conversation with Reilly when we discussed the 
sojourner metaphor as a description for our temporary yet dynamic relationship with our 
students. The following excerpt from that conversation illustrates the connection I was 
making:

    To apply this to teacher education, that’s sort of where I was coming from when I 
was playing around with the theme—authenticity in and through teacher 
education; two perspectives: 1) as teacher educator, how am I finding my 
authenticity through this experience but 2) how am I helping my teacher 
candidates find their authenticity. As teacher candidates and as humans they have
been students for 12 years and now they need to switch that over and think of themselves as teachers; and then take that with them, to see their children in their classrooms and chairs, not simply as students, but as little ones (humans), that are on their way through the drive-thru of education. (Conversation #1, 2020-02-13)

The use of “authenticity in” and “authenticity through” provided the conceptual language to describe the transformations that takes place through teacher education.

No matter how we conceptualized it, authenticity proved to be a catalyst for rich conversations about being and becoming a teacher educator. Not surprisingly, each teacher educator had their own lived experiences and therefore approached these conversations with a unique perspective. For example, the invitation for our second conversation included a summary of the ways I had intentionally worked with authenticity in DT 410. The summary included a reference to an article by Brook (2009). I was pleasantly surprised that Jordan came prepared to talk about the ideas Brook developed to apply elements of authenticity to the practice of teaching. I had expressed in my letter of invitation that I struggled to translate the conceptual knowledge associated with authenticity into practice. Jordan tackled this problem head-on:

I don’t necessarily agree with everything Brook said that Heidegger said but I was always keeping in mind science methods as I went through it. I’ve been doing that for the past 10 years. How would this apply to what I’ve been doing? Was I an authentic teacher? Was I training my teacher candidates to be authentic? Were we making this subject authentic? Like Brook said at one place, science is too objective, it’s not authentic—Is that true? How can I make the content area authentic? How can I encourage the teachers to be authentic? How can they teach
for their students to be authentic? And how can I be authentic? (Conversation #2, 2020-03-27)

Jordan encouraged me to take something that can be abstract, like authenticity, and ask myself: “What are you specifically going to put into your lesson plan, unit plan to do that, show that, to foster that authenticity on being human?” (Conversation #2, 2020-03-27).

In a similar manner, Erin observed that “authenticity should never remain a theoretical, abstract concept … it needs to be fostered” (Conversation #1, 2020-01-24). Reflecting on becoming a teacher educator, Erin continued: “It’s a pretty unique job because you want to push them to think about being a teacher while you have to think about being a teacher of teachers as you develop; you can’t give a blueprint for authenticity.” Although a concept like authenticity can be abstract it can also serve as a powerful tool. Describing authenticity as a “hinge to have these conversations about” Reilly noted that the “many layers of complexity” of this word was helpful for these conversations “as opposed to a kind of unstructured, unfiltered conversation which I think could be valuable to some degrees, but I could see it become more about problem solving if that was the way it was” (Conversation #3, 2020-06-22). Moreover, Reilly expanded upon the potential of authenticity with the following reflection:

So, again to bring it back to that idea of authenticity and thinking about your dissertation and the relevance of your dissertation beyond, you know, your immediate context or my immediate context, I think there is a good argument to be made or at least a case to be made that it’s a concept that can move across faith, language, culture. By that I think it has power from a faith lens but also from a—call it a professional lens, not particularly from a faith worldview or
Christian worldview perspective. So I think that speaks something to the power of the concept of authenticity as well. Again, I am just raising that because I think your dissertation will obviously be applicable to teacher educators within faith-based organizations but I think you could make, as I just said, that it goes far beyond that. (Conversation #3, 2020-06-22)

As a Christian working at a public university, Reilly’s testimony was encouraging as it provided support for the broad potential of authenticity for teacher education.

**Becoming a Teacher Educator**

The notion of *becoming* is a conceptual element associated with authenticity (Brook, 2009). With that in mind, it was not surprising that as we spoke together about our respective journeys, we reflected on becoming teacher educators who help others to become teachers. Each of the teacher educators in this study demonstrated unique characteristics as they recounted the experiences that led them to this vocation. For example, Erin observed that whether it was a child in Grade 1 or a teacher candidate at the college, “the people component always intrigued me; who are they really?” (Conversation #1, 2020-01-24). Of the teacher candidates that passed through the doors of the teachers college, Erin observed: “Some really develop that person of a teacher—if that makes any sense—for others it’s ‘Okay, I am ready to teach, I know my stuff.’ To me that authenticity part is very much a part of that” (Conversation #1, 2020-01-24). For Jordan, passion was a prerequisite quality for teachers, whether they were elementary teachers or teacher educators. Jordan’s diverse career in public education before becoming a teacher educator could be characterized by a passion for teaching science and
inspiring others to teach science. In a description of entrance interviews for the teacher education program, Jordan associated passion with authenticity:

I remember there was one girl, I think she was born to be a teacher. She talked about it enough that you knew it was authentic. She really loved to teach. She has been teaching for 10 years, she’s great—in some cases you can tell right away. But some of them, they were just in it for the job, for the money, they really didn’t have a passion for teaching. So that’s all about authenticity I think. Isn’t it? They say, “I want to be a teacher” but if their life has shown that they don’t want to teach then they are not authentic. Right? (Conversation #3, 2020-06-26)

Helping others to become teachers was also a motivating factor for Reilly. Looking back at events that preceded becoming a teacher educator, Reilly concluded:

So that’s the journey I went through to sort of realize that 1) I love teaching, and 2) I enjoy mentoring new teachers and seasoned veterans and then seeing the potential for being involved with that on a much more scalable level working in a Faculty of Education. (Conversation #1, 2020-02-13)

The unique qualities of the teacher educators illustrated above characterized all of their conversations. In the remainder of this subsection we will focus in on the distinctive qualities of each of these teacher educators as a means of analyzing my own becoming as a teacher educator.

Erin’s Interest in the Person of the Student

When Erin linked authenticity to the development of the person of the student, I felt compelled to reflect on my development as a teacher educator. I had been teaching in a high school for 16 years but now I was teaching students who would teach in
elementary schools. I observed to Erin that, “my stories didn’t align—for me that had been sort of a tension” (Conversation #1, 2020-01-24). With time and experience that particular tension eased but I also indicated to Erin that teaching a course for the first time in my 5th year at the college brought back “feelings of insecurity.” These experiences highlighted the challenge to be authentic when I was still discovering who I was as a teacher educator. Reflecting on the need to foster authenticity, Erin observed that “when you start it’s difficult to think about authenticity when you are so focused on content; you have not really thought about, ‘Who am I now as a teacher working with teacher candidates?’” (Conversation #1, 2020-01-24). Erin’s counsel drew a parallel to the development of teacher candidates and first year teacher educators: “When you start here, first you focus on the what, then the how, finally the why—the premise question.” In a subsequent conversation we would return to this theme—the what, the how, the why—recognizing that with experience a teacher educator will reach the “why” and yet every year again the teacher candidates are at the “what” and “how” stage. Erin cautioned that “there is a sort of discrepancy between where you are in your thinking as an instructor and where the students are with their perceptions as learners” (Conversation #2, 2020-03-26). We discussed the analogy of scaffolding to capture these stages of development as teachers and as teacher educators. For the teacher educator who has taught a course, like science methods, for many years, Erin suggested the need to return to the “what” and the “how” in a spiral kind of way:

You might think you know what, there might be different ways of fostering a love for teaching science in these students going forward; perhaps it’s worth exploring that. And then you find yourself back again, so if I am going to change it, then
what is the what, what is the how, and what is the why. You travel that same
(path) again. (Conversation #2, 2020-03-26)

For Erin, this approach to looking at an old course in new ways resonated with the notion
of reflective practice. I agreed and also saw a link to authenticity: “In order to pursue that
authenticity, (teacher educators) have to be thinking about the what, the how, and the
why in a spiral kind of way” (Conversation #2, 2020-03-26).

**Jordan’s Passion for Teaching Science**

The reflective practice of reviewing and revising familiar courses also
characterized Jordan’s 10 years as a teacher educator. For example, at various times
Jordan adapted science methods courses to reflect current emphases in STEM as well as
indigenous perspectives. However, when Jordan detected a waning passion to revise
these courses again, this became a signal for Jordan that it may be time to retire from this
vocation. Nevertheless, a continuing passion for teaching and learning science still
characterized our conversations. For example, I learned that technology was added to the
science curriculum in the 1980s. Referring to this as the “physification of the science
curriculum” Jordan explained that before this period, the elementary science curriculum
was “more oriented to biology, something elementary teachers may have been more
familiar with” (Conversation #1, 2020-01-30). As I reflected on this part of the
conversation I realized that I do not give enough attention to the technology component
of the science and technology curriculum. In a follow-up email to Jordan I attributed this
tendency to being more comfortable with chemistry and biology and less comfortable
teaching physics and its applications. I observed: “Perhaps a consideration of authenticity
in and through teacher education will help to expose tendencies where we might rest or
get too comfortable” (Email, 2020-02-21). Jordan picked up on this thread in the second
conversation and encouraged me to work with what I am passionate about:

Being authentic then, something you just said, the key ideas in the curriculum that you emphasize will not be the same as me, they are part of who you are and I don’t think that’s bad, I think that’s good because if those teacher candidates can see that you like this … that you get turned on about subjects like the cell [Grade 8] and habitats [Grade 4]. … I mean, they want to see that you’re excited and their students are going to want to see that they’re excited, no one is going to be excited about every part of science. (Conversation #2, 2020-03-27)

That last statement was not only a helpful consolation it also motivated me to invite future teacher candidates to consider what subjects in science they are passionate about.

At the conclusion of our third conversation Jordan made a connection to Schwab’s (1973) four commonplaces: (a) teacher, (b) student, (c) milieu, and (d) curriculum. Jordan suggested I consider how they might resonate with authenticity. For example, with respect to the curriculum Jordan asked rhetorically, “What’s your passion for science? If they don’t have any passion, why do they want to teach it [in high school]? You got to have a passion for something to want to share it. Right?” (Conversation #3, 2020-06-26).

My conversations with Jordan revealed that there are parallels between becoming a teacher educator and becoming a teacher. Both require passion—for students, for subject, for learning—but this requirement is tempered by a humble recognition that not every person—teacher and student alike—will be passionate to the same degree about every subject and learning experience.

**Reilly’s Commitment to Mentoring New Teachers**

Reflecting together on becoming teacher educators, Reilly and I shared stories of transformational moments and key individuals that influenced our respective vocational
journeys. In a follow-up email I summarized part of our first conversation as follows:

In some sense, becoming who we are today is a cumulative effect of factors in life including education, family, teaching experiences, upbringing, and so much more. We both could point to transformational moments, unplanned events that set us on a trajectory to where we are at this time. (Email, 2020-02-24)

One transformational moment that I could point to was an additional qualification course that I took (Special Education Part 1) where Reilly was the instructor. Although the course was close to 10 years ago, I remarked to Reilly that I came away from this course, “really appreciating the person of the student, with all of their struggles, needing so much extra care; but it is because they are people that they need extra care” (Conversation #1, 2020-02-13). This course motivated me to pursue a Master’s degree in education. As I described to Reilly, I thought I was on track to become the next principal of our school. This developed into the second transformational moment, an event that Reilly would label as a disorienting dilemma (Mezirow, 1998). The principal’s position was appointed to someone else and my authenticity as a person and as a teacher was shaken. In hindsight these transformational moments were necessary to set me on the path to becoming a teacher educator. As Reilly summarized: “It sounds like your journey, that you didn’t anticipate, has taken you to a good spot where you are able to have significant influence and impact on many teachers across a variety of contexts” (Conversation #1, 2020-02-13).

In addition to transformational moments, we also discussed the influence of mentors on becoming a teacher educator. I admitted that when I began teaching high school science I emulated my own high school chemistry teacher. Similarly, Reilly pointed to a charismatic and knowledgeable high school history teacher. However, this
discussion also led to the conclusion that we will never be these mentors. I coded this as “this is who I am not.” Reilly observed that with every career move came the issue of: “Who am I?” In time and with experience Reilly attested to being able to face this issue with a sense of confidence:

As I became more aware of who I am as a teacher I guess that confidence came with it; so, okay, I can do these things in relatively effective ways; then I became more true to who I am and not trying to replicate those mentor teachers who are phenomenal but I will never be them. (Conversation #3, 2020-06-22)

I responded to Reilly’s assertion by acknowledging that I need to remind myself that I cannot replicate those who I look up to because I am not who they are, and I have not lived their lives. Becoming a teacher educator is shaped by untold factors in life, including transformational moments and the self-imposed influence of mentors. Being true to who you are while knowing who you are not are evidence that becoming a teacher educator involves the pursuit of one’s own personal authenticity.

**Being a Teacher Educator**

In addition to the notion of becoming, a related conceptual element associated with authenticity is the notion of *being* (Kreber, 2013). As we engaged with authenticity throughout our conversations, there was a sense in which authenticity revealed the multifaceted and integrated nature of being a teacher educator. For example, Jordan spoke of integrating faith with an interest in physics and astronomy and then transferring that lifelong interest to teaching P/J and J/I elementary teacher candidates (Conversation #1, 2020-01-30). For Erin, consideration of authenticity and teacher education elicited a need to not only know the person of the student, but to know the stuff of teaching
including knowing “how to teach, how to assess, and how to know your students.” This led Erin to conclude:

I think as over the course of a teacher education program there is a deepening of each one of those elements and as each one of those elements deepens the connection between the person of the teacher and the profession of teaching start to blend more and more. (Conversation #1, 2020-01-24)

This idea of blending prompted me to recall my first encounter with authenticity during my Master of Education studies. Authenticity captured my interest as a Christian educator because “it aligns well with our philosophy of having a Reformed worldview that integrates into everything” (Conversation #1, 2020-01-24). This integrated nature of being a teacher led Erin to an intriguing corollary: “How would I define authenticity? I sort of have been wondering how the four elements of the Ontario College of Teachers’ standards of the teaching profession—care, respect, integrity, trust—how they fit into the model of authenticity?” (Conversation #1, 2020-01-24). In a follow-up email I asked for some clarity about this part of this discussion and Erin explained:

The ethical standards define elements of what it means to be a teacher in Ontario. The standards form the foundation of the teaching profession as well as serving as a compass for the teaching practice. Care, respect, trust, and integrity are those inseparable qualities that shape the person/teacher—in other words: An authentic Christian teacher will typically exhibit these four standards “naturally” as inseparable facets of being a person/teacher. (Email, 2020-03-04)

In the context of describing the “being” of teachers, Reilly also spoke about these four ethical standards for teaching and so I asked whether authenticity should be added to the
list; Reilly responded:

I see a lot of cross-over between authenticity and integrity. An authentic person has integrity. A person with integrity is authentic. An authentic task is one that is meaningful and relevant. I’m not sure that a task can have integrity but it can be integrated i.e., harmonious, aligned with purpose. The SOP have a lot of connectedness to each other but I certainly see a particular connection between authenticity and integrity. (Email, 2020-07-02)

In the context of these discussions about being a teacher educator, authenticity evoked a sense of drawing together separate elements, such as faith, ethical standards, worldview, and the purpose of teaching into an inseparable being who is a teacher.

With that in mind, the notion of being a teacher educator who is also a Christian led me to hypothesize that to be authentic a person’s Christian faith should be evident. Using the biblical analogy of a lit lamp being placed under a bushel (Matthew 5:14-15, NIV), I interacted with Reilly about the challenges of being a teacher educator who is a Christian teaching in a public university setting. The conversation began following Reilly’s remark that authenticity resonates very strongly with a Christian worldview (Conversation #3, 2020-06-22). When asked to elaborate on that thought Reilly described Christ as a model for establishing relationships with others and who always looked to the margins of society. Reilly reflected and related this back to authenticity:

I think this works very much with who I am as a teacher educator … when I think about what attracts me to leaders, whether those are leaders in our universities, our churches, our government, our businesses, I am attracted to those who reflect who Jesus was and who Jesus is and that idea of being who he claimed to be. (Conversation #3, 2020-06-22)
Later in this conversation I suggested that it might be easier for me to be authentic as a Christian working in a Christian education setting. However, Reilly interjected and cautioned that a setting like mine might provide some variables that could actually interfere with authenticity. Having worked in both contexts, Reilly testified:

One of the things that I have actually found freeing about being in a public institution is I am who I am not because of my name, not because of my church but because of my faith. This is who I am. (Conversation #3, 2020-06-22)

In a similar vein, Jordan and I also talked about being authentic as a teacher educator who is a Christian. Jordan attested to challenges in both systems: “I think the challenge of being authentic is greater in the secular system but I don’t think that it is an automatic given that in a Christian system you are actually going to be more authentic” (Conversation #3, 2020-06-26). On the one hand, Jordan described that a teacher who has an authentic relationship with God can experience a sense of freedom: “So you want to be a good teacher, not to promote yourself, but you want to be a good teacher because this is God’s truth, this is God’s world.” However, Jordan also suggested that a teacher who is a Christian in a public setting may need to limit the expression of their faith in view of their position of power in the classroom. Being mindful of the other would seem to suggest that being authentic as a teacher educator who is a Christian requires the need for discernment.

Like all teachers, teacher educators are faced with a familiar question: Do you teach students or do you teach the subject? This was a significant discussion point in my second conversation with Erin who defined the distinction as teaching a subject authentically and teaching the student authentically. For context, the discussion centred
on the instructor’s role to be authentic and thereby model authenticity. Erin asked rhetorically: “Might there be teachers who are good subject teachers, who might teach the subject in an authentic manner, but who do not necessarily teach their students that subject authentically?” (Conversation #2, 2020-04-16). An illustration from my first conversation with Jordan seemed to suggest that could be the case. Jordan recounted a Grade 13 physics teacher who would be unaware of the students entering into the room since he was enthusiastically having fun with his latest apparatus. Jordan said the “teacher was authentic in the sense that he couldn’t restrain his joy in the things that he was discovering, even though pedagogically he was weak” (Conversation #1, 2020-01-31). What does it mean to teach a subject authentically? In a follow-up email I invited Erin to flesh out the distinctive. Erin responded that teaching the subject authentically “suggests to me that an instructor, or teacher candidate, or teacher, needs to acknowledge the extrinsic factors that the subject brings to bear on the what, how, why of teaching” (Email, 2020-06-03). The extrinsic factors include the knowledge, skills, and affective elements that are unique to that particular discipline of study. To teach a subject like science and technology authentically, the teacher is responsible for comprehending and working with these extrinsic factors. As Jordan emphasized: “So teachers, if they want their students to learn and to learn to like a subject, they have to continue to learn and learn to like it themselves” (Conversation #2, 2020-03-26).

While teaching the subject authentically involves extrinsic factors, Erin proposed that teaching the student authentically would involve intrinsic factors. By that Erin referred to the interpersonal connections between teacher and student: “Getting to know them, their level of mastery of the discipline, finding ways in which to encourage them to
direct their own science learning, seeking to motivate them, etc.” (Email, 2020-06-03).

Intrinsic factors fall within the domain of the classroom and are therefore under the control of teacher and student. For example, in DT 410 I focused on the foundational elements associated with teaching science in the first half, reserving the practical elements for the final half. Yet, feedback from teacher candidates revealed that they anticipated doing more science earlier in the course. Reilly helped me to think through this dilemma by sharing a parallel situation with two related courses. The first course was taught in the first term and the second taught in the last term of the program. By design, the first course is more technical, providing teacher candidates with the terminology and processes needed before their first teaching practicum. The second course comes after their last practicum and delves into some of the deeper and philosophical issues associated with the course. Reilly’s initial reaction was that the second course was more authentic because the first course focused more on training. However, as our conversation progressed Reilly came to the following realization:

> But the more I think about it, the first course is equally authentic; it’s responsive to their needs even though I don’t like it because it feels like that old teacher training piece—we are going to train you how to do this. (Conversation #2, 2020-03-26)

In a follow-up email I asked Reilly: “Could we say that while we might not use the word, in both cases you are concerned about your students’ personal authenticity? Who they are and who they are becoming?” Reilly concurred with this statement and reflected on the important responsibility teacher educators have to nurture new teachers. Referring to the multiplication effect that teacher educators have, Reilly asserted: “If we are authentic in
our teaching ‘approaches’ then we model this for a new generation of teachers” (Email, 2020-05-10).

The distinction between teaching the subject authentically and teaching the student authentically was intriguing. Following the conversation with Erin where this distinction was first discussed, and prior to receiving her email clarifying the distinction, I used the distinction as a reflective tool (see Appendix D). Together, teaching the student authentically and teaching the subject authentically are integral components of modelling authenticity for our teacher candidates. As Erin concluded: “When the two merge, that to me is where a model of authenticity can be fostered to the fullest in a sense” (Conversation #2, 2020-04-16).

Learning From Lived Experiences

The notion of lived experiences arose in the first conversation that I had with Reilly. As we discussed becoming teacher educators, I shared an incident that had changed the trajectory of my career and set me on the path to becoming a teacher educator. As I described the incident to Reilly, I acknowledged that at the time the incident had been rather devastating. Reilly provided an encouraging analysis of my response to the incident and stated that the analysis was based on a lived experience perspective rather than a research perspective (Conversation #1, 2020-02-13). The notion of lived experiences was new to me but became a useful way of speaking about the everyday and not-so-everyday experiences of teacher education through which teacher candidates and teacher educators learn. This final subsection presents three perspectives of learning from lived experiences as facilitated by authenticity: (a) lived experiences of
teacher candidates, (b) lived experiences of teacher educators, and (c) self-study as lived experience.

**Lived Experiences of Teacher Candidates**

Reflecting on lived experiences reveals lessons learned from past experiences that we may not have been conscious of at that time. For example, in one of the first classes of DT 410, I introduced the notion of authentic learning to teacher candidates by asking them to discuss examples of inauthentic learning that they had experienced in science and technology. As I explained to Reilly, this exercise caused the teacher candidates to reflect on their lived experiences as elementary or secondary students (Conversation #2, 2020-03-26). Authenticity also facilitated the examination of lived experiences of teacher candidates on practicum. Erin and I talked about the conversations we have had with teacher candidates while on practicum to help them to make connections. There are moments when a teacher candidate begins to see the value of assignments and the connections between theory and practice. As Erin said, “It’s sort of like, they take ownership. They’ve had it all along, but they have claimed it for themselves. I think that’s another part of this whole notion of learning authentically” (Conversation #3, 2020-06-29). Erin also observed that it is the responsibility of the teacher educator to push the teacher candidate to make the connections between what they have learned in class and what they are learning from the teaching experiences on practicum. Reflecting on these conversations and the notion of lived experiences, I commented to Erin: “If the lived experiences in a teacher education program are going to be characterized by authenticity then there are implications for teacher educators and teacher candidates” (Email, 2020-07-15).
Lived Experiences of Teacher Educators

At the beginning of my third and final conversation with Reilly, I provided a high-level recap of the discussion points that had come up in our previous two conversations. In response, Reilly said:

That’s good Jack, your living in the data, right; it’s interesting how just hearing you do those high level things puts a smile on my face because it’s almost as if there are these layers of your lived experience, my lived experience, our shared lived experience and then you have this massive lived experience that is shared by the whole world—it is very interesting how those sort of cross and inform each other isn’t it? And the lived experience of our students is obviously another circle in those. (Conversation #3, 2020-06-22)

Reilly painted a mental picture of concentric circles each representing lived experiences through which we learn. But Reilly also alluded to a “massive lived experience” resulting from a tiny virus whose impact had reverberated to all parts of our lives including this study. COVID-19 became real and scary in Ontario in early March when the Premier and Minister of Education announced that schools would be closed for 2 weeks after March break. It was with some trepidation that I sent the following message to the teacher educators in this study prior to our second conversation:

In such times as these, a conversation about authenticity is not necessarily a top priority. I am reminded of Baggini’s (2004) caution that authenticity should not be seen as the supreme value in life: “a starving person does not as a priority want to be the author of her destiny, she wants bread” (p. 100). Nevertheless, the work of a teacher educator/researcher with thoughts about authenticity continues.
Towards that end I have prepared the following to set up our second conversation—by video conferencing—at your convenience. (Research journal, 2020-03-16)

I was grateful that each of the teacher educators took time out of their COVID-19 impacted lives to have that second conversation. The conversations that followed would each touch on the new reality we were living in, but they would also serve as a source of encouragement to persevere.

As we reflected together on the challenges of the sudden shift to distance-learning, we agreed that the new medium created a disconnect between the teacher educator and the teacher candidate. For example, Erin lamented that the virtual dimension of engaging teacher candidates hindered the ability to read students’ body language. We also agreed that we missed the interaction we would normally have at the college, as Erin observed: “We probably underestimate that informal interaction. It is probably a bigger part of the learning process than we give it credit for somehow” (Conversation #2, 2020-04-16). I responded that in terms of authenticity, the most challenging aspect of the asynchronous learning experience was that the “relational piece—which is tied closely with care—is hard to demonstrate when you hand out an assignment and wait for it to come back; it’s kind of an input–output experience.” Similarly, Erin remarked:

Again, too, if you think about authenticity and that relational aspect, it isn’t only the relationship between instructor and students—as a class or even as individuals—but to create an environment of authentic learning, you also have to have that student to student relational element in place. Then I would keep wondering, what is the instructor’s role in that? (Conversation #2, 2020-04-16)
The teacher educator’s responsibility to try to mitigate the disconnect was also reflected in the following comment made by Reilly:

It connects with authenticity, what is authentic in your immediate lived experience and what will be meaningful and important to you in the longer term. Yeah, focus on the community—I’ve sent emails saying, we’ve got this, we’re in this together … but I really believe that having facilitated community at this point is much more authentic, much more important, much more meaningful, than learning about global competencies. (Conversation #2, 2020-03-26)

These reflective comments made by teacher educators using authenticity to guide their conversations suggested that building and fostering relationships was the vaccine for the isolation brought about by COVID-19.

**Self-study as Lived Experience**

The conversations I had with teacher educators during this study became lived experiences from which I could learn more about being and becoming a teacher educator. The teacher educators took to their roles as critical friends, listening carefully to my lived experiences, thinking deeply about authenticity in the context of teacher education, and posing questions that challenged me to explain or rethink my ideas. Reilly referred to these conversations as opportunities for co-learning as the following remarks demonstrate:

In the spirit of co-learning or reciprocity, I would love to have a conversation about it, let me respond to it and then if you don’t mind to respond back. That would be great. I would love to hear your insights here. (Reilly, Conversation #3, 2020-06-22)
We’ve had good conversations. I’ve greatly benefited from your analysis of what I was describing whether you used comparisons or metaphors from your own experience. (Jack, Conversation #3, 2020-06-22)

In some cases, a remark made by a critical friend in an email would provoke me to deeper thought about an issue. For example, as we transitioned to distance learning, Erin encouraged me to personally reflect and journal about all that was happening:

- How do you maintain the sense of authenticity when doing a major late-semester course change? How do you seek to salvage that sense for/with your students?
- What does experiencing this unexpected process of adjustment say about you and your practice of authenticity? (Email, 2020-03-27)

At other times it was beneficial to be asked by a critical friend to simply remind them about the purpose of my study or to share with them some of the learning experiences from my science curriculum and instruction course. As I transcribed the second conversation with Jordan I paused to note: “It is interesting to observe that these conversations are also helpful because they make me talk about and articulate my understanding of this topic and these experiences” (Research journal, 2020-06-05). These examples illustrate some of the benefits of dialogue with critical friends in self-study.

An unanticipated finding of this study came by looking in the mirror of authenticity at myself and being confronted with the question: “Am I authentic in my teaching?” Reflecting on our discussions centred on authenticity, Reilly observed: “I hadn’t really thought about … you know, most of us don’t sit back and spend hours thinking, ‘In what ways am I authentic?’ or ‘In what ways am I not authentic?’ as a
teacher or teacher educator” (Conversation #3, 2020-06-22). Yet, that was exactly what I did later in that same conversation when I said:

So I think you are right, the idea of an authentic person attracts many people, whether you are a Christian or not, that you know that who you are dealing with … this is who you have. I think part of the interesting challenge using authenticity as this dissertation topic is to think about turning the lens back on myself. And asking that question, “Am I authentic in my teaching?” (Conversation #3, 2020-06-22)

Looking in that mirror of authenticity revealed areas of teaching science that I am not comfortable with. For example, in my conversation with Jordan I realized that even now as a teacher educator I do not emphasize technology and I am not comfortable with open inquiry. Summarizing this part of the conversation in an email to Jordan I wrote:

Like the notion of open inquiry, the latter topics create in me a sense of vulnerability since these are areas that I am not comfortable with. This is tied closely to another danger to authentic learning that we discussed, namely complacency. Perhaps a consideration of authenticity in and through teacher education will help to expose these tendencies where we might rest or get too comfortable. (Email, 2020-02-21)

Subsequently, in a reflection that I wrote looking back at the five occasions when I taught the science curriculum and instruction course, I realized:

Being a scientist is living with the uncertainty of what we don’t know. I think what I really enjoyed about learning and teaching science is being able to explain phenomenon that we knew something about. Therefore, a structured inquiry was a
way in which I could help students confirm/discover something about this world.

I so enjoyed those moments when students would say, “Cool!” or “Check this out!” (Research journal, 2020-07-30)

As I analyzed these conversations, I coded these lived experiences as “self-(study),” drawing attention to the benefit of self-examination through self-study. While some of these benefits were practical in nature (e.g., ideas on how to restructure my science curriculum and instruction course) others were more philosophical in nature. For example, as I prepared for my second round of conversations, the world was reeling with uncertainty from the news of COVID-19, and I reflected:

Nevertheless, the concern about illness, death, or even access to the necessities of life does awaken our senses to the search for the meaning of life. Suddenly what we envisioned for the future has been replaced with the unknown—even if the future is always unknown—and I believe that can challenge our sense of authenticity (being-present). This is where faith steps in to reassure me that I may not know the future, but my Father in heaven does. My authenticity is formed through my relationship with God. (Research journal, 2020-03-16)

The question of being authentic extended beyond vocation to encompass all facets of my life including my faith. In that regard, it was good to be able to talk with other teacher educators who are Christians regardless of their denominational affiliation or whether they worked in a Christian or secular environment. Becoming more aware of who you are also exposes areas that need work. As I described to Reilly in our final conversation: “I think that if anything, this whole life experience—lived experiences—we have talked about has taught me a sense of humility” (Conversation #3, 2020-06-22).
Summary of Findings

The second section of this chapter presented findings derived from the analysis of transcripts of nine conversations and follow-up emails that I had with three experienced teacher educators. The conversations and correspondence were facilitated by the concept of authenticity. The findings in this section relate to the remaining empirical research question: How can authenticity illuminate being and becoming a teacher educator? The findings revealed that teaching authentically might be viewed as two complementary activities: teaching the subject authentically and teaching the student authentically. The four themes that were generated from an analysis of the transcripts and emails revealed the potential authenticity has for stimulating rich conversations about teaching and learning. As the teacher educators discussed being and becoming a teacher educator they each revealed unique qualities that shaped their perspective of teaching. Speaking from their lived experiences, each teacher educator illustrated their authenticity by remaining true to these qualities. Their resolve to model teaching authentically was on display when they had to unexpectedly shift to online learning. The conversations with my critical friends were nuanced by authenticity and helped me to examine my own being and becoming as a teacher educator, to identify areas where I have grown and areas that need further attention.

Chapter Summary

This chapter presented the findings that emerged from the analysis of data from two sources: teacher candidates and teacher educators. The purpose of this study was to explore the significance and potential of authenticity in teacher education. Although authenticity is not a concept that is regularly discussed in the context of teacher
education, the participants in this study could relate to it and with some reflection even valued it. The findings suggest that authenticity has potential for teacher candidates to contemplate authentic learning and for teacher educators to contemplate teaching authentically. The contributions and implications arising from these findings will be discussed in the next chapter.
CHAPTER FIVE: SUMMARY, DISCUSSION, AND IMPLICATIONS

This study explored the notion of authenticity within the context of teacher education. The study arose from my experiences as a novice teacher educator teaching at a small, independent teachers college that prepares teacher candidates to teach in independent Christian schools in Ontario. My research interest in the concept of authenticity and education coupled with the positive response that authenticity evoked from professional workshop participants was tempered by the dissonance I experienced in seeking to apply the concept to my practice as a teacher educator. To mitigate the dissonance, this study was designed to explore the significance and potential of authenticity in teacher education. A qualitative research approach was used employing methods associated with self-study. This chapter provides a summary of this study, a discussion of key findings, and a description of the implications arising from the results.

Summary of the Study

What can authenticity reveal about teaching and learning in teacher education? To address this overarching research question, this study involved novice teacher candidates and experienced teacher educators. Eight teacher candidates in a science curriculum and instruction course (DT 410) that I was teaching accepted the invitation to participate in this study. The notion of authenticity was intentionally applied in this course and served as a catalyst for their reflective thinking. These reflections were captured on exit cards and notebook reflections submitted throughout the course. While this course was being taught, three experienced teacher educators served as my critical friends, participating in conversations guided by the notion of authenticity. These open-ended conversations provided an opportunity for me to share ideas from my past and present experiences
teaching DT 410. As critical friends, the teacher educators drew upon their experiences to provide professional feedback while also pondering the implications and applications of authenticity for teacher education.

Analysis of the teacher candidates’ reflections and transcripts of the teacher educators’ conversations resulted in thematic answers to the overarching research question. These findings were sorted into two sections corresponding to teacher candidates and teacher educators. The first section, Learning to Be Teachers, presented insights derived from the teacher candidates’ reflections. The findings addressed two of the three empirical research questions: How can authenticity be translated into praxis in teacher education? What are the benefits and challenges of an intentional focus on authenticity in a science curriculum and instruction course for elementary teacher candidates? The findings revealed that the notion of authentic learning served as a helpful construct that the teacher candidates could relate to and were able to use as they reflected about teaching and learning science. By considering authentic learning in science, the teacher candidates were able to reflect on the subject, the learning activity, and the learner. Elementary teacher candidates have a limited time to learn about teaching science and technology. Reflecting on authentic learning helped the teacher candidates to see that learning science involves more than acquiring knowledge and skills; it involves a child’s pursuit of their personal authenticity. Inauthentic learning fails to make the connection between the subject, the learning activity, and the learner.

The second section, Learning to Be Teacher Educators, presented thoughtful understandings of being and becoming a teacher educator. The findings addressed the remaining empirical research question: How can authenticity illuminate being and
becoming a teacher educator? The findings revealed that authenticity served as a helpful concept around which we could have rich conversations about being and becoming a teacher educator. Although each had their own lived experiences and unique qualities, the teacher educators shared a common commitment to helping teacher candidates become teachers. As those who teach students of teaching, the importance of teaching authentically and modelling this for a future generation of teachers was a helpful insight from these conversations. During analysis of the data, a distinction was made between the complementary activities of teaching the subject authentically and teaching the student authentically. These findings are particularly relevant for novice teacher educators, such as myself, who are navigating the transition from classroom teacher to teacher educator. In that regard, authenticity has aided my own self-examination as a novice teacher educator through this self-study. The findings in both sections provided a robust set of ideas relevant to authenticity and teacher education that contributes to the knowledge field and results in several implications.

**Discussion**

At the heart of teacher education are people, each person possessing unique qualities, histories, values, and aspirations. The conceptual framework for this study, presented in Chapter 1 (see Figure 1), highlights this complex reality. Teacher educators equip teacher candidates to be teachers by engaging them with pedagogical and subject-related content knowledge. Teacher candidates live on the hyphen as student-teachers, simultaneously students of teaching while also being teachers who teach elementary students. Each person in the groups identified above is searching for their own personal authenticity (Starratt, 2012; Taylor, 1991). For the purpose of this study I define personal
authenticity as *the quality of knowing who you are and being true to that person*. By exploring the significance and potential of authenticity in teacher education, this study contributes a new perspective to the field of teacher education.

As a novice teacher educator teaching at a small independent teachers college, this study has afforded me the opportunity to position my role as a teacher educator within the broader field of teacher education. From the Normal schools of the 19th century to the Faculties of Education in the 21st century, teacher education matured concurrently with the recognition that teaching is more than a practical craft; it is a profession (Robinson, 2017). Kitchen (2020a) attributes this maturation, in part, to the attention Schön (1983) gave to how professionals learn through reflection-in-action and reflection-on-action. Examination of exemplary teacher education programs today reveals a dynamic interplay between three elements: theory, reflection, and practice (Kitchen, 2020a). By intentionally applying authenticity in a course that I was teaching and then reflecting on this experience with critical friends, the interplay of these elements was present throughout this study. This self-study has contributed to my development as a teacher educator by helping me learn that my view of teaching, which I developed over 16 years as a high school science teacher, would shape whether I approached my role as a teacher-trainer or as a teacher educator (Bullough, 1994).

This self-study was conducted, in part, within a science curriculum and instruction course for elementary teacher candidates. Unlike secondary school science specialists, elementary teachers often do not have any formal background training in science. Consequently, elementary teacher candidates have low self-efficacy for science and science teaching (Avery & Meyer, 2012). Moreover, these teacher candidates are
unaware of the different purposes of learning science. Based upon their apprenticeship of observation (Lortie, 1975) most teacher candidates, like those in this study, would envision that the purpose of learning science is to amass knowledge gained through the discipline of science. They are unaware that learning science also involves socio-scientific issues and that through the study of these issues students’ identities are being shaped into a particular concept of a future citizen (Ideland & Malmberg, 2012). A focus on authenticity in our science curriculum and instruction course created opportunities to learn about science and to also think about how students are being shaped through these learning experiences.

The discussion that follows elaborates on these contributions by examining what was revealed about teaching and learning in teacher education through a focus on authenticity. The little word reveal in the overarching research question implies that authenticity is not the focus; rather, authenticity functioned as a mirror for self-examination in this study. To that end, the discussion is organized into three subsections. The first subsection, Teacher Candidates and Authentic Learning, examines what was revealed as teacher candidates in my elementary science curriculum and instruction course reflected on authentic learning. The second subsection, Teacher Educators and Teaching Authentically, examines the distinction revealed in conversation with my critical friends between teaching the subject authentically and teaching the student authentically. The third subsection, Pursuing Authenticity as a Teacher Educator, examines what I have learned about myself and my practice as a teacher educator through this study. The discussion in each subsection also reveals a recurring interplay between three elements: the student, the teacher, and the subject.
Teacher Candidates and Authentic Learning

As the teacher candidates reflected on their future role as teachers and the responsibility they have for their future elementary students, the notion of authenticity guided their reflections. While the teacher candidates worked with their own conception of authenticity, the findings also revealed that authentic learning became a helpful way of conceptualizing authenticity in relation to their future role as a teacher. In class we defined authentic learning as the learning that occurs when students are able to:

1. Discover more about the authentic subject;
2. Experience the integrity of the learning activity;
3. Find more about themselves (i.e., meaning and purpose) in what they do at school.

This subsection explores the findings relative to authentic learning by examining these three elements. As the teacher candidates began to appropriate this definition of authentic learning, these elements appeared in their reflections. In this way, the mirror of authenticity helped the teacher candidates to reflect upon the student, the subject and themselves as future teachers.

The science curriculum and instruction course (DT 410) in the program at CCRTC is the only course where elementary teacher candidates can learn about teaching science. Unlike the notion and perceived power of being a science teacher (Melville & Bartley, 2013), elementary teacher candidates are becoming teachers who teach science as one of a number of subjects. For the teacher candidates in DT 410, this was the first time they had been in a science course since high school. Therefore, it was important to start with the subject (science) and identify conceptions of what science is. By writing their own definition of science and then refining a working definition as a class, the
teacher candidates were invited to begin to think about the authentic subject. This initial class activity produced the following definition: Science is discovering and investigating God’s creation and how we can take care of it. By contrast, the Ontario curriculum for science and technology defines science as “a way of knowing that seeks to describe and explain the natural and physical world” (Ontario Ministry of Education, 2007, p. 4). The class’s working definition and the formal definition share some similarities. Both point to the processes of science, what scientists do, and to the object of science, the world in which we live. The definitions also reveal a particular worldview. A Christian worldview is evident in the class’s definition of science while the definition found in the Ontario curriculum reflects a secular worldview. Admittedly, the class’s definition is not polished but the exercise helped teacher candidates make their prior conceptions explicit. Melville and Kerr (2021) have recently suggested: “At its heart, science is a human story of coming to understand the physical world” (p. 1). Part of discovering the authentic subject that is science is discovering the human story. Like the scientists we study, those of us who teach and learn science must recognize that we approach the subject from a particular perspective and with particular values.

For elementary teacher candidates who have limited experience with science, helping students discover the authentic subject can be challenging. It was encouraging, therefore, to read of the resolve the teacher candidates had with respect to the learning activity in science and technology. Expressed as meaningful learning or going deeper, the teacher candidates were committed to ensuring that science and technology would involve more than textbook-based learning. Reliance on a textbook was identified as an example of inauthentic learning. On the contrary, fostering a sense of wonder and
enabling students to choose topics of interest were considered integral to learning science and technology. The notion of wonder expressed by the teacher candidates evoked two meanings, both of which have been linked to the heart of scientific inquiry (Gilbert & Byers, 2017). The first was a sense of awe created in the learner through the study of the physical world. Wonder, used in this sense, was an expression of what students could experience through their study of science and technology. Starratt (2007) described authentic knowing as the responsible act of coming to the known carefully. In a similar manner, authentic knowing in science and technology means approaching the study of the physical world with wonder. The second meaning of wonder refers to the natural curiosity that students have and this, coupled with encouraging students to choose a topic of interest, creates a meaningful learning experience. Developing curiosity and wonder has been identified by the Ontario curriculum as a primary learning objective for elementary science and technology (Ontario Ministry of Education, 2007). In the context of describing elementary students’ natural curiosity, the curriculum reminds us that each student has unique interests and abilities, along with personal and cultural experiences. The teacher candidates in DT 410 were learning that as teachers create opportunities for students to wonder in science and technology they are also helping students pursue their personal authenticity.

The notion of authentic learning also helped the teacher candidates to be mindful of and reflect upon the whole person of the student. This could be seen in how the teacher candidates reflected on who elementary students are and who they are becoming as people. For example, the teacher candidates reflected on the unique abilities and qualities that each student brings to the classroom. Consequently, it was observed that in a subject
like science and technology, not every topic will resonate equally with every elementary student. At the same time, it was observed that some topics within science and technology may spark a new interest in a student, an interest that was previously undiscovered by that student. These findings illustrate the important role of education in helping students find their own personal authenticity (Kreber, 2013; Starratt, 2012). Through a subject like science and technology, elementary students begin to learn something about themselves. By reflecting on authentic learning in their science curriculum and instruction course, the teacher candidates discovered that teachers can make a difference beyond teaching knowledge and skills; teachers contribute to the ways students are developing as people (Beijaard & Meijer, 2017).

The notion of authentic learning helped our class to have discussions relating the study of science and technology to the larger questions of life, questions of meaning and purpose. These discussions and the resulting teacher candidate reflections revealed another aspect of the personal authenticity of the student—belonging. There were three levels of belonging captured in the teacher candidates’ reflections. The first was at the level of the classroom, where building positive relationships between students and between teacher and student help students know that they belong. This sense of relatedness has been identified as a basic need that each person has (Woolfolk et al., 2020). The second level of belonging was reflected in comments made by teacher candidates as they considered how the study of science and technology helps students to learn about their role and responsibilities to society and the environment. This is indicative of Starratt’s (2007) description of authentic learning as the kind of learning where students discover who they are and what their responsibilities are within the
natural, social, and cultural worlds. The third level of belonging that authentic learning evoked from the teacher candidates was expressed in their unreserved commitment to ensuring that the study of science and technology would help their future students know that they are children of God. With this knowledge, the responsibility of stewardship—a fundamental concept in the science and technology curriculum (Ontario Ministry of Education, 2007)—became a significant learning goal. This discussion of levels of belonging is reminiscent of Taylor’s (1991) perspective of personal authenticity:

Only if I exist in a world in which history, or the demands of nature, or the needs of my fellow human beings, or the duties of citizenship, or the call of God, or something else of this order matters crucially, can I define an identity for myself that is not trivial. Authenticity is not the enemy of demands that emanate from beyond the self; it supposes such demands. (p. 40; emphasis in original)

The notion of authentic learning helped the teacher candidates to see that in a subject like science and technology, learning can transcend the acquisition of knowledge and the development of skills. Learning involves the whole person, as each student discovers who they are, contemplates who they are becoming, and appropriates the rights and responsibilities of belonging.

Reflecting on authentic learning revealed a commitment to the learner. This could be seen in the way that some teacher candidates acknowledged that while certain topics in science and technology were not their favourite, a lack of zeal should not hinder the learning experiences of their students. In fact, in order to ensure that their future students could experience authentic learning in science, the teacher candidates were committed to extra effort in preparing to teach those topics. This was an encouraging finding in light of
the evidence that elementary teacher candidates often have low self-efficacy for teaching science (Bursal, 2012; Mallow, 2010). Commitment to students and their learning is recognized as a standard of practice by the Ontario College of Teachers (Smith, 2013). A consideration of authentic learning by these future teachers helped them to discover within themselves a commitment to their students. This resolve came from the awareness that learning—including a subject like science—is an important component in a child’s pursuit of personal authenticity.

**Teacher Educators and Teaching Authentically**

Through the teaching and learning experiences in the classroom, teachers help their students pursue their own personal authenticity. The discussion above revealed that by reflecting on authentic learning, teacher candidates learned more about themselves as teachers. They were committed to the learner as a person. In a similar manner, the conversations with my critical friends revealed that teacher educators are also helping teacher candidates find their authenticity as beginning teachers. By looking together in the mirror of authenticity, the dynamic between student, subject, and teacher was also evident in the findings from these conversations. As we reflected together about teaching authentically and how we might model this for teacher candidates, a distinction emerged between teaching the subject authentically and teaching the student authentically.

Teaching the student authentically involved intrinsic factors. These are factors within the classroom and are therefore under the purview of teachers. Knowing your students and their needs vis-à-vis the subject are factors within the control of the teacher. Teaching authentically would mean that teachers respond to the needs of their students (Kreber et al., 2007). For example, in an elementary science classroom, this may involve
providing an opportunity for students to choose a topic or an assessment task for an instructional activity. In the teacher education classroom, this may involve restructuring a course or courses in order to serve the needs of teacher candidates more effectively. The pivot to online learning due to COVID-19 during this study illustrated how teachers and teacher educators responded in order to meet the needs of their respective students. If learning involves the whole person, as discussed in the subsection above, teaching the student authentically captures the teacher’s responsibility to be mindful of the whole person of the student. As Starratt (2012) asserts, “The authenticity of the learner as a learner is at stake every day at school” (p. 96).

Teaching the subject authentically begins by acknowledging extrinsic factors. These factors are established outside of the classroom and therefore the control of teachers is limited. Schwab (1978) distinguished between syntactic and substantive structures of knowledge of a discipline. Bullock (2009) explains that the substantive knowledge of science includes the conceptual ideas of science, while syntactic knowledge of science is learned by doing science. For example, to teach science and technology authentically, it is important to teach and model inquiry as part of the learning experience (Fazio & Melville, 2008) in addition to teaching the conceptual ideas science has produced. For an elementary teacher with limited history in science, teaching science authentically will require an investment in learning how to model the inquiry method. The findings in this study demonstrated that when this is lacking, teacher candidates are left with a skewed view of science education. Elementary teacher candidates have a limited opportunity to develop both substantive and syntactic knowledge of science in their program. This reality reinforces the importance of the science curriculum and
instruction course in preparing elementary teacher candidates to teach the subject of science authentically (Bursal, 2012).

By engaging with authenticity, the teacher educators revealed a concern for the student—whether that student was a teacher candidate or an elementary student—and a concern for the subject. The definition of authentic learning given at the outset of this discussion also reveals a concern for the student and a concern for the subject. That is to say, teaching authentically and authentic learning are complementary notions. Implicit in both is a concern for the subject and a concern for the student. That authenticity elicits care for students and care for subject highlights the relational nature of teaching (Palmer, 2007; Starratt, 2012). Teacher educators who model how to teach authentically are also modeling authentic learning for teacher candidates. Beijaard and Meijer (2017) identified a need for a pedagogy of identity learning in teacher education. As teacher candidates experience authentic learning in their teacher education program they begin to learn more about themselves as teachers. As those who are committed to an ethic of care, teachers and teacher educators also reveal their own authenticity as teachers (Rabin, 2013).

As the teacher educators engaged the concept of authenticity within the context of teacher education they each expressed certain ideas about teaching and learning that were important to them. These ideas shaped how they reflected on teaching and learning in teacher education and functioned as a window onto their personal authenticity. This finding illustrates Bialystok’s (2016) assertion that an “authentic teacher is an authentic person whose identity is expressed or confirmed in some necessary way through her teaching” (p. 317). In addition to the distinct emphases that each teacher educator made, they each revealed an aspect of their Christian faith as they talked about being a teacher
The teacher educators who had worked in a secular system acknowledged that the context may have limited the expression of their Christian faith, but it was also clear that working in a Christian setting would provide variables that could interfere with authenticity. Beijaard and Meijer (2017) highlight the role that beliefs play in a teacher’s professional identity. Like other teachers, teacher educators bring their past teaching experiences, values, faith, and worldview into the classroom. These all shape the being of the teacher educator and influence their teaching (Bullough, 2005).

The integrated nature of being a teacher is also captured by the four ethical standards of the teaching profession—care, respect, trust, integrity—identified by the Ontario College of Teachers (Smith, 2013). Discussing authenticity in the context of teacher education led some of the teacher educators to draw connections to these ethical standards. Being an authentic teacher or teacher educator suggests that these ethical standards are more than theoretical ideals; they are integral to who teachers are. Consequently, an authentic teacher or teacher educator will exhibit care, respect, trust, and integrity. Authenticity in teaching highlights a way that teacher educators engage teaching teacher candidates that is characterized by who they are as they pursue their own personal authenticity (Kreber, 2013).

**Pursuing Authenticity as a Teacher Educator**

The pursuit of authenticity suggests, however, that teacher educators are also becoming. As a novice teacher educator, the experience of becoming a teacher educator has, at times, challenged my personal authenticity. Throughout this self-study I found myself asking, “Am I authentic as a teacher educator?” This internal dialogue was provoked by the discussions I had with my critical friends, all of whom were experienced
teacher educators. This question also came to mind as I examined the reflections on authentic learning written by the teacher candidates in my science curriculum and instruction course. In this subsection I examine what I have learned about being and becoming a teacher educator, using the mirror of authenticity to identify gaps and areas that need further attention. The narrative is organized sequentially to explore the uncertainties that I have encountered as I transitioned from a classroom teacher, grew as a teacher educator, and through this self-study reflected on being a teacher educator.

Those who transition from being a classroom teacher to being a teacher of teachers often acknowledge, in hindsight, that they did so assuming that teaching in an elementary or secondary classroom would be the same as teaching in a teacher education classroom (Korthagen et al., 2005; Zeichner, 2005). My transition from being an experienced secondary school teacher to becoming a novice teacher educator involved a variety of changes that created a sense of uncertainty about who I was. To be sure, this transition also involved a good amount of excitement about being involved in educating prospective classroom teachers but this was tempered by an acute awareness of the limits of my knowledge and experience. For example, while I was experienced teaching secondary science I had no experience in teaching elementary science. Moreover, as a classroom teacher, the Ontario curriculum outlined the expectations for the courses I taught. That sense of security was lost in my first year as a teacher educator when I was given the academic freedom to design the courses I would teach. Those who have interrogated the transition to being a teacher of teachers have employed organizing frameworks in self-study methodology, such as tensions (Berry, 2007), or turning points (Bullock & Ritter, 2011). This study contributes to this discourse through the use of
authenticity. In conversation with my critical friends, I have described authenticity as an asymptote—something that I approach but never quite reach. During that first year I felt further away from that asymptote as I navigated the competing expectations of research, service, and teaching that comprise being a teacher educator (Bullock & Ritter, 2011).

Over the course of the next few years as a teacher educator I established routines that provided a sense of stability. Invariably, when I taught a course for the first time I felt further away from that asymptote. Reflecting on this transformation with my critical friends I identified with the learning continuum that Abell et al. (2009) described for teacher educators, a continuum that parallels becoming a teacher. During the initial years I was preoccupied with learning what I had to teach and how to do so effectively in a college setting. Thoughts about my authenticity as a teacher educator may have been in the background but my focus was on the here-and-now. Nevertheless, I began to learn that I was not simply an experienced teacher teaching in a teacher education program. As Loughran (2006) contends, I was learning to be “a teacher educator with an expertise in teaching and learning about teaching” (p. 13; emphasis in original). Dinkelman et al. (2006) described this as a reframing of knowledge in practice. For example, I became increasingly aware of a conscious effort to help teacher candidates learn to think about themselves as teachers. Paradoxically, at the same time I was learning to think about myself as a teacher educator. Ritter (2007) described the process of becoming a teacher educator as a time in which we develop a new professional identity and a new set of pedagogical practices. As I learned to be a teacher educator, I began to see that the technical-rational model (Schön, 1983) of teaching—the transfer of knowledge and practices—would not create an authentic learning experience. Just as I needed to think
about being a teacher educator so too my teacher candidates needed to think about being a teacher.

Now, with 5 years of experience, this self-study has given me the opportunity to reflect upon my authenticity as a teacher educator. To guide this self-examination, I employed the distinction discussed in the subsection above, namely, teaching the subject authentically and teaching the student authentically. Although I taught science in secondary school for many years, the conversations with my critical friends revealed that my lived experience did not fully prepare me to teach elementary teacher candidates about teaching science. In a science curriculum and instruction course, science pedagogical content knowledge is an important component for elementary teacher candidates (Fazio & Steele, 2019). Teaching the subject authentically in this course implies that teacher candidates learn about science and technology and how to make it accessible to students (Schneider & Plasman, 2011). As I reflected with my critical friend Jordan, I realized that I avoided certain topics in the science and technology curriculum. To teach the subject authentically I would need to give more attention to the technology and technological problem solving component of the curriculum. Nevertheless, in view of our focus on authenticity, Jordan encouraged me to not feel guilty about being passionate about other topics, such as biology and chemistry. When I shared this finding with teacher candidates in DT 410, some indicated that being open with your students about your passion or lack of passion for a topic is part of authentic learning.

The teacher candidates’ lament that we did not do science in DT 410 also exposed an inauthentic tendency I have as a teacher educator. I promote doing science in the elementary classroom but struggle to do science in the teacher education classroom.
Schwab (1970) described this classic struggle as a tension between teaching science as a rhetoric of conclusions and teaching science as enquiry. The way I taught the science curriculum and instruction course reinforced the substantive knowledge of science but limited the appropriation of the syntactic knowledge of science. That is to say, I realize now that as a science teacher, I enjoy describing and explaining what science reveals. In the process, however, I have not done adequate justice to what science is in terms of exploring what we do not know. This gap became clear in the teacher candidates’ reflections where I began to discern that they too enjoyed talking about the findings of science without adequately understanding the nature of science. Reflecting on the impact of science education, Prescod-Weinstein (2019) noted that the impression people have is that science is about what we know when in fact science is really about what we do not know. Reflecting on how to teach science authentically has helped me to identify areas about teaching the subject that I need to improve upon.

The motivation to improve as a teacher educator will not rest solely on my commitment to the subject; rather, it is my commitment to the teacher candidates and their future students that will prompt me to address these limitations. As Melville (2010) states succinctly, “Teachers help shape what a person becomes” (p. 11). Teaching the student authentically involves responding to the needs of the student so that they can relate to the subject. For example, when the teacher candidates recognized that they preferred certain topics in science, they committed to doubling their effort to learn more about the topics they were less interested in. This finding contrasts with the observation that elementary teachers who harbour a dislike for science will limit their students’ opportunities to engage with science (Gilbert & Byers, 2017; Tosun, 2000). I also learned from the teacher candidates that some students may have more of an interest in a topic
than the teacher does and in those situations it is important to kindle those interests. In that way we do not suppress students’ personal authenticity but rather we help them to discover more about themselves through the study of that topic. In these ways the teacher candidates were demonstrating a form of care for their future students as Noddings (2010) effectively stated, “To recognize in another a better self, struggling to realize itself is indeed a lovely act” (p. 14).

In a similar manner the teacher educators all expressed in different ways that they cared for teacher candidates as they struggled to realize in themselves their own authenticity as teachers. Teaching students authentically in teacher education is an intrinsically relational experience, a welcoming into the vocation of teaching. By modelling authenticity in teaching, teacher educators show teacher candidates that “being a teacher is primarily about helping one’s students become someone—achieve their own singular being—through the concrete encounter between his/her own singular being and theirs” (Oral, 2013, p. 220). The sense of belonging that the teacher candidates felt their students should know through authentic learning is an equally valid expectation for teacher education. For example, the feedback I received from teacher candidates about the organization of DT 410 has led me to rethink how I can effectively restructure the course. Valuing their insight as teachers will hopefully lead to a better presentation of this course for future teacher candidates. I have learned through this self-study that as a teacher educator my role is to model teaching authentically and by doing so help teacher candidates discover their authenticity as teachers.

The discussion of my pursuit of authenticity as a teacher educator provides a window onto my learning continuum as a teacher educator. Like other novice teacher educators (Bullock, 2009), through my own apprenticeship of observation (Lortie, 1975)
I approached teacher education as a matter of transferring knowledge gained from the school context to the teacher education classroom. Little did I know of the rich complexity that comprises the teaching discipline. This was something I would learn through my lived experiences as a teacher educator and through self-study. As outlined above, through these experiences I have learned much about teaching in general and about teaching science in particular. This observation does not, however, negate my lived experiences as a classroom teacher. For example, my commitment to Christian education was a deciding factor in becoming a teacher educator at CCRTC. As Wolterstorff (2002) summarized, Christian education is for Christian life, not just Christian thought. Like the teacher educators who served as my critical friends, my Christian faith shapes who I am as a person and as a teacher educator. The question remains: Am I authentic as a teacher educator? Bialystok (2016) concludes that an “authentic teacher is an authentic person whose identity is expressed or confirmed in some necessary way through her teaching” (p. 317). Similarly, Kreber’s (2013) authenticity in teaching in higher education draws attention to the way a teacher’s personal authenticity is expressed through their teaching. Like a learning continuum, my authenticity as a teacher educator is greater today than when I began. At the same time, the implications discussed in the next section will reveal that there is much that I have yet to learn about being a teacher educator.

**Summary**

This discussion has revealed that learning to be a teacher educator involves past experiences as a classroom teacher, present experiences as a teacher educator, and the learning that takes place through self-study (Dinkelman et al., 2006). By using the distinction between teaching the student authentically and teaching the subject authentically I have begun to explore the question: “Am I authentic as a teacher
educator?” For this reason I have described authenticity as a mirror that has helped me as a novice teacher educator to examine the space between self and practice (Bullough & Pinnegar, 2001). The teacher educators in this study used authenticity to capture the personal nature of teaching students of teaching. Erin pictured authenticity as a Möbius strip to reflect the inseparable nature of the personal and professional aspects of being a teacher. Jordan gravitated to Kreber’s (2013) use of authenticity in and through teaching to contemplate the person of the teacher educator and the person of the teacher candidate. Reilly remarked on the potential of using authenticity as a hinge for conversations about teacher education that moved the discussion beyond a typical problem-solving focus. As we have seen, the teacher candidates also demonstrated the potential of authenticity as they embraced authentic learning as a construct to reflect about being a teacher. In summary, an intentional focus on authenticity with teacher candidates and teacher educators has revealed potentials for teaching and learning in teacher education. In the following section, a number of implications of this potential will be explored.

**Implications**

Throughout this study, authenticity facilitated the examination of the lived experiences of teacher candidates, teacher educators, and myself. This intentional focus on authenticity in teacher education creates implications for practice, for theory, and for further research. In view of the nature of this study as a self-study, the first subsection begins with implications for my practice as a teacher educator and then broadens out to include implications for teacher education in general. The contributions of this study to the broader field of research in education are presented in the implications for theory. This section will conclude with implications for further research in self-study of teacher education practice (S-STEP).
Implications for Practice

Before looking in a mirror we all have a mental image of who we are. When we look in a mirror we sometimes see something that causes us to alter our self-perception or leads us to change something about ourselves. Throughout this study, authenticity has been that mirror for me, revealing moments of uncertainty as I learned to be a teacher educator. To paraphrase the overarching research question: What has authenticity revealed about teaching and learning in teacher education for me? Through a consideration of teaching the subject authentically, I have learned that there are certain topics in science and technology that I have avoided, perhaps growing too complacent with topics that I favour. I have learned the value of being open with my teacher candidates about this and of recognizing that they will face similar tensions in their teaching. Their commitment to work harder in areas where they lack passion is inspiring. I came to realize that I enjoy teaching about what science has revealed but that it is also important to teach about what science is. In retrospect, the goals of scientific literacy, developing expertise in scientific inquiry and an understanding of the nature of science (Fazio & Melville, 2008), are goals that I need to model. A consideration of teaching the student authentically has reaffirmed for me that a focus on helping teacher candidates develop their teacher identity is critical for teacher education (Beijaard & Meijer, 2017; Britzman, 1991). The notion of belonging, first distilled from the teacher candidates’ reflections about authentic learning in elementary school, is also appropriate for my teacher education classroom. Following years of being an apprentice of observation, teacher candidates should begin to feel that they belong as teachers. This means challenging their experience-based perspective of teaching and introducing teacher candidates to the complexity of being a teacher (Kitchen & Petrarca, 2016).
Throughout this study the teacher candidates considered the notion of authentic learning in relation to teaching and learning science and technology. The three elements of authentic learning—the subject, the learning activity, and the learner—provided a framework to help the teacher candidates reflect on their past experiences learning science while they anticipated their future responsibility to teach science. Teacher educators who teach an elementary science curriculum and instruction course have a daunting task given the limited exposure to science and technology that most elementary teacher candidates have (Menon & Sadler, 2016). Nevertheless, this may be the one and only opportunity elementary teacher candidates have to develop positive attitudes towards teaching science. This creates an implication for teacher educators to design a course that can benefit these future elementary teachers in various respects (Bursal, 2012). There is a concern expressed in the literature that science is often reduced to knowledge derived within the scientific disciplines (Ideland & Malmberg, 2012). Science instruction is then reduced to the transmission of this knowledge (Melville, 2013). However, reformed visions of science education are challenging this static notion of science by emphasizing the need for students to apply the knowledge derived through the study of science to resolve questions about the world they live in (Melville & Kerr, 2021). By structuring a science curriculum and instruction course around the three elements of authentic learning identified above, there is an opportunity to help elementary teacher candidates push beyond a reduced notion of science education. As discussed above, the subject helps teacher candidates to take a step back and examine their prior conceptions of science in view of current articulations. The learning activity draws attention to what scientists do and looks for ways to encourage students to wonder.
Gilbert and Byers’s (2017) use of wonder exemplifies one approach to engage elementary teacher candidates in learning to teach science. Finally, the learner reminds the teacher candidates that science is a human story (Melville & Kerr, 2021) and therefore, the subject and the learning activity should help students to position themselves within that story.

Discussing reformed visions of science education draws attention to the implied power of education to shape society’s future citizens (Ideland & Malmberg, 2012). While this example applies to science education, it stands to reason that systems of education play an important role in shaping society. This opens up a broader discussion about the purpose, nature, and problems of education, a discussion that Darling-Hammond (2006) suggested teacher educators should have a voice in. The teacher educators in this study represented teacher education programs preparing teachers to teach in Reformed Christian schools, evangelical Christian schools, and public and Catholic schools. While the teacher educators may have been serving different communities, the rich conversations about teaching and learning in teacher education, facilitated by authenticity, served as a unifying factor. As one of the teacher educators commented, authenticity has the potential to cross boundaries of faith, language, and culture. An implication arising from this study is that authenticity could facilitate edifying discussions about teaching and learning amongst members of a faculty of education. A collaborative faculty team has been identified as an integral component of effective teacher education programs that integrate theory, practice, and reflection (Kitchen, 2020a). As was suggested in this study, unguided discussions may be limited, resulting in discussions of practice focused on problem solving. However, discussions guided by the concept of authenticity, like those that I had with my critical friends, may lead to deeper
discussions. As colleagues wrestle together with questions about authentic learning and teaching authentically, a sense of belonging and commitment may grow and form the basis for a community of teacher educator practice (Bullough, 2005). This would be particularly helpful for the novice teacher educator who desires to fit in to their new professional community while maintaining a sense of authenticity as a professional (Williams et al., 2012). Teacher education is contextually bound. Authenticity acknowledges that context and draws attention to the unique people who comprise a teacher education program.

**Implications for Theory**

The theoretical basis for this study was the rich and complex notion of authenticity. The literature review (see Chapter 2) demonstrated that authenticity is a current and relevant concept employed by researchers in the fields of education, higher education, and teacher education. Of the latter group of scholars, authenticity was presented as a dimension of an ethic of care (Rabin, 2013), as an argument from philosophy for more practicum experience (Oral, 2013), and as a means to describe a correspondence view of authentic learning (Sutherland & Markauskaite, 2012). Brook (2009) captured the potential of authenticity for research in teacher education by acknowledging the rich possibilities this concept had for thinking about teaching. This study affirmed this potential by exploring authenticity in relation to teaching and learning in teacher education. Personal authenticity, knowing who you are and being true to that person, has been shown to be integral to education in general and to teacher education in particular. This is clearly seen through the integrated nature of being a teacher and the four ethical standards of the teaching profession articulated by the Ontario College of
Teachers (Smith, 2013). Discussions of authenticity in teaching evoked connections to these four ethical standards. Theorizing how authenticity complements these standards would provide a new perspective on this vision of a professional teacher. Ideas such as teaching the student authentically or considering how authentic learning helps students know that they belong, are ways in which care, respect, trust, and integrity can be highlighted as integral to the being of a teacher.

In their comprehensive review of the literature, Kreber et al., (2007) searched for insight into the meaning of authenticity in teaching in higher education settings. The scholars distilled 13 features which were subsequently reduced to six dimensions and then finally three philosophical perspectives (Kreber, 2013). These three perspectives each informed Kreber’s framing of authenticity in and authenticity through teaching in higher education. This theoretical structure draws attention to the transformative potential that teaching and learning in higher education has. By exploring the significance and potential of authenticity in teacher education, the findings from this study demonstrated that Kreber’s framework is applicable to teacher education. For example, the notions of teaching authentically and authentic learning discussed above imply that through a particular form of teaching in teacher education, teacher educators and teacher candidates become more authentic in their respective vocations. Moreover, the teacher educators demonstrated authenticity in teaching in teacher education by the way their personal authenticity shaped their conversations about teaching and learning. An implication from this study is that Kreber’s framework of authenticity in and authenticity through teaching in higher education is relevant to teacher education.
Implications for Further Research

The literature revealed that the aims of S-STEP are twofold: to improve teaching about teaching and to advance teacher education research (Bullough & Pinnegar, 2001). As a self-study of teacher education practice, this study was driven by my desire to help teacher candidates learn about being and becoming a teacher in Reformed Christian schools. Authenticity facilitated reflection on what is both authentic and inauthentic about the teaching and learning experiences in my teacher education classroom. Having used authenticity as a focus in my science curriculum and instruction course, an implication for further research could include the application of authenticity to other courses I teach such as mathematics. Teaching mathematics as a school subject reveals a tension between helping students acquire procedural knowledge and helping students develop conceptual understanding (Reys et al., 2010). With no formal education in mathematics and limited experience teaching mathematics, a self-study could explore my development as a teacher educator who helps elementary teacher candidates navigate this tension when crafting learning experiences. I would also invite experienced teacher educators who teach mathematics to be critical friends, interrogating what teaching the subject authentically and teaching the student authentically might look like. The elements of authentic learning—the subject, the learning activity, and the learner—could be used as a framework to organize the learning experiences for the teacher candidates. The subject would help us to compare our prior conceptions of mathematics to formal definitions, such as math as the study of patterns (Reys et al., 2010). The learning activity would challenge us to push beyond acquiring procedural knowledge to create meaningful learning experiences. The learner would once again remind us that the subject and the learning activity cannot be separated from who the student is as a person. For example,
we may wish to explore math anxiety and its effect on teachers and students (Bursal & Paznokas, 2006). As teacher candidates attempt to develop and implement authentic learning experiences we would explore the tensions that arise from their teaching experiences.

Zeichner (2005) asserts that self-study research is an essential requirement for learning to be a teacher educator who consciously thinks about educating teachers. It follows that authenticity could help other novice teacher educators to examine their own teaching practice. As a self-study, this study was limited to my experience as a teacher educator teaching teacher candidates in an elementary science curriculum and instruction course. However, the reflective nature of self-study provides fertile ground to ask: Am I authentic as a teacher? What does it mean to teach my students authentically? How can I teach the subject authentically? Have I created learning experiences where my students can discover their authenticity? These questions are challenging to answer. In this study it was my experience that discussing these questions with trusted colleagues led to rich discussions about teaching and learning. As Bullock and Ritter (2011) observed, collaborative interactions push “participants out from the solitude of their mind’s eyes to engage with personal values and the values of others” (p. 179). Critical reflection and dialogue are important elements of transformative learning (Mezirow, 1978) which can, in turn, lead to the development of authenticity (Cranton & Carussetta, 2004; Kreber, 2013). An implication for future research through self-study is to explore the benefits and challenges teachers and teacher educators experience using the mirror of authenticity as a tool for self-examination.

This study is only one of many self-studies that advance teacher education research. As teaching matured as a profession, self-study emerged as a means of helping
teachers learn through reflective practice. Inquiring into one’s practice ensures that teachers take up their responsibilities as those who create knowledge, rather than those who passively transmit knowledge (Clarke & Erikson, 2012). Samaras and Freese (2006) assert that the reflective nature of self-study leads the practitioner to encounter four commonplaces (Schwab, 1973) of teaching: the learner, the teacher, the subject matter, and the milieu. In this study, through the notion of authentic learning the teacher candidates encountered the learner, the subject, themselves as teachers, and the unique context in which the learner lives. The conversations with teacher educators also touched on these commonplaces through the distinction between teaching the subject authentically and teaching the student authentically. The discussion of authenticity in teacher education even led one critical friend to suggest an explicit connection to the four commonplaces. Kitchen (2020b) recently looked ahead to the future of S-STEP and suggested that the four commonplaces may provide self-study with a needed curriculum-making orientation. It follows that the potential resonance of authenticity with the four commonplaces could create a novel research focus for S-STEP so that teacher education research can continue to advance.

Conclusion

Over the past century and a half, teacher education has undergone a remarkable evolution, from the Normal schools of the mid-19th century to the degree-granting institutions today. Accompanying these changes has been a shift in how teachers have been viewed and how they view themselves—once practitioners and now professionals. Today, teacher education programs prepare teacher candidates to be teachers for 21st century classrooms. Soon after they begin though, teacher candidates discover that they are not only learning about teaching, they are also learning to be a teacher. Wrestling
with their prior conceptions of teaching and a plurality of voices from a social-media saturated world, teacher candidates labour to construct their own identity as a teacher. However, they are not alone in this endeavour. Coming alongside of them are teacher educators who help these students of teaching reflect on who they are and who they are becoming while also welcoming them into the vocation of teaching. Paradoxically, as teacher educators seek to do this, they themselves are learning to be teacher educators.

The relational and dialogical nature of teaching and learning that characterizes the school classroom is also pervasive in the teacher education classroom.

Before teacher candidates enter their first classroom it is important that they engage questions about the purpose, nature, and problems of education. In this study, authenticity facilitated discussions and reflections about foundational questions of education. By reflecting on authentic learning, the teacher candidates in this study discovered that learning transcends the acquisition of knowledge and development of skills. When teachers help students learn, they are helping children find meaning and purpose in life. From that perspective, what happens in the classroom has enduring consequences. This creates an equally weighty responsibility for teacher educators to model authentic teaching for their students of teaching. By caring for these students as those who are becoming teachers, teacher educators set an example of how teacher and student live and learn together for a time. By teaching authentically, teacher educators create an opportunity for teacher candidates to experience authentic learning; as teacher candidates reflect on what authentic learning means for them and their future students, they learn how to teach authentically.

In a teacher education program, teacher candidates and teacher educators travel together on parallel paths of learning. Teacher candidates are learning to be teachers
while at the same time teacher educators are learning to teach students of teaching. Their brief time together in a teacher education program is an opportunity to engage the philosophical questions of education. In this study, authenticity opened the door to this opportunity in a science curriculum and instruction course. By reflecting on authentic learning for an elementary science and technology class, the teacher candidates became mindful of their responsibility to their future students as people. Authenticity also guided my critical reflections and collegial conversations about being and becoming a teacher educator. These transformative learning experiences, facilitated by authenticity, helped my teacher candidates and me as we developed into our respective professional identities. What can authenticity reveal about teaching and learning in teacher education? The significance and potential of authenticity in teacher education lies in looking in the mirror.
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Appendix A

Course Syllabus (DT 410) 2019–2020

CURRICULUM METHODS STUDIES

DT 410: Science and Technology
Credits: 3.0
Duration: 3 hours per week
2019-2020 – Winter Semester
Instructor: Mr. J. Huizenga, PhD (candidate)
Email: jhuizenga@covenantteacherscollege.com

Curriculum Methods Studies – Curriculum methods courses provide teacher candidates with subject-specific content and pedagogical knowledge. They equip teacher candidates with background knowledge and an understanding of the nature and purpose of the subjects in the elementary and/or secondary school curriculum. Teacher candidates are also equipped with skills for planning, teaching, and assessment in the context of specific subject areas. Methods courses are linked to the expectations outlined in Ontario’s Ministry of Education curriculum documents, and reflect the applications to Reformed Christian day schools (CCRTC Academic Calendar, General Program Overview, p. 27)

Course Description
Introduction to the content and teaching methodology of science in Christian elementary schools. Historical and theoretical underpinnings of science education (e.g., constructivism, conceptual understanding, inquiry method) are explored in the context of teaching and learning science. Students will become acquainted with the Ontario Curriculum Grades 1-8 Science and Technology, Grades 9 and 10 Science: primary/junior specialists (grades 1-6); junior/intermediate specialists (grades 4-10).

Course Outcomes

Specific Learning Outcomes
By the end of this course, students should be able to:

1. Describe historical developments in the field of teaching and learning Science and Technology.
2. Investigate current ideas and practices in the field of teaching Science and Technology.
3. Develop a lesson plan for a lesson in Science and Technology which will include: (a) identifying learning objectives, (b) assessing student learning of these objectives, and (c) planning learning experiences.
4. Demonstrate understanding of concepts from the four strands of Science and Technology in the ON curriculum.
5. Design learning experiences for elementary students which engage students in scientific inquiry.
6. Use the notion of authenticity to reflect on becoming a teacher who teaches science and technology.
7. Articulate a personal perspective on teaching and learning Science and Technology informed by a Reformed Christian worldview.

General Learning Outcomes

The Curriculum Methods Studies course cluster outcomes significantly addressed in this course are:

- delineate and exam the content of the discipline
- develop pedagogical knowledge of methodologies, resources, and approaches for teaching, learning, and assessment within the context of the discipline
- critical examination of educational theories and practices in the light of both secular and Reformed Christian curriculum orientations

Program Expectations

The CCRTC Profile of a Reformed Teacher candidate (CCRTC 2019-2020 Academic Calendar, p. 10) has been crafted to exemplify the teacher candidate CCRTC seeks to graduate. These graduate expectations have been divided into three categories: knowledge, skills, and commitment. Those expectations that are addressed throughout this course are identified in the course outline kept on file in the administrative office.

CCRTC has developed Diploma Level Expectations (DLEs) following the Ontario Qualifications Framework (OQF) determined by the Postsecondary Education Quality Assessment Board of the Ministry of Colleges and Universities. DLEs reflect the academic rigour of the Diploma of Teaching and Diploma of Education programs and have been crafted to reflect the College’s own mission, ethos, values, and culture. All of the CCRTC DLEs are published on the CCRTC website. The specific DLEs that are significantly addressed in this course are identified in the course outline kept on file in the administrative office.

The Ontario College of Teachers has published an Accreditation Resource Guide (2017) that is “predicated on the principle that students of programs of professional education and teachers need a strong body of foundational professional knowledge that is evidence based and practice informed in order to begin to develop professional judgement and skills in pedagogical decision-making” (p. 5). To provide evidence that the teacher education program at CCRTC provides such knowledge and skill, the faculty has identified expectations from the Accreditation Resource Guide that apply in each course. Those expectations significantly addressed in this course are identified in the course outline kept on file in the administrative office.
Course Materials and Resources

**Required Texts**

**Course Assignments and Evaluation**

*Growing Success: assessment, evaluation and reporting in Ontario schools* (2010) distinguishes three types of assessment strategies used to improve student learning. “As part of assessment FOR learning, teachers provide students with descriptive feedback and coaching for improvement. Teachers engage in assessment AS learning by helping all students develop their capacity to be independent, autonomous learners who are able to set individual goals, monitor their own progress, determine next steps, and reflect on their thinking and learning” (p. 27). While no evaluative weight is given to these forms of assessment, students should take advantage of their formative nature. Evaluation is based upon assessment OF learning which “provides evidence of student achievement [of expectations] at strategic times throughout the course” (p. 37).

<table>
<thead>
<tr>
<th>Assessment FOR/AS learning</th>
<th>Assessment OF learning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Readings – for assigned readings students are advised to take notes of key ideas, confusing aspects or new learnings; individual students or pairs of students will be assigned to spark related discussions.</td>
<td>1. Science notebook (25%)</td>
</tr>
<tr>
<td>Discussions – conversations in class afford students opportunities to assess their understanding of theoretical elements while making connections between theory and practice.</td>
<td>2. Midterm test (10%)</td>
</tr>
<tr>
<td>Reflections – in keeping with the reflective practice of teaching, students are encouraged to reflect both individually (e.g. journal, exit cards) or as a group (e.g. practicum reflections).</td>
<td>3. Presentation (20%)</td>
</tr>
<tr>
<td>Descriptive feedback – oral and written feedback from teacher to student and from student to student.</td>
<td>4. Perspective &amp; rationale (15%)</td>
</tr>
<tr>
<td></td>
<td>5. Science instructional unit (30%)</td>
</tr>
</tbody>
</table>
Assignments:

**Exit cards (AfL):** Feedback will be solicited from teacher candidates on a regular basis. Exit cards promote dialogue by serving as a vehicle to convey concerns, questions, and comments so that the instructor can better understand learning and adapt instruction accordingly.

**Science Notebook (25%):** Reflect upon your experience and understanding of teaching and learning Science & Technology (P/J or J/I). The notebook will consist of 3 entries before practicum, 2 entries during practicum, along with 4 entries focused on each of the four strands in module 2. **Weeks 7-10.**

**Midterm Test (10%):** Written in class. Topics will be identified before the exam.

**Presentation (20%):** Showcase lesson ideas from one of the four strands of *The Ontario Curriculum – Grades 1-8 Science and technology.* Incorporate ideas or an activity uncovered through an analysis of an article from a recent issue of *The Science Teacher, Science Scope or Science & Children.* **Weeks 7-10.**

**Personal perspective and rationale (15%):** In a short paper, articulate your personal perspective and rationale for Science & Technology education, informed by a Reformed Christian worldview and your knowledge of how children learn science. **Due - Week 11.**

**Science Instructional Unit (30%):** Craft an instructional unit for a chosen grade and strand from the ON S&T curriculum (P/J or J/I). Design a series of lesson plans (minimum of 5) you might anticipate teaching next year. These lessons will also include a variety of assessment tasks. **Due - Week 12.**

Assignment Submission

Most assignments will be submitted electronically as a Word file which allows the instructor to embed feedback within the document. See section 5.10 of the Academic Calendar for College expectations regarding format and due dates

Information and Communications Technologies (ICT) in the Classroom

Information and communications technologies that advance student learning and do not hinder the collegial nature of our classroom are welcome (see also 6.12 in the Academic Calendar).
## Course Agenda [May change as required]

<table>
<thead>
<tr>
<th>Week #</th>
<th>Theme:</th>
<th>Topics:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Module 1 – Underlying principles of Science and Technology education</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Jan. 6&amp;8</td>
<td>The subject: S&amp;T education</td>
<td>vision, goals, curricula, nature of science</td>
</tr>
<tr>
<td>2. Jan. 13&amp;15</td>
<td>The learner and S&amp;T education</td>
<td>nature of children’s thinking, scientific literacy</td>
</tr>
<tr>
<td>4. Jan. 27 &amp;29</td>
<td>Planning to teach S&amp;T</td>
<td>1. identify desired results, 2. determine acceptable evidence</td>
</tr>
<tr>
<td>5. Feb. 3&amp;5</td>
<td>Planning to teach S&amp;T</td>
<td>3. plan learning experience, 4. craft a lesson plan</td>
</tr>
<tr>
<td>6. Feb. 10 &amp;12</td>
<td>Midterm test (Feb. 12)</td>
<td>Review and consolidate</td>
</tr>
</tbody>
</table>

| Practicum Session 2 (Feb.18 – Mar.27) |
| Module 2 – Strands in the Science and Technology curriculum |
| 7. Mar. 30-Apr. 2 | Understanding Earth and Space Systems | understanding concepts, lesson ideas |
| 8. Apr. 6-9 | Understanding Life Systems | understanding concepts, lesson ideas |
| 9. Apr.13-16 | Understanding Matter and Energy | understanding concepts, lesson ideas |
| 10. Apr.20-23 | Understanding Structures and Mechanisms | understanding concepts, lesson ideas |
| 11. Apr.27-30 | Perspective & rationale - due | |
| 12. May 5-8 | Instructional unit - due | |
Appendix B

Teacher Educator Conversation Starters

Figure B1

Conversation #1 (2020-01-16)

For my dissertation proposal, I chose the title: Authenticity in and through teacher education. I explain this choice as follows:

Authenticity in teacher education refers to teacher educators striving for authenticity, avoiding complacency, becoming consciously aware of self, and being true to that self in teaching. Authenticity through teacher education refers to the transformative potential of teaching and learning whereby teacher educators help teacher candidates develop greater authenticity as individuals and as teachers in the field of education.

For our first conversation, there are two aspects I would like to give some attention to. The first has to do with becoming a teacher educator. Perhaps we might share some of our experiences of becoming a teacher educator, recognizing that becoming is not a onetime event; rather, it is an ongoing process. We may also interact a bit with the notion of authenticity, to see how this concept might shape our discussion.

I would also like to share some ideas I have been working with to use authenticity intentionally in a science methods course. This second aspect could be briefer, but I do look forward to any ideas or feedback you may have.
One of my goals for this dissertation is to wrestle with ways of working with authenticity in teacher education in ways that are not forced. In other words, I realize that a lecture on authenticity, while cognitively stimulating (at least for me), does not necessarily help teacher candidates as they think about the day-to-day aspects of teaching and learning. For my dissertation proposal I wrote:

I believe that authenticity, applied to the purpose and practice of teaching/learning, holds potential for teacher education. Yet as a teacher educator, I experience dissonance between conceptualizing authenticity and realizing its potential in practice. This dissertation seeks to resolve the dissonance I experience between the rhetoric surrounding authenticity and its application in teacher education.

For the purposes of this dissertation I have focussed on a Science & Technology methods course that I teach for P/J elementary teacher candidates. To bring you up to speed on my efforts to intentionally work with authenticity, I have appended a pseudo-timeline below. I have also attached the course syllabus for the course that I am currently teaching. For our second conversation I invite your input, critique, and suggestions in light of your experience as a teacher educator and researcher.
I’d like to make arrangements for our third and potentially final conversation on the topic of authenticity in and through teacher education.

Throughout our first two conversations we have explored the notion of authenticity relative to becoming a teacher educator and considered ways in which this concept could be applied in teacher education. These foci loosely flowed from my first two research questions. My third research question applied specifically to my science methods course which I taught this past semester:

What are the benefits and challenges of an intentional focus on authenticity in a science curriculum and instruction course for elementary teacher candidates?

For our third conversation I would like to share some preliminary observations from this experience in order to solicit any feedback or suggestions that may guide my data analysis. Perhaps this will also be a good opportunity to reflect together about our experience using authenticity to guide our conversations about teaching and learning in teacher education.
Appendix C

Teacher Candidate Prompts

Figure C1

Notebook Reflections

Notebook reflections – teacher candidates reflected on their experience and understanding of teaching and learning science; the journal consisted of three entries before practicum, two entries during practicum, four weekly reflections after practicum and a final reflection at the end of the term.

Conceptual

1. (Jan. 15) In light of what we have discussed about the learner this week, reflect on how this might affect your perspective of teaching/learning S&T?

2. (Jan. 29) We have said that authentic learning occurs when students are able to: 1) Discover more about the subject; 2) experience the integrity of the learning activity, and 3) through that find more about themselves.
   Looking back at what we have sought to learn together in DT 410, reflect on your learning: How has it been authentic? How has it not? What might hinder your experience of authentic learning? What might help?

3. (Feb. 3) Reflect briefly on the ideas that you listed when you were prompted to plan a unit in S&T. Then respond to the following: How can we plan (for S&T) with authenticity in mind?
   “Can we plan to incorporate authenticity as the foundation of teaching/learning that emerge through the content and outcomes?” (Brook, 2009, p. 54)

Practicum

4/5. (Feb.-Mar.)

During your practicum you are required to write two reflections for your Science Journal. The topics for these reflections are open but should be connected to your practicum experiences teaching S&T. It would be a good idea to review the requirements for the journal entries (attached), so that these reflections help you to address the learning goal. Try to connect your observations and experience to what you have been learning and thinking about in S&T.

I would also like to suggest the following quote as a unifying theme: "Relentlessly cause students to wonder!"

(Continued on next page)
Notebook reflections – teacher candidates reflected on their experience and understanding of teaching and learning science; the journal consisted of three entries before practicum, two entries during practicum, four weekly reflections after practicum and a final reflection at the end of the term.

**Strand reflections**
6-9. (Mar.-Apr.)

In the coming weeks you will be learning key concepts from each of the four strands of the S&T curriculum. The four strands – **Earth & Space Systems** (Mar. 30), **Matter & Energy** (Apr. 6), **Structures & Mechanisms** (Apr. 15), and **Life Systems** (Apr. 22) – provide a handy way of dividing the study of science by disciplines (i.e., environmental science, chemistry, physics, biology). Nevertheless, each strand also represents science as a unity and therefore, the things we discussed before practicum apply to each strand (e.g., values in science, STSE, inquiry methods, authentic learning, scientific literacy).

At the end of each week reflect on what you have learned about that particular discipline and how you could envision working with that knowledge to help elementary students learn about science & technology.

**Cumulative**
10. (May 5) Articulate your personal perspective and rationale for science and technology education, informed by your Reformed Christian worldview, and your knowledge of how children learn science. Context – anticipate a parent teacher conference or staff meeting where you are asked about your perspective on teaching/learning science and technology.
Exit Cards

Exit cards – teacher candidates provided regular feedback on their learning experience in class by responding to questions or open-ended prompts.

1. (Jan. 6) What is authenticity?

2. (Jan. 8) What does a scientist do? What qualities must a scientist possess?

3. (Jan. 15) How did the “little person” activity help you think about teaching/learning S&T?

4. (Jan. 29) Do you think authenticity might be a value that could guide scientists? Why or why not?

5. (Apr. 6) Just before practicum we talked together about planning in S&T (... and planning for authenticity). Over the past couple of weeks, teachers have been scrambling to plan at-home learning experiences for their students. If you were in their place, what decisions would you need to make? What criteria would you use in making these decisions?

6. (Apr. 16) Imagine that you were teaching your future class under the current circumstances. The media is saturated with news about the Coronavirus (COVID-19). How could you use this current and relevant topic as a learning opportunity in S&T for your students?

7. (Apr. 23) Today I mentioned that my zeal for physics and related topics is not great, whereas my teacher-efficacy for teaching biology and chemistry is high. This likely has impacted some of the choices I have made in S&T methods, tending to focus more on the science than technology. Do you experience something like that for any (or all) of the strands of S&T? How do you overcome that sense of drag (to borrow a term from today’s lesson) so that you can create the best learning experiences possible for your students in S&T?

8. (Apr. 29) Throughout this course we have interacted with authenticity as sort of a theme that is behind the scenes. For example, we used authenticity to frame the first three weeks around authentic learning by looking at: 1) the authentic subject, 2) the learner, and 3) the learning activity. And before we embarked on planning a lesson in S&T we had a discussion about how we might plan for authenticity as we plan learning experiences.

Looking back at our time together (… while looking ahead to teaching) in what ways has our interaction with authenticity been a blessing? In what ways might it have been inauthentic? Thank you for your thoughts!
Appendix D

Self-Reflection

Figure D1

Teaching the Subject Authentically and Teaching the Student Authentically

“Would you mind to describe for me what you believe is the distinction between teaching the subject authentically and teaching the students authentically?”

Hmmm. Maybe I should remind myself that I have loosely defined authenticity as the capacity to know who I am and to remain true to that person. Embedded in my working definition is the need for self-reflection (… hence self-study). To know who I am – meaning and purpose. To know who I am – significance and potential. And to realize that the answers to these questions are rooted in whose I am (c.f. LD #1). But authenticity also involves remaining true to who I am, in other words, to not be a hypocrite – harmony between inner and outer self.

So then, teaching a subject like science authentically and teaching students authentically. In some ways they are distinct and in other ways they overlap. Teaching science authentically involves being true to the discipline, so as much as is possible and in an age-appropriate manner, try to make the study of science resemble the discipline. Not only in trying to emulate true scientific practice (… which incidentally vary considerably; see Thomas Kuhn), but also in trying to capture the experience of “searching for ignorance” and the sense of “wonder” that these discoveries evoke. Teaching (science) authentically also implies teaching in a manner that is true to who I am. There are many areas of science that I enjoy and am enthusiastic about (chemistry, biology) but if I am honest with myself and with my students, other areas less so (physics, space science). If I am going to teach these latter areas of science authentically then I will have to work harder in my preparation.

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If I then consider teaching my students authentically, then I need to know that not every student is as enthusiastic about science as I am or that they may prefer those areas that are not my favourite. I think part of teaching students authentically is having students self-reflect on their own inclinations and past learning experiences. What do they enjoy most/least about a subject? Why is that? As I get to know my students I can also help them to articulate these things about themselves. Teaching students authentically also requires helping them to see whose they are, no matter what the subject matter is. Teaching (students) authentically also implies knowing what my interpersonal strengths and weaknesses are and then working on the latter. Above all, teaching students authentically involves caring for each of them as people, created in the image of God, the Author, who has also brought each of them into covenant relationship.

By contrast, inauthentic teaching of students and inauthentic teaching of the subject both reflect the same problem – a lack of care for the subject and a lack of care for the student. For example, in science class this may manifest as lessons that are textbook and worksheet laden. But inauthentic learning may also occur when a certain malaise sets in, especially when a teacher has taught a subject or grade for many years. It may be a bit of a paradox, but I suppose a teacher like that could teach a subject well but do so inauthentically. I think of my own experience teaching high school biology or chemistry for 16 years or so. Hmmm. Something to ponder further. As a teacher, self-reflection will always expose areas of the subject where my knowledge could grow, as well as ways of engaging my students better as people. There is always room for growth – to continue to learn.

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