

NOVICE AND EXPERIENCED SCIENCE TEACHERS' PERSPECTIVES ON THEORY
AND PRACTICE: A SHIFT TOWARD INTEGRATING EVERYDAY AND ACADEMIC
CONCEPTS

by

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Abstract

The current research used a Vygotskian approach, in particular his definitions of everyday and academic concepts, to examine the perspectives of two novice and two experienced science teachers on the relationship between theory and practice. Semi-structured and artefact-mediated interviews were used to examine novice and experienced science teachers' definitions of theory, practice, and learning, as well as their experiences in teacher education, and their expectations for their future pedagogy. Thematic analysis was conducted to analyze and interpret the interviews and the artefacts produced. There were five findings that emerged from the research: different perspectives on theory and its role in decision-making processes; a shift in perspective on teaching practice, student practice, and learning; the importance of gaining teaching experience—and further education—in the development of effective teaching; how the role a teacher candidate plays, as a student or a teacher, affects their learning and identity construction and; the importance of the relationships between the university and the practicum school. There were eight barriers that appeared to affect teacher candidate learning and development that were identified in the research and eight recommendations were articulated to overcome these barriers. Three of the recommendations included: for teacher education programs to examine ways to make theory explicit and to discuss how to apply theory and practice; to develop assessments that assess teacher candidates' understanding of theory and their ability to apply theory in practice; to increase time for guided dialogue and reflection around why certain strategies are used in different contexts and/or for different students and how theoretical grounding can help teachers think about approaching classroom interactions. Working toward the integration of everyday and academic concepts in teacher education may enable the development of theory and

practice as related academic concepts, thus, improving their internalization as psychological tools that facilitate learning and development in classroom contexts.

Preface

This thesis is an original, unpublished work by the author, Tara-Lynn O'Reilly. The information reported in the research was covered by UBC Human Ethics Board Certificate number H13-01978.

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Lastly, I would like to thank my family, friends, and loved ones who have supported me throughout my journey, providing me with advice, encouragement, and laughs—when needed—along the way.

Dedication

To all my students: past, present, and future.

Chapter 1: Introduction

Research on learning and development in teacher education highlights several issues that have impacted and continue to impact the success of teacher education programs (Cochran-Smith, 2001; Gambhir, Broad, Evans & Gaskell, 2008). For example, research has shown that teacher candidates continue to see student teaching as not only the most important aspect of teacher education, but also the only aspect worthwhile (Cochran-Smith, 2001). Courses that are considered to be significant by teacher educators, such as courses on child development, educational philosophy, and diverse learners, tend to be devalued and unrecognized as important by teacher candidates (Conway & Clark, 2003; Sandholtz, 2011; You, Kang & Lee, 2010). Once teacher candidates are immersed in their practicum, they are often more concerned about classroom management, delivery of the course content, and surviving student teaching (Cochran-Smith, 2001).

According to the National Council for Accreditation of Teacher Education (NCATE) (2006) there is a need for new research on the outcomes of teacher education programs that explores the theories teacher candidates learn during their teacher education programs, and how teacher candidates use theories in their practicum experiences. Research has found that, frequently, teacher candidates ask how to implement and apply educational theories in their teaching practice (Gordon & O'Brien, 2007). This research highlights teacher candidates' confusion around potential misconceptions of what it means to apply a theory to teaching practice and the relevance of applying the theories they have learned in their education program. Educational theories are often viewed as ideal and philosophical concepts that are distant from the realities of schooling and teaching. This perceived division brings forth a concern that the separation between theory and practice is understood as an unbridgeable gap.

With continued research, the gap may be minimized and the value of integrating the two concepts may be further understood (Gordon & O'Brien, 2007). According to NCATE (2006), teacher education programs are teaching educational theories, but not teaching enough on how to apply theory in practice. It is important to explore the relationships between how teacher candidates use the theory and practice taught in their teacher education programs, and how they make meaning of these during their practicum experience in order to integrate theory and practice as related academic concepts in their future pedagogy. This is significant for a number of reasons not the least of which is the significance of ensuring teacher candidates can utilize the educational theories they have learned in their teacher education programs.

Another related issue is the difficulty novice teachers seem to have in developing perspectives on the relationship between theory and practice. Following Vygotsky (1987), this research proposes that, while there are many ways to co-create perspectives on the relationship between theory and practice, integrating theory and practice as related academic concepts may enable the kind of learning and development in teacher education programs necessary for teacher candidates, and novice teachers, to learn and apply theory in practice. Developing theory and practice as academic concepts in a conceptual system, therefore, as psychological tools, may facilitate the development of perspectives on effective teaching. Ultimately, this has implications for teacher learning and development, as well as the learning and development of future students in their classrooms.

As a current secondary science teacher, a graduate from a research intensive teacher education program, a sponsor teacher to teacher candidates in this education program, and as a researcher, I am exposed first hand to the disconnect between theory and practice. My experiences inform this research into novice and experienced teachers' perspectives on the

relationship between theory and practice, and investigating what novice teachers learned in their teacher education programs and how this differed from the perspectives of experienced teachers.

This chapter is divided into four sections. In the first section, I link current research in teacher education with the theoretical framework for this qualitative study. In the second section, I discuss the context and characterize the study. In the third section, I introduce the research questions and provide an overview of methodology used in the study. In the fourth section, I discuss the significance of the research in relation to teacher education and the development of science educators. This chapter ends with a brief summary and overview of the rest of the chapters.

Theory and Practice in Teacher Education: A Vygotskian Framework

One of the major criticisms of teacher education is that the field is lacking theoretical foundations (NCATE, 2006; Otero, 2006). A related concern, the importance of integrating theory and practice, stems not only because the two are inseparable as complimentary paradigms of knowledge, but also because theory allows an understanding for why certain results are obtained from certain practices (Otero, 2006). Even if teacher candidates have taken an educational psychology course, and understand various educational theories of learning, human development, and conceptual development, it is crucial that they have the opportunity to reflect on their understanding through opportunities to apply theory during course work and in the context of their own student teaching classroom. Theory and practice should not be taught as two separate entities, and teacher education programs share a part of the responsibility to ensure teacher candidates have explicit opportunities to develop the relationship between theory and practice and to integrate theory and practice as related academic concepts in their teaching pedagogy (Otero, 2006).

Current work addressing the separation of theory and practice in teacher education has drawn upon Vygotsky's (1987, 1994) sociocultural theory and, in particular, the concept of unity to maintain the relationship between theory and practice. The concept of unity foregrounds the significance of studying holistic units of analysis in order to maintain relationships between entities like theory and practice, social and individual, cognition and emotion, and thinking and speaking. The relationship maintained is not merely uni- or even bi-directional, but is dialectical and, therefore, constitutive of change over time. The dialectical relationship between theory and practice is fluid in that it is continuously developing and being re-constructed over time, as new research emerges—in this case, in teaching and learning.

In addition, Vygotsky (1987) used the concept of unity to ground the dialectical relationship between everyday (i.e., concrete, experiential) and academic (i.e., abstract, conceptual) concepts. Everyday concepts develop from daily, lived experiences. They occur in the context of participation in family and community activities, and are, therefore, rich, concrete and saturated with emotion. An example of an everyday concept could be developing an intuitive understanding about how to keep warm or cool down, based for example, on closing the door if it is cold or opening windows when it is hot (Fleer, 2009). Conversely, academic concepts are abstract and have a different developmental history than everyday concepts. For example, an understanding of insulation, how it works on both cold and hot days, that derives from formal school instruction is an example of an academic concept. Academic concepts are taught as definitions and relationships between words, situated within knowledge systems in formal educational settings, thus, they are decontextualized and abstract.

Vygotsky (1987) argued that everyday concepts lay the foundation for the development of academic concepts. Everyday concepts, grounded in day-to-day life experiences, create the

potential for the development of academic concepts in the context of more formal school experiences. Teacher candidates' ability to develop and integrate everyday concepts and academic concepts are important pathways toward academic thinking (Fleer, 2009). During schooling, academic concepts tend to be emphasized, but in order for them to be appropriated they must be integrated with prior everyday knowledge and experience. Everyday concepts are not replaced by academic concepts, but must be integrated with academic concepts to construct meaning. Without this integration between everyday and academic concepts, academic concepts tend to become distorted: they may not have been understood to begin with, or they may not have been understood in relation to other concepts in a systematic fashion, and this limits their usefulness.

Moreover, everyday concepts grounded in practical experiences may enable theoretical understandings (Hedges, 2012). "Working theories" are present from childhood to adulthood. They represent the tentative, evolving ideas and understandings formulated by individuals as they engage with others to think, wonder, learn and make sense of the world in order to participate more effectively within in their communities (Hedges, 2012). This research argues that novice teachers' "working theories," largely based on everyday concepts can mediate the development of theory and practice as related academic concepts and help develop conceptions of the relationship between theory and practice in classroom contexts. Indeed, Hedgegaard and Chaiklin (2005) proposed that the most powerful learning contexts are those where the educator is aware of everyday concepts and academic concepts when preparing for learning. Knowing how everyday concepts and academic concepts can be used within educational settings is important for building pedagogical approaches for teacher education programs with specific values placed on integrating theory and practice as related academic concepts.

An understanding of novice teachers' perspectives on the relationship between theory and practice is central if integrating theory and practice as related academic concepts throughout education program experiences is a goal. Understanding and integrating theory and practice as academic concepts can allow novice teachers' to apply it in practica experience, as well as implement theory and practice as related academic concepts in their future teaching positions. The significance of understanding and integrating theory and practice as related academic concepts highlights the role of psychological tools, or culturally constructed tools that become tools for thinking and learning and, for novice teachers, tools for thinking about, and reflecting on teaching as well. The differences between everyday and academic concepts are two of several key concepts from Vygotsky's (1987) work that framed this research. Definitions for the following concepts are offered and elaborated in Chapter 2: the general law of cultural development, the zone of proximal development, mediation and psychological tools, and everyday and academic concepts.

The goal of the current research is to investigate novice and experienced science teachers' perspectives on the relationship between theory and practice, with the hopes of contributing to research on the extend to which and how novice teachers and teacher candidates in science come to conceptualize theory and practice. If teacher candidates are exposed to theories and are given the opportunity to build on their developing understanding of the relationship between theory and practice, then perhaps teacher candidates and novice teachers can integrate theory and practice as related academic concepts to better guide their own teaching practice (see Figure 1).

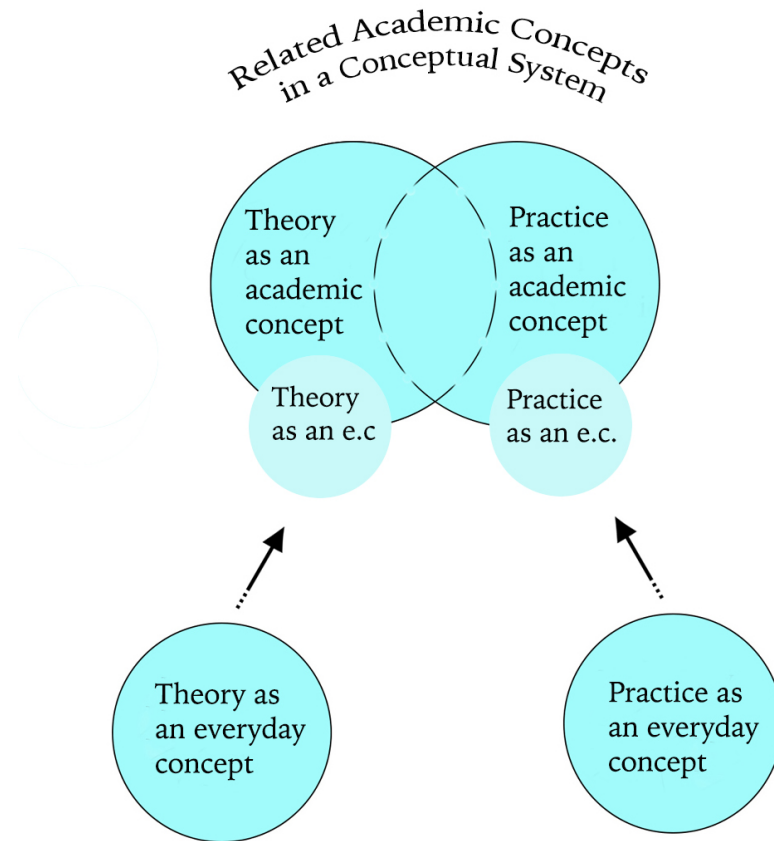


Figure 1: A goal for teacher education: The integration of everyday and academic concepts of theory and practice.

Context of the Study

The participants in this study graduated from TMU, a research-intensive university in British Columbia. According to the university's website, students who applied for the Bachelor of Education Program were required to have completed a Bachelor's Degree, in addition to completing a detailed online application. The university accepted approximately 800 students in the Bachelor of Education Program and required that each teacher candidate received a Criminal Record clearance from the Ministry of Public Safety and Solicitor General prior to practicum placements. This section describes the context of the teacher education program at TMU, my

experience as a sponsor teacher for teacher candidates from this program, and the participants in this study.

Teacher Education at TMU

The university's website indicated the teacher candidates committed to 12 months of accelerated studies from September to August. The program placed the teacher candidates into learning groups called cohorts, in which secondary teacher candidates were most often placed in cohorts defined by one or two teaching subjects. At the time of this study, 15 different secondary teaching subject specializations were offered, including Art, English, Mathematics and Science. The teacher candidates remained in their assigned cohort for the duration of the 12-month program, and were unlikely to be placed together during their practica experiences.

The Bachelor of Education Program required that the secondary teacher candidates complete 61-68 credits to successfully complete the program. Teacher candidates enrolled in eight courses during the fall semester. During this semester the teacher candidates also completed a 2-week practicum at a secondary school, in which the majority of their time was typically spent engaging and connecting with their respective sponsor teachers, familiarizing themselves with potential future students, establishing connections within the practicum school, and observing a variety of teachers in a variety of teaching disciplines. Emphasis was placed on cultivating professional understanding about teaching and learning, as well as inquiry and reflection. Within this 2-week period the teacher candidate engaged in team teaching one or two lessons with their sponsor teacher, as well as taught lessons independently, which occurred toward the end of their 2-week practicum experience. Although, the teacher candidates taught a few lessons, generally speaking, there was limited focus on instructional responsibilities during this time.

Experiences as a Sponsor Teacher in Science

In my experience as a current secondary science teacher and a sponsor teacher for teacher candidates in this education program, this is typically what occurred in the teacher education program. Previously, as a sponsor teacher, my mentoring role was to provide the teacher candidate with continuous formative feedback, guidance, and support throughout their teaching practica. During the first week of the 2-week practicum, I encouraged the teacher candidates that I worked with to observe a variety of classroom teachers and diverse learners, and noted the variety of teaching strategies that were implemented in the different subject areas and in different instructional activities. During the second week of the 2-week practicum, we co-created a lesson plan that the teacher candidate taught either independently or together. Teacher candidates typically taught two or three lessons during the 2-week practicum. Prior to the teacher candidate teaching the lessons, I reviewed the lesson plan with the teacher candidate. We reviewed the content of the lesson, the students' intended learning outcomes based on the British Columbia Ministry of Education's prescribed learning outcomes, the importance, value and goals of the lesson, teaching strategies, and time management all through a sociocultural lens. Immediately after the lesson, I provided constructive feedback to the teacher candidate, highlighting the teacher candidate's areas of strengths and areas for improvement.

After the 2-week practicum, I was responsible for filling out an evaluation form, which queried if the teacher candidate showed the potential of being successful during the 10-week school-based practicum and the 3-week enhanced practicum, which was a community-based field experience. Together my evaluation and the evaluation of the faculty advisor needed to indicate that the teacher candidate had successfully completed their placement and was ready to prepare for the 10-week school-based practicum at the end of January. The teacher candidates

returned to the university after their 2-week practicum, completed course work in preparation for their 10-week school-based practicum.

Typically in January, prior to the 10-week practicum, teacher candidates were enrolled in two courses: a developmental theories course and a classroom community course. Each course was 3 weeks in length and was one credit towards their final degree. Once these courses were completed at the end of January the teacher candidates embarked on a 13-week practicum, which was divided into a 10-week school-based practicum and a 3-week community-based practicum (Faculty Advisor, personal communication, May 2012).

According to the university, the practicum experience was designed to link theory and practice of education alongside a professional experienced teacher. The teacher candidates were typically at the same school in which they completed their 2-week and their 10-week practicum. During this time, the teacher candidates did not attend additional classes at the university, as they were fully immersed in their practice teaching.

Prior to teaching any lessons, the teacher candidates were expected to provide their faculty advisor and their sponsor teacher with unit plans and individual lesson plans. This ensured that there is time for the teacher candidates, faculty advisor, and sponsor teacher to go over the activities, learning goals, and structure of the lesson that the teacher candidate had prepared (Faculty Advisor, personal communication, May 2012). In my experience, once the teacher candidate was fully immersed into their 10-week practicum, lesson plans were continuously changing and the lesson that was initially prepared in advance for an upcoming lesson was not actually what was taught. Most often teacher candidates were working on their lesson plan for the following day a couple of days before, or more realistically, the night before the lesson. As a sponsor teacher it was my responsibility to support and encourage the teacher

candidates to make sure that the goals of the lesson were established, and they had the appropriate tools necessary to create the lesson.

The 10-week school-based practicum was designed to allow teacher candidates to “phase-in” to their responsibilities. In the first 2 weeks of the practicum, the teacher candidate was engaged in a 20% teaching load. This typically consisted of teaching one course, in which the teacher candidate had one course to prepare for, but may have taught two sections of the same course. Depending on the dynamic of the school, this varied for the teacher candidate.

After the first 2 weeks, the teacher candidate was expected to engage in a 40% teaching load for an additional 2 weeks. This may have included preparing and teaching two different courses. After the first 4 weeks were over, the phase-in stage ended, and for 8 weeks the teacher candidate was engaged in an 80% teaching load. During the maximum teaching load in a semester system, the teacher candidate was most likely teaching three out of the four classes within the day. At a linear school, the teacher candidate taught six classes over the span of 2 days. This typically consisted of teaching three different courses, and was subject to vary depending on the sponsor teacher’s schedule.

Towards the end of the practicum, there was a phase-out stage in which the teacher candidate reduced the teaching load back down to 40% for 1 week, and was then further reduced to a 20% teaching load. The teacher candidate typically started and ended with the same class and, therefore, had been working with the group of students for the entire duration of their 10-week practicum. During the last week of the practicum, teacher candidates had the opportunity to observe a variety of different classrooms and teaching styles performed by a variety of teachers within the school. This may have provided the teacher candidates a time to reflect on different teaching approaches and strategies within various curricular areas (Faculty Advisor,

personal communication, May 2012). Although, the intention was for teacher candidates to use their phase-out stage to reflect and observe a variety of other classes, it was not always what happened in the final week of the practicum. Based on my experiences working with teacher candidates, I noticed that teacher candidates were busy preparing for their final classes, marking assignments, and entering grades in the computer system and, therefore, did not have the time for reflection or observing other teachers' classrooms (personal experience, 2012).

Throughout the 10-week practicum, sponsor teachers and faculty advisors observed teacher candidates informally and formally, completing one formal assessment evaluation per week. In addition, there was mid-way evaluation that was completed independently by the sponsor teacher and the faculty advisor. During this mid-way evaluation period, the teacher candidate, sponsor teacher, and the faculty advisor arranged a time to collaborate and discuss the teacher candidate's strengths and areas for improvement. The mid-way evaluation was based on a practicum checklist, which was divided into six sections of focus. These areas focused on, but were not limited to, professional qualities, curriculum and assessment, and classroom climate. The sponsor teacher and faculty advisor indicated if the teacher candidate was not meeting expectations, approaching expectations, or consistently meeting expectations.

The practica offered teacher candidates unique and challenging teaching experiences. Each experience played a significant role in the professional education of prospective teachers and was a prerequisite for successfully completing the teacher education program. Apart from teaching in the classroom, teacher candidates were encouraged to build upon student relationships outside of the classroom. They were encouraged to become involved in coaching, supervising school events, or sponsoring clubs in addition to their teaching requirements. Those that did become involved in school activities, and co-created relationships with students outside

of the classroom, found their overall experience as a teacher candidate that much more valuable (Teacher Candidate, personal communication, 2012).

At the end of the 10-week practicum, a formal evaluation was completed by the sponsor teacher and the faculty advisor that represented an evaluation indicating if the teacher candidate was successful during their practicum. The final evaluation was based on the areas of focus as noted previously. Specific examples of the evaluation on each area included: developed a rapport with students, communicated curriculum content clearly, demonstrated sensitivity to individual diversity, selected appropriate goals in accordance to IRPs, acted on advice to improve practica, and demonstrated enthusiasm and a positive attitude for teaching and learning. The evaluation was an assessment designed to highlight the aspects of teaching that are important in order for teacher candidates to be successful in their future teaching experiences. The evaluation checklist provided by the university's teacher education program did not assess the teacher candidates' developing conceptions of the relationship between theory and practice, nor did it focus on their application of theory in practice or how their practical experiences may have challenged their understanding of theory.

Upon a successful evaluation of their 10-week practicum, in which the teacher candidates had consistently met expectations for all aspects of the evaluation, they completed a 3-week community-based practicum. The community-based practicum consisted of, but was not limited to an experience in Science World and the Aquarium. After successful completion of the 3-week enhanced practicum, the teacher candidates returned to the university and completed their final courses required for the Bachelor of Education Program.

Once the teacher candidate had successfully completed the 12-month Bachelor of Education Program, the Ministry of Education Teacher Regulation Branch recommended the

teacher candidate for initial teacher certification. Upon graduation from the program, the teacher candidates would be qualified to apply for certification to teach in the province of British Columbia.

The Participants: Novice and Experienced Science Teachers

This qualitative research involved working with two novice and two experienced science teachers who graduated from the teacher education program at TMU, a research-intensive university in the Lower Mainland of British Columbia, Canada. All four participants were registered in a 12-month Bachelor of Education Program at the same university, and specialized in teaching science to secondary students. The novice teachers completed two practica at suburban schools in the Lower Mainland. These suburban schools were located within the same geographic area, composed of two school districts, and included students in grades 8 through to grade 12. The first practicum experience was 2 weeks, and the second practicum experience was 10 weeks. Once the novice teachers completed their 10-week practicum, they were then required to complete a 3-week community-based practicum. The community-based practicum was designed to help teachers develop a broader view of education outside of a formal classroom setting. Community partners included the Arts Club Theatre Company, Vancouver Holocaust Education Centre, PALS Autism School Society, and Science World. The experienced teachers completed two practica at suburban schools in the Lower Mainland. The first practicum was 2-weeks, and the second practicum was 13-weeks. When the experienced teachers were in the teacher education program the 3-week community-based practicum was not a component program.

Research Questions and Methodology

The research questions for this study were articulated with the purpose of investigating the participants' perspectives on the relationship between theory and practice both during their teacher education program and at the time of the study. The questions focused on the participants' overall experiences during their teacher education program and probed for information about their perspectives on theory and practice when they were enrolled in courses at the university, prior to their practica, during their practica, and in relation to future pedagogy. Their perspectives on their faculty advisors', sponsor teachers', and students' perspectives in regard to theory, practice, and the relationship between theory and practice, were also queried.

Research Questions

- 1) What do the participants remember learning about the relationship between theory and practice in their teacher education program?
- 2) How do novice science teachers' perspectives on theory and practice compare to experienced science teachers' perspectives on theory and practice?

Sub questions

- A) What are the participants' perspectives on theory, practice, and learning?
- B) What are the participants' perspectives on how theory and practice are integrated in teacher education courses, in both non-methods courses and methods courses?
- C) How does theory influence participants' teaching practice? For example, do they use theory to make decisions regarding strategies used in lesson planning, classroom management, or differentiated assessments?

Two important clarifications need to be made here. First, for teacher candidates, prior knowledge cannot be simply viewed as equivalent to everyday concepts because before entering

the education program they have completed their Bachelor of Science degree. Individually, they brought diverse experiences and frames of reference and were adult learners who developed some academic concepts in their K-12 schooling and university. For teacher candidates, and novice teachers, some everyday concepts and academic concepts may have merged through mediated learning and this can influence the further development of concepts and their learning. Second, in this research, teacher candidates were taught by university instructors, faculty associates, and sponsor teachers. The university instructors who taught teacher candidates at the university were not necessarily faculty members of the university. Faculty associates were typically, but were not always, experienced secondary teachers who were seconded teachers to the university for a temporary appointment, and sponsor teachers were current teachers in secondary classrooms.

Methodology

In this study, I used a qualitative approach to examine the perspectives of novice and experienced science teachers on theory, practice, and learning and the relationship between theory and practice. Two recently graduated novice teachers who completed the secondary science program and two experienced teachers (one of whom was the researcher), both with 10 years of science teaching, were engaged in interviews. The novice teachers engaged in two interviews. The experienced teachers engaged in one extended interview that consisted of the same questions and framework as the novice teachers. For the novice teachers, the first interview focused on theory and practice, and the second interview focused on learning. For the experienced teachers, the one extended interview focused on theory, practice, and learning. All of the interviews were semi-structured. A semi-structured interview allowed for open-ended questioning, in which new ideas could be brought forth (Patton, 2002). In addition, all of the

interviews were mediated by the co-construction of an artefact to help represent the participant's perspectives on the relationships between theory and practice with the use of additional key concepts.

The first interview for the novice teachers was semi-structured with open-ended questions that engaged participants in reflection on and articulation of their experiences in teacher education with specific attention on how theory and practice were positioned in course materials, assignments, practica experiences, and student teaching. The interview also focused on participants' perspectives on their teacher educators' and secondary students' perspectives on theory and practice. Together, we co-constructed a concept map as an artefact that helped express relationships among theory, practice, the university, practicum school, and learning. The co-construction of the concept map was guided by the following words to help the participants explain their perspectives: theory, practice, university, practicum school, and learning. The first set of interviews was approximately one hour, and was personally transcribed.

After the first interviews with the novice teachers were transcribed, a second interview was conducted with the same novice teachers. This was also a semi-structured interview with open-ended questions that were parallel to the first interview questions, but focused on the novice teachers' perspectives on learning, rather than theory and practice. The interview also focused on the participants' perspectives on their teacher educators' and secondary students' perspectives on learning. Together, we revisited the concept map that we co-created in the first interview to generate new and continued dialogue on the relationships among theory, practice, the university, the practicum school, and learning. For the novice teachers, community-based practicum was added as an additional concept in the second interview when we co-constructed

the artefact. The second set of interviews with the novice teachers was approximately one hour, and was personally transcribed.

The extended interview for the experienced teachers included the same formatting and open-ended questions that were used with the novice teachers. The interviews for the experienced teachers were approximately 90 minutes. One difference to note is that as the researcher and one of the participants, I did not record and transcribe my interview in the same fashion as the other three participants; rather, I reflected on the questions and wrote my responses in a word document as an auto-interview. For all the interviews—transcribed and written—I used a thematic analysis to analyze the data in relation to the research questions (Braun & Clarke, 2006).

Significance of the Research

Research within the field of science education was identified as a priority area in the NCATE (2006) report. Indeed, there is a need for research on the outcomes of preparing teachers in subject areas and grade levels in science in addition to subjects like secondary mathematics and English (Cochran-Smith, 2005). Mortimer and Scott (2003) argued for research on how academic concepts are developed through language and other modes of communication in science classrooms. They demonstrated that classroom dialogue and other rhetorical devices in science education is important, and this new direction for science education research signals a move away from studies focusing on individual student understandings of specific phenomena towards research into the ways in which understandings are developed in a social context of science classrooms. Sociocultural theory is one of the main traditions that has informed this research.

Teaching science is both similar and different from teaching other subject disciplines. Focusing on the differences, science teachers have to introduce a whole new “science” language to a classroom of students, making available to students the scientific concepts referred to as the “academic story.” The “academic story” represents the way the scientific perspective is narrated to the students in the social plane of the classroom so as to make it accessible to them (Mortimer & Scott, 2003). Among other curricular objectives, a key goal of science teachers is to promote students’ understandings of scientific concepts, such as photosynthesis and cellular respiration. When teaching is grounded in a sociocultural framework, teachers facilitate student learning by making the academic story available through discussion and dialogue, assisting students in making sense of scientific concepts, and supporting students in applying scientific concepts. Scientific concepts make up students’ stories linking concepts to theory. In facilitating the development of students’ “academic story,” the teacher needs to be aware of the students’ prior knowledge, everyday concepts, and the heterogeneity that exists within a classroom in order to effectively approach the meaning making process (Mortimer & El-Hani, 2014).

Although a variety of theories may be mentioned throughout a teacher education program, what importance do these theories play in practice if there were few opportunities to apply, reflect on, and integrate theory into practical settings? According to Britzman (1991), much teacher education research does not examine what theory means to those learning to teach. It seems as though the importance of theory is undermined, affecting the learning and development of teacher candidates and students, and future teaching practices. Currently, teacher education programs emphasize mastery of subject content as a critical component for quality education. However, the application of theory is a missing element in most teacher education programs (NCATE, 2006). In my experience as a sponsor teacher, it would have been

valuable to determine if teacher candidates were using strategies grounded in theory when developing their teaching pedagogy, but I had neither the language to articulate my evolving understanding nor the language to emphasize the importance of educational theory in practice. It was not until later that I learned of Vygotsky's (1987) sociocultural theory, as well as the differentiation between everyday and academic concepts. This is elaborated in Chapter 2.

As a current secondary science teacher and an experienced sponsor teacher, I now recognize the importance of facilitating the development of perspectives on the relationship between theory and practice. Thus, guided by my interests as a current secondary science teacher, and the work done by Mortimer and Scott (2003) in secondary science classrooms, I begin this research with two questions: 1) what do the participants remember learning about the relationship between theory and practice in their teacher education program? and 2) how do the perspectives of novice science teachers compare with experienced science teachers' perspectives on theory and practice?

Summary

Investigating novice and experienced science teachers' perspectives on theory and practice, the relationship between theory and practice, and their ability to integrate theory and practice as related academic concepts in classroom contexts is imperative to the continued success in teaching and learning for teacher candidates. Integrating theory and practice as related academic concepts and understanding how theory and practice can be applied in a classroom may lead to more engaging and motivating teacher education environments and, therefore, foster teacher candidates' learning and development. Certainly, from a sociocultural perspective the development of academic concepts is central to the development of teachers.

Chapter 2 provides a literature review for the key concepts in this study and grounds the research using a sociocultural framework. Chapter 3 describes my position as the researcher and the methodology used in the research. Chapter 4 compares includes a comparison between the novice teachers' perspectives on theory, practice, and learning. Chapter 5 includes a comparison between the experienced teachers' perspectives on theory, practice, and learning. Chapter 6 summarizes the research findings and includes a comparison across all the participants' perspectives on theory, practice, and learning. In addition, the chapter provides recommendations for teacher education programs, limitations of the research, and questions for future research.

Chapter 2: Literature Review

Chapter 2 provides a literature review that grounds concepts in the research questions within the literature and elaborates the sociocultural framework proposed by Vygotsky. This chapter consists of two sections. The first section reviews literature on teacher education programs and addresses issues within teacher education programs, including the division between theory and practice within teacher education programs, practicum school and university partnerships, models of teacher education programs, and the assessment of teacher candidates. In addition, this section reviews research on teacher candidates' and novice teachers' perspectives on teaching and learning. The second section describes key concepts in Vygotsky's theoretical framework, including the general genetic law of cultural development, the zone of proximal development, mediation, a description of the internalization process, and role in the development of social, private, and inner speech, and the importance of dialogue as a tool throughout the process of development. Within this section, I discuss the construction of everyday and academic concepts, and Vygotsky's unique perspective on the development of these concepts. I end this chapter with a brief summary.

Research in Teacher Education

Teacher education programs vary in structure and duration across North America, and these differences have a significant influence on program delivery for teacher candidates and their opportunity for theoretical and practical experiences (van Nuland, 2011). Within Canada, teacher education is offered in 62 institutions throughout the country's 10 provinces, and programs are not currently offered in the three territories.

Canadian teacher education programs typically follow one of two structures: consecutive or concurrent. In British Columbia, a Bachelor of Education (BEd) program for secondary

teacher candidates typically introduces teacher candidates to the principles of teaching, development, theoretical, and pedagogical frameworks, and methodology for teaching specialization subjects. To successfully complete a Bachelor of Education (BEd), consecutive students first complete an undergraduate degree, followed by a 2 to 4-semester program of study specifically in teacher education. Depending on the post secondary institution, the teacher education program is usually 12 months or 24 months in duration (Gambhir, Broad, Evans, & Gaskell, 2008; van Nuland, 2011). In this kind of program, there tends to be a more diverse population of teacher candidates in terms of age, past careers, and expertise (Gambhir et al., 2008). In concurrent education programs, students acquire an undergraduate degree and a BEd degree simultaneously within 4 to 6 years. This model allows students to take education courses in their fourth and fifth year, which leads to a BEd (Gambhir et al., 2008).

Regardless of the program structure, consecutive or concurrent, teacher candidates undertake professional and methodological courses providing opportunities for the teacher candidates to gain basic knowledge, skills, and practica experiences to enter into the field of teaching (van Nuland, 2011). During the practicum component of teacher education programs, teacher candidates observe and practice teaching in a school as an opportunity to apply theoretical, practical, and experiential knowledge to construct an understanding of the profession. Throughout the practicum experience, teacher candidates' responsibilities gradually increase over the course of the practicum period and the teacher candidate assumes full responsibility for teaching by the end of their practicum. Although the scheduled practicum experiences vary among faculties and by program structure, Canada's western and eastern provinces typically have a 10-20 week practicum (van Nuland, 2011). The structure of the teacher education

programs throughout Canada has changed throughout the years, and continues to evolve with the intention to maximize teacher candidate learning and development.

Teacher education programs have developed over the years, and the focus of what drives the field continues to change. Historically, teacher education programs have not regarded theory and the application of theory in practice as essential components for quality teaching (NCATE, 2006). In the 1950's, teacher education programs focused on attributes of teacher candidates. What are the attributes and qualities of good teachers? In the 1960's through to the mid 1980's, the development of teacher education programs shifted to focus on teaching strategies and processes that are used in effective teaching. In the 1980's to the late 1990's, knowledge drove teacher education programs. What should teachers know and be able to do? What skills, knowledge, and dispositions should teacher candidate's possess (Cochran-Smith, 2001)? According to Stoddart, Connell, Stofflet, and Peck (1993), the pedagogy and conceptual understanding of content influences the ability of teacher candidates to be successful. Therefore, teaching teacher candidates' subject matter can lead to a greater conceptual understanding and improve their own understanding of content, leading to greater student understanding. According to NCATE (2006), integrating content knowledge, knowledge of children, family, community, and pedagogy is important for teacher development, and as teacher education programs evolve, the importance of developing teacher candidates' perspectives on the relationship between theory and practice, and how theory can be applied in practice, continue to be regarded as essential components of effective teaching.

In the Canada and the United States, there are many differences in perspectives on how and where teachers should be educated, what teacher candidates should learn (or not learn), and what theories of teaching and learning should guide teacher candidates' learning (Cochran-

Smith, 2001). In comparison to other Canadian education programs, there are significant similarities in regards to the proposed objectives of the program, duration of the program, classes required, practical experiences, evaluation of teacher candidates' success, and the certification accredited among education programs is consistent. One difference that seems to surface is in research intensive universities: if the program is in a research intensive university, faculty members tend to be engaged in teaching in graduate programs and, therefore, the teacher education program courses tend to be taught by people other than tenure track faculty members. This may have an influence on the teacher candidates' experiences.

In the United States, there are greater differences and inconsistencies involved when looking at ways in which people can become a certified teacher. Evidence shows that there is neither consensus in the United States about how teacher candidates should be educated, nor what is valued in the teacher education programs (Cochran-Smith, 2001; Kraft, 2001). The “standards-based reform movement” in the United States has publicized the perspective that to improve the quality of teaching, standards for what beginning and experienced teachers should know and be able to do in classrooms must be articulated and met (Kraft, 2001). Standards in teacher education have had a long history. Fear was generated that the schools in the United States were lagging behind most developed nations in terms of literacy rates, mathematic and core academic subjects competency, leading to a “nation at risk” (Kraft, 2001). To try and ensure quality in teaching, the National Council for Accreditation of Teacher Education (NCATE), the Interstate New Teacher Assessment and Support Consortium (INTASC), and the National Board for Professional Teaching Standards (NBPTS), as well as other organizations, collaborated to establish a complimentary system of standards that addresses how teacher

education programs provide teacher candidates with the knowledge, skills, and disposition to be effective teachers.

Also, for initial certification in the United States, most states require teachers to write a paper and pen test that involves a combination of general knowledge, communication and literacy skills, knowledge of the subject matter, and pedagogy with the intention of measuring quality teachers in accordance with the standards-based reform movement (Cochran-Smith, 2001). Of post-secondary institutions in the United States, 500 out of 1200 institutions that recommend teachers for certification are not nationally accredited (Cochran-Smith, 2001). Having said this, there is major criticism against the standards-based reform movement and questions raised about the ultimate impact that standards at any level can have on improving education (Kraft, 2001).

Issues in Teacher Education Programs

Teacher education literature reports that there are issues with teacher education programs, such as a divide between theory and practice, the relationship between the practicum school and the university, different models of the education programs, and the assessment of teacher candidates (Kerr, Mandzuk, & Raptis, 2011; Kubli, 2005). How questions and assessments of teacher education programs are constructed not only drives policy and practice, but can also impact the purpose of schooling and perceptions of the nature of teaching and learning (Cochran-Smith, 2001). This section highlights four issues within teacher education programs: 1) the well documented issue regarding the disconnect between university course work taught in teacher education programs and the school-based practicum experience of the teacher education program; 2) the difficult history of the partnership between the university and the school; 3) the

different models of teacher education programs, and; 4) the assessment of teacher candidates during their practica experiences.

The Theory and Practice Divide in Teacher Education Programs

Theories presented in education programs are often presented to teacher candidates as abstract ideas and may not be integrated into practical experiences. This may make it challenging for teacher candidates to integrate theory and practice as related academic concepts in classroom contexts (Kubli, 2005). The importance of integrating theory and practice stems not only from the fact that the two are inseparable as complementary paradigms of knowledge, but also because theory allows an understanding of why certain results are obtained from certain practice (Kerr, Mandzuk, & Raptis, 2011; Otero, 2006). It is fundamentally important to bridge the gap between theory and practice in teacher education programs. Neville Scarfe, Dean of Education at University of British Columbia in 1969, claimed that one of the key challenges of teacher education was that teacher candidates find it challenging to translate educational thought into practice (Kerr et al., 2011).

In teacher education programs, there is a range of coursework that contributes to the preparation of teachers, such as developmental psychology, specific subject content and methods for teaching specific content, educational philosophy, assessment, and classroom management. However, none of these subjects of study provide an exact prescription for what to do in specific situations that may arise in different teaching contexts. Teacher candidates enter teacher education programs with prior beliefs about education, epistemologies, and ideas of how students learn and develop (Kerr et al., 2011). The knowledge of principles and the application of such principles depend upon teacher candidates' "working theories" (Hedges, 2012). Rather than teaching about exact prescriptions for what to do in a particular classroom context, it is valuable

to learn about theoretical frameworks, as well as to have the opportunity to implement theoretically grounded strategies and reflect on these strategies during the teacher candidates' practica experiences (Otero, 2006). Teacher candidates may not be aware of how to apply theory in practice, and/or how it relates to learning (Britzman, 1991). According to Vygotsky (1987), theoretical ideas, knowledge, and skills and practical ideas should not be taught as two separate entities, and it is a shared responsibility of the teacher education program to ensure teacher candidates have explicit opportunities to integrate theory and practice (Otero, 2006).

Sandholtz (2011) indicated that gaining experience is not equivalent to learning from experience. Through reflective practices teacher candidates may come to understand the value of the experiences and apply their understanding to new experiences in an array of contexts. Teacher candidates must engage in thoughtful application of theory and practice to teaching situations in order for them to engage in an informed and critical examination of theories in their practice (Kerr et al., 2011). This engagement can occur with university professors, sponsor teachers, faculty advisors, and peers within their education program, during and after their practica experiences. Reflective inquiry into one's own and others' teaching practices is an integral component of teacher education programs. Dewey (1916) claimed that reflection requires teachers to "confront the complexity of students and their learning, of themselves and their teaching, their subject matter, and the contexts in which all these operate" (p. 864). Understanding and integrating theory and practice as related academic concepts can allow teacher candidates to reflect on their own experiences and then make meaning of their own experiences. It is important for teacher candidates to "reflect in action," as well as "reflect after the fact" (Falkenberg, 2010a, p.13). Having a group of teacher candidates, sponsor teachers, faculty advisors, and university professors collaborate may provide an opportunity for teacher

candidates to engage in rich dialogue examining the teacher candidates' developing understanding of the relationship between theory and practice, and their understanding of theory and practice as related academic concepts.

Practicum School and University Partnership

Many teacher education programs are traditional in the sense that the teacher candidates are enrolled in university courses and directly attend these classes at the university. The only time that teacher candidates are in secondary classroom contexts is during the practicum experiences, and there is often a disconnect between the practicum schools and the university. There is increasing evidence in the professional development literature that professional and collaborative learning communities contribute positively to the learning of teachers (Betts, 2011). These communities foster increased learning opportunities for a group of educators to plan, implement and reflect, where a team is more likely to detect the many ways that teaching impacts learning, and use these observations to further inform their practice. Teacher candidates can benefit from participation in professional learning communities, both with their peers and with other education professionals (Betts, 2011).

The concept of practicum school-university partnerships in teacher education is not a new concept, yet these programs are hard to develop and sustain. One goal of the partnership is to co-construct a relationship in which more meaningful linkages can be made by teacher candidates between the content, theory, and practice they learn in their course work and their practicum experiences. The experiences can allow teacher candidates, university instructors, faculty advisors, and sponsor teachers to debrief, reflect, and make immediate course theory-to-practicum connections. Learning is enhanced when teacher candidates are provided with multiple opportunities to apply what they have learned in meaningful contexts. Close proximity

of university courses to actual classrooms allows teachable moments to be seized, and teacher candidates can apply theory learned to practice in real time rather than abstractly, which is usually the case in traditional education programs (Allsop, DeMarie, Alvarez-McHatton & Doone, 2006). This model could foster developing understandings of the relationship between theory and practice because of the potential to enrich course content with the unique contexts and contingencies of each practicum school. A course in the practicum school can build on focused observations by teacher candidates of explicit and implicit theories enacted with the practicum school, engaging in reflection that support professional theory building and the critical use of educational theory; this brings educational theory to life, so it can indeed inform practice (Betts, 2011).

Teacher education models involving strong practicum school-university partnerships attempt to bridge the disconnect between theory and practice by promoting ongoing relationships with partner schools, university faculty, and teacher candidates. This partnership model can be effective, yet, it is challenging to establish and sustain. If there are not significant efforts at building coherence and consistency in theoretical concepts and relationship building between the university and the school sites, the theory and practice disconnect can be increased and the development of research-informed practice is lessened (Gambhir et al., 2008). It is challenging to physically create the space that fosters the partnership between the school and the university. In addition to the daily job requirements, it is also challenging for university instructors, faculty advisors, sponsor teachers, and teacher candidates to commit to this partnership because of the time and energy required to co-create a successful partnership (Betts, 2011).

Models for Teacher Education Programs

There are a variety of models for teacher education programs. In addition to the concurrent and consecutive models mentioned earlier, there are also other teacher education programs, such as the six week “fast track” teacher education workshops that are available in New Jersey and Texas (Cochran-Smith, 2001), all of which have different outcomes. One concern in teacher education is the program model that is being implemented for teacher candidates. This includes the duration of the teacher education program, and includes the length of the practica experiences. One of the greatest challenges with the “fast track” program model is the intensity of delivering comprehensive course content, educational theories, and practicum placements in shorter teacher education programs (Gambhir et al., 2008). The topics covered may be limited in depth and breadth and more time may be needed for developing teaching skills, developing teacher candidates’ understanding of the relationship between theory and practice, and integrating theory and practice as related academic concepts in educational contexts. Despite potential set backs to the shorter education programs, they continue to exist and are prevalent in the United States.

According to Kraft (2001), there has been a projected enrolment increase in the United States elementary and secondary schools of approximately 3 million new students. This indicates more teachers will be hired, and to ease the demand some school districts may lower the standards and hire less qualified teachers. This is typically the case in fast growing populations, areas of increased poverty and lower socioeconomic status, and where the attrition rate for teachers is significantly high. New Jersey and Texas are two states that now advocate for alternative routes with six-week “fast track” teacher education workshops as a preferred entry into teaching. The zeitgeist to move away from a university preparation toward the completion

of a fast track program increases the likelihood of a disconnect between theory and practice. According to Darling-Hammond (2012), teacher candidates who have had more preparation for teaching are more confident and successful with secondary students than those who have had little or none. Recent evidence also indicates that improvements of teacher education creating programs with extended practicum preparation interwoven with coursework on learning and teaching produce teachers who are both more effective and more likely to enter and stay in teaching (Darling-Hammond, 2000, 2012).

New and effective pedagogy for teacher education is sought after in order to link theory and practice, and the fast track programs do not provide sufficient time to allow teacher candidates to develop perspectives on theory and practice as related academic concepts and implement these academic concepts during their practicum experience (Korthagen, Loughran, & Russell, 2006). Research suggests that the quality of teacher education matters for teachers' effectiveness. Teaching for inquiry, problem solving, and co-construction of knowledge requires teachers not only to have knowledge of subject matter, which is often over emphasized in characterizing a "good teacher," but also an understanding of pedagogical knowledge, including the integration of theory and practice. Developing understandings of the relationship between theory and practice and being able to integrate theory and practice can help teacher candidates organize a productive learning environment for diverse students with a variety of needs, prior knowledge and experiences (Darling-Hammond, 2000, 2012).

Moving away from fast track programs is critical for the development of teacher education. Aside from high attrition rates, studies of short term alternative programs have also noted that there is little pedagogical preparation and institutions tend to focus more on singular teaching techniques, rather than a range of methods and on specific, immediate advice, rather

than on research or theory (Darling-Hammond, 2000). Placing the focus of research on the dialectical relationship between theory and practice may foster the development of teacher candidates' perspectives on theory and practice across the education program.

Assessment of Teacher Candidates

A fourth concern is teacher candidate assessments that are conducted to determine if teacher candidates have been successful during their education program, and are ready to teach in their own classroom. There are conflicting opinions about how teacher candidates should be assessed and the validity of teacher candidate assessments (Waggoner & Carroll, 2014). In the United States, there are standard-based assessments designed by accreditation and licensure agencies (Waggoner & Carroll, 2014). NCATE (2008) summarized essential teacher competencies in five areas: content knowledge, pedagogical content knowledge, pedagogical knowledge, student learning, and professional dispositions. In addition, some states have implemented teacher candidate assessments that measure students' actual academic growth with predicted growth in a classroom using standardized testing. Value Added Modeling (VAM) has become an approach mandated in certain states. VAM is a system that uses student learning to assess teacher effectiveness and preparedness. Correlating student performance and teacher effectiveness is concerning, and research has indicated that this is not an accurate assessment for teacher candidates (Waggoner & Carroll, 2014). There are also concerns around external mandates developed for teacher education programs to implement.

Although, there may be standards in place, the teacher education program assessments for the teacher candidates may not coincide with the assessments set by external mandates. The assessments may not be valid and/or accurate based on the expectations that have been set. For instance, NCATE (2006) indicated that there is a gap between understanding the relationship

between theory and practice, but assessments of teacher candidates may not measure this aspect. According to Quatroche et al. (2012), teacher candidates are expected to be able to demonstrate that they can link theory learned in the teacher education university classes with the practice in the practicum settings. According to the university foregrounded in the current research, linking theory and practice is also an aspect of the teacher education program as noted on TMU's website. Although, teacher education programs understand the importance of linking theory and practice, one challenge is the development and use of an assessment that measures this aspect with validity.

Teacher Candidates' Developing Perspectives on Learning and Teaching

Developing highly qualified, effective teachers has always been a stated goal of teacher education programs. The term "effective teacher" can be interpreted and defined differently. Teacher candidates develop conceptions of what it means to be an effective teacher before entering their education program and their practicum experiences (Conway & Clark, 2003). Teacher candidates' understandings may be different in comparison to the public's view of an effective teacher. The public may define an effective teacher as one who is highly qualified, knowledgeable in their subject area, and who holds a Bachelor's degree, teaching license or certificate (Brown, Morehead & Smith, 2008). As teacher candidates progress through the teacher education program, their perspectives on effective teaching evolve. Teacher candidates' development exhibits an outward oriented pattern, shifting from concerns about themselves to concerns about students' learning, as well as inward oriented patterns shifting from personal capacity to manage a classroom to personal capacity for professional growth (Conway & Clark, 2003).

Research also suggests that teacher candidates' initial perspectives on effective teaching focus on classroom management and personal attributes such as caring, level of empathy, and patience, as well as student centeredness, which includes encouragement and an affinity for children. The perspectives on effective teaching shifts for experienced teachers, away from teacher delivery and more towards student participation (Sandholtz, 2011).

Teacher candidates highlight the importance of student participation, in and of itself, as the reason the lesson was effective and focus less on student understanding. Research indicates that one main reason why secondary students are not successful in the school system, and some disengage and drop out, is a lack of engagement and learning in schools (Croninger & Lee, 2001). Although engagement is important in instruction, teacher candidates seem to overlook the possibility that the classroom activities can be engaging without leading to student learning. In other words, teacher candidates are assuming that lessons are effective because student engagement is high, rather than reflecting on the level of student learning. The notion of engagement and motivation being significant factors in education is supported by Wertsch (2007) who proposed that if the goal of education is to “socialize students to use socioculturally provided and sanctioned semiotic means, the issue is how to engage them in a way that will lead to increasing levels of expertise” (p. 190). Engagement must lead to learning and development; engagement alone is not an end in itself.

Vygotskian Concepts and Theoretical Framework

This section defines key concepts of Vygotsky's sociocultural theory, providing a foundation for understanding psychological functioning and the significance of developing teacher candidates', novice and experienced science teachers' perspectives on the relationship between theory and practice. An overview of the general genetic law of cultural development is

provided followed by a description of the zone of proximal development, mediation, the internalization process and its role in the development of social, inner, and private speech, as well as the importance of dialogue in learning and development. In this section, I also elaborate the development of everyday and academic concepts and their significance as psychological tools.

General Genetic Law of Cultural Development

Vygotsky's (1987) sociocultural theory focuses on human psychological functioning as situated in historical, social, and cultural contexts. The foundations of Vygotsky's theoretical framework are built upon both the social origin and cultural means of development, with particular attention to how human development occurs over time. Vygotsky emphasized that in order to understand an individual's psychological functioning, analyzing social practices in which they emerge is essential. His theory emphasized how psychological functioning develops from a biological beginning point to a specifically human cultural form of psychological functioning. Human psychological functioning originates in interpersonal social practices mediated by cultural tools that have evolved over time (Ferryhough, 1996).

Vygotsky (1978) argued that higher psychological functioning is shared socially before it becomes an aspect of individual functioning, noting: "Any function in the child's cultural development appears twice, or on two planes. First it appears between people as an interpsychological category, and then within a child as an intrapsychological category" (p. 60). Wertsch (1985) highlighted an example in Vygotsky's work in which an infant's movement is transformed over time into a meaningful gesture. What appears to the adult like a gesture, initially a general movement made by the infant, is interpreted by the caregiver to be meaningful and to reflect the desire of the infant for an object. Over time, the infant begins to learn that the

movement can be indicative: it can indicate to others the infant's desires. From this perspective, the adult imposes meaning on the infant's movement and, thus, the infant learns the movement is meaningful only after the adult has interpreted it as such. The gesture has meaning for the adult before it has meaning for the infant; that meaning is co-constructed by the adult-infant interaction. The significance of the grasping gesture did not exist until the infant internalized the meaning of the behaviour. This example demonstrates that the functions of the grasping behaviour itself have undergone a change, from a behaviour directed toward an object, to a behaviour directed toward another individual. Now the gesture becomes a sign for the adult, something that can be used to mean or indicate a desire. This becomes possible for the infant because the caregiver has interpreted his/her gesture as meaningful.

Vygotsky described the relationship between the interpsychological and intrapsychological planes in connection with mediation and the development of speech in a book he wrote in 1929:

...any higher mental function which has emerged in the process of human historical development appears on the scene twice. It first appears as a part of socio-psychological adaptation, as a form of interaction and co-operation among people, as an interpsychological category. The best example of this is the development of speech. We all know that the process of inner speech has great significance for human thinking in modern times. This significance is so great that many authors are inclined to equate thinking and speaking. Incidentally, there was a time when the human race knew absolutely nothing of the mental function that we call inner speech. Speech is first a communicative ordination of behaviour. Only afterwards, by applying the same mode of behaviour to oneself, do humans develop inner speech. In this process, they, as it were,

preserve the “function of social interaction” in their individual behaviour. They apply the social mode of action to themselves. Under this condition, the individual function becomes in essence a unique form of internal collaboration with oneself. (Vygotsky, 1960, p. 450-451, cited in Wertsch & Stone, 1985, p. 172)

The general genetic law of cultural development highlights the significance of human participation in social practices and the means of participation, or speech. In order to understand different functions of speech one must analyze their ontogenetic origins, historically, socially, and culturally. Social, private, and inner speech—as essential speech functions—are defined after the zone of proximal development and mediation respectively.

The Zone of Proximal Development

The zone of proximal development is a concept in Vygotsky’s sociocultural theory that is significant in understanding individual development as a result of social interactions. The zone of proximal development can be described as the region between an individual’s actual development level, determined by independent problem solving, and the individual’s potential development level, determined by problem solving under guidance from more capable individuals such as teachers or through peer collaboration (Wertsch & Stone, 1985). Vygotsky first introduced the concept of the zone of proximal development in response to summative assessment practices, such as IQ tests and standardized tests, which were used to evaluate an individual’s intellectual abilities. Vygotsky claimed that assessment practices focused primarily on the academic output from each individual, and he claimed that the potential an individual possessed was more important because it allowed the assessment of future learning and development. Assessments should focus not only on actual development, but also on the process of identifying functions on the verge of development (Wertsch & Stone, 1985).

Vygotsky (1978) stated, “What the child can do in co-operation today he can do alone tomorrow” (p. 188). The zone of proximal development bridges the gap between what students have the potential to understand and what they currently understand. Having said this, teachers can be cognisant of their students’ current level of development in order to ensure that student groups can foster individual higher mental functioning. Since learning leads to development in the zone of proximal development, instruction should be designed to reach a developmental level that is just above the students’ current developmental level, or just beyond where the student can operate without assistance. It would be ineffective if a teacher guided instruction toward a level of development that has already been reached, or toward a level of development that is beyond the current reach of the child even with assistance.

The zone of proximal development is not limited to the progress of children, rather it applies to all individuals; we are continuously learning and developing. In development there is not a final endpoint or goal, rather it is a process that is ongoing as a result of access to and developing proficiency with cultural tools. For example, when teacher candidates work with their peers, sponsor teachers, and teacher educators within their zones of proximal development, changes in psychological functions and the relationships between psychological functions are possible (Vadeboncoeur, 1998). Within their zones of proximal development, teacher candidates can integrate theory and practice as related academic concepts and internalize these as psychological tools that can lead to greater professional development, as well as the ability to support increased development for their own students in their future classrooms.

Mediation

Mediation is central to human existence, as well as to Vygotsky’s (1987) theory. Vygotsky (1987) proposed that cultural tools used to mediate social practices can be used in the

development of individual activity, such as the development of social, private, and inner speech, as well as everyday and academic concepts (Wertsch, 1980). Cultural material tools are external in nature and the objective of using cultural tools is directed at mastering or influencing the natural environment. Examples of tools can be pencils, computers, and artefacts used in a classroom. Mediation also takes place using psychological tools. Psychological tools are internal in nature and the objective of using psychological tools is directed at mastering or influencing one's own behaviour (Vygotsky, 1978). The primary psychological tool is language, and even more specifically, speech. Speech mediates actions on the interpsychological level and the intrapsychological level, influencing not only our own actions and thinking, but the actions and thought processes of others as well. Humans use culturally created material and psychological tools to mediate their social environments. Psychological tools can also help in conceptualizing the world around us, aiding in analyzing, planning, designing, and reflecting (Warford, 2011).

Vygotsky argued that the internalization of psychological tools leads to the human capacity to think. According to Eun (2008), different cultural tools can act as mediators and can change in different contexts; they are not fixed entities. The process of development is not the result of maturation or transmission, rather development is a continuous process of internalizing psychological tools and the change in psychological functions and relations between functions that results. Vygotsky viewed development occurring on a continuum, and psychological tools continuously change as well. Psychological tools are not contextually fixed; rather individuals engaging in social interactions co-create “toolkits” in which a variety of psychological tools can be used in different contexts, allowing them to develop higher psychological functioning in different environments. For example, language or theory, and other psychological tools can

change and can be interpreted differently in a variety of social and cultural contexts. In this research, the emphasis is placed on understanding the importance of the relationship between theory and practice, and using theory and practice as psychological tools that may lead to integrating theory and practice as related academic concepts that enable meaning making in science classrooms.

Internalization and Social, Private, and Inner Speech

Following the general genetic law of development described earlier, internalization is the process through which social functions, and in particular social speech, is transformed from the interpsychological plane to the intrapsychological plane. Understanding human learning and development as social and cultural practices, rather than as an individual process, implies that higher psychological functioning is made possible through the social interactions between people. An example of this process is the development of speech. Speech that is initially social in nature, and used for communication between people, develops into audible private speech for oneself, and ultimately into inner speech for oneself, or verbal thinking (Eun, 2008; Vygotsky, 1978). Private speech is defined by Vygotsky (1978) as audible speech that is used for self-guidance and self-regulation of behaviours, for example, when children and adults talk to themselves when tasks become more difficult. When internalization takes place, inner speech is not simply a direct transfer of knowledge from the interpsychological plane to the intrapsychological plane. Internalization results in a transformation in inner speech. Private speech and inner speech are not isolated phenomena; these speech functions have their origin in social interactions and social speech, although their form and function differ.

Generally social speech is the interchange of words between one person and another. In addition, social speech can take place during reading and writing, and can involve the use of

gestures, diagrams and other non-verbal interactions, in addition to verbal interactions (Mercer & Littleton, 2007). Social speech is a ubiquitous, flexible, and a creative meaning-making tool that is useful for understanding its role in the development of zones of proximal development and the capacity for individuals to direct their own thinking. Social speech in a classroom allows for further engagement and collaboration with the potential to maximize student learning and development. Although working and learning with other people is common outside of classrooms, the history of education shows that social speech amongst students has rarely been incorporated as purposefully as it could be in mainstream classrooms (Mercer & Littleton, 2007).

Traditionally, social speech in classrooms has been discouraged and treated as disruptive and subversive. Even in child-centred approaches that emphasize the autonomy of children, the significance of social speech has tended to be downplayed in favour of individual action (Manning & Payne, 1993). Although ideas have changed to some extent in recent years, social speech among students in some contexts may still be regarded with unease by some teachers in that a noisy classroom may be viewed by their colleagues as chaotic, disorganized, and a place where ineffective teaching and learning is occurring. From a historical perspective, a teacher-centred approach to teaching and learning was accepted and was considered most effective, but now the importance of social speech in classrooms challenges traditional views and focuses more on the sociocultural accounts of the nature of learning and development proposed by Vygotsky (Manning & Payne, 1993). Vygotsky focused on the internalization of social speech and how this is transformed by individual meaning. Language practices, first used by others, representing the interpsychological plane, and later used by oneself, representing the intrapsychological plane, enables an individual to develop the capacity to direct her own thinking (Manning & Payne, 1993).

Although the acts of internalization are social processes, eventually the students need to be able to independently demonstrate their understanding of concepts (Kubli, 2005). Internalization is a process, and typically does not occur after one social interaction. Sufficient time and support for social interactions must be available in order for intrapsychological development to occur (Eun, 2008). Social interactions and collaborative engagement that discontinue before internalization occurs may not contribute to development. In addition, social interactions must be framed with a purpose. Otherwise it is possible for social interactions without goals to have minimal influence on development. In other words, social interactions with little structure or purpose may not lead to development, just as all experiences do not lead to learning experiences. Social interactions embedded in purposeful activities directed at achieving specific goals can drive learning and development (Eun, 2008). In this research, this also applies to teacher candidates making meaning and internalizing theories that are taught throughout their teacher education programs. There needs to be multiple opportunities for teacher candidates to work within their zones of proximal development engaging in conversations around theory at the university and the practicum school. Ideally, the social processes involving social speech around theories will be sufficiently purposeful and supported to lead to the development of private speech and inner speech, and the theories are understood as academic concepts. Theory, as an academic concept can become a part of inner speech and can be used as a psychological tool and be applied to pedagogy.

In addition, the environment in which the social interactions occur influences the internalization process, and plays a significant role in development (Vygotsky, 1978). Co-creating a collaborative and safe environment is important for development to take place in a classroom. The environment influences development in that every individual becomes aware of,

interprets, and emotionally relates to certain events in an environment in different ways (Vygotsky, 1994; Wertsch, 1985). The environment cannot be regarded as a static entity, or one that is peripheral in relation to development. Individual and environment are related and ensuring that the individuals feel like they have contributed to the co-creation of the environment is essential for them to engage in discussions and become active learners; both are essential components for development (Vygotsky, 1994; Wentzel & Wigfield, 2007). This is important in my research in relation to establishing a collaborative environment among the university instructors, faculty advisor, sponsor teacher, and the teacher candidates, which can contribute to the teacher candidates' learning and development.

Teachers, including teacher candidates, and students can co-create a classroom environment in which students feel safe sharing ideas and engaging in class discussions. In this environment, teachers need to be a part of their students' learning and be actively engaged themselves. Taking initiative to be a part of the learning process provides the teacher with an opportunity to create relationships and camaraderie in the classroom. Working within such an environment can encourage students to become more actively involved in their learning, more interested in the material, which can mediate the opportunity for students to work with their peers, and teachers, striving to reach beyond their potential and maximizing development (Kubli, 2005; Wentzel & Wigfield, 2007). From a research perspective, this helps demonstrate the influence of, and importance of, Vygotskian perspectives in understanding teacher education.

Everyday Concepts and Academic Concepts

The development of everyday concepts and academic concepts is a significant component of teacher education programs that is frequently taken for granted, rather than assessed. Everyday concepts and academic concepts influence each other, but differ in their history of

development. Everyday concepts develop directly from experiences of the individual away from any formal system of knowledge. The development occurs from isolated experiences of the individual that relate directly to objects due to immediate experience in an environment.

Academic concepts develop within formal contexts mediated by language and social speech.

Academic concepts develop deductively, beginning with verbal definitions and word relationships that are guided by a person's everyday concepts and experiences. Everyday concepts serve as a foundation for academic concepts to develop, and academic concepts enhance the level of everyday concept development (Vygotsky, 1987).

Integrating theory and practice as related academic concepts can help teacher candidates develop as successful teachers. Everyday concepts are defined as spontaneous concepts that lack conscious awareness (Vygotsky, 1987). For example, an individual may tie a knot properly, but may lack conscious awareness of the act. The individuals' attention was directed toward the act of tying the knot, not on how to tie the knot. In other words, the act was done consciously; however, the individual cannot say precisely how they have done the tying (Wertsch, 1985). The act of tying can become the object of consciousness when there is conscious awareness.

Conscious awareness is defined as awareness of the activity of the mind; the consciousness of being conscious. Conscious awareness is a form of consciousness that exists when consciousness itself becomes the object of consciousness (Wertsch, 1985), and it requires the use of psychological tools, and specifically language, and conceptual development.

Academic concepts are defined as concepts that have conscious awareness and volition. Being aware of the thought process and mindful during learning is an important aspect of academic concepts. Academic concepts have a different relationship to the individual's experience, in that they have a different relationship to the object that they represent, and in that

they follow a different path during development (Wertsch, 1985). Thinking about the act of tying a knot, being aware of the thinking, and translating this thinking to new contexts demonstrates conscious awareness and distinguishes everyday concepts from academic concepts.

The development of everyday concepts creates opportunities for academic concepts to develop and when academic concepts develop this can elicit changes in everyday concepts (Vygotsky, 1987). Development is continuous in that the development of academic concepts is not the completion of development; rather is the beginning of new directions leading to even further development, and the process of concept formation is mediated by individuals working with others in their zones of proximal development. It is also important to note that the strength of the academic concept is the weakness of the everyday concept, just as the strength of the everyday concept is the weakness of the academic concept (Wertsch, 1985).

Vygotsky (1987) explained this relationship by comparing the processes of learning a foreign language to that of learning a native language. Learning a foreign language relies on the semantic aspect of the native language, and has its foundations in the knowledge of a person's native language. Perhaps less obvious is the idea that the foreign language influences the development of the native language. The conscious awareness of linguistic forms and the level of abstraction of linguistic phenomena increase. The person develops a more conscious, voluntary capacity to use words as tools of thought and as a means of expressing ideas. Vygotsky (1987) indicated that a person who does not know at least one other foreign language does not know her/his own language.

Understanding the relationship between everyday concepts and academic concepts and their developmental history is important for teachers, teacher educators, and teacher education programs. Trying to directly teach academic concepts is ineffective; they cannot be transferred

from one person to another. A teacher who attempts to use this approach achieves mindless learning of words: “empty verbalism” (Vygotsky, 1987). The individual learns not the concept, but the word and this word is taken over by the individual through memory, rather than thought. Developing concepts is a social process that takes time for word meaning to become internalized and develop into a concept. Often as adults, according to Vygotsky (1987), we do not think in academic concepts.

Summary

This chapter reviewed literature on teacher education programs, and, more specifically addressed issues within teacher education programs. Issues that surfaced in the literature included the division between theory and practice, the practicum school and university partnership, models of teacher education programs, and assessments of teacher candidates. These issues informed my use of Vygotsky’s (1987) theory in this research, and specifically his emphasis on the differentiation between everyday and academic concepts and the importance of their integration for conceptual development.

Chapter 3: Methodology

This qualitative study used semi-structured and artefact-mediated interviews to gather data. The interviews focused on collecting data from participants around their perspectives on theory, practice, and the relationship between theory and practice. Questions focused on the significance of theory in their university course work and their practica experiences, the amount of theory presented in the teacher education program, as well as how theory was presented in the teacher education program. The questions highlighted what participants learned about the relationship between theory and practice in their education programs, and how this may influence their perspective on teaching and teaching pedagogy before, during, and after their practica experiences in future teaching positions.

This chapter begins with a section on researcher positionality that includes a statement of my position as the researcher. The second section describes the qualitative research design, followed by a section on participant selection. The last section explains the methods of data collection and the thematic analysis. It includes a description of the first semi-structured artefact-mediated interview, a description of the second semi-structured artefact-mediated interview, and an explanation of the transcription process, as well as approaches for coding and interpreting themes from data using procedures for thematic analysis.

Researcher Positionality

I was fortunate enough to complete a teacher education program at a research-intensive university. Since my graduation, I have also been fortunate to teach Junior Science and Senior Biology for the last 10 years within a local school district. As well, I have been a sponsor teacher working with teacher candidates from the teacher education program at this university, TMU. My array of experiences affiliated with TMU has allowed me the opportunity to reflect on my

own teaching practice and pedagogy, as well as to engage in rich dialogue with colleagues about the teaching profession. In more recent years, I have become more aware of building a greater understanding of what makes an effective classroom in which teachers and students co-create an environment where learning and development are continuously taking place. Specifically, what has surfaced is the importance of the relationship between theory and practice and integrating theory and practice as related academic concepts within classroom contexts to support meaning making.

Being a qualitative researcher has allowed me the opportunity to further my own learning and development, focusing specifically on the importance of the relationship between theory and practice in an educational context. I have always been passionate about co-creating environments that foster engagement, motivation, learning and development, and have realized through my graduate studies that seeing and integrating theory and practice as related academic concepts can lead to greater teacher candidate success and, therefore, to greater student success. Development is ongoing and continuous for all individuals. Collaborating with colleagues and working with teacher candidates to maximize student engagement and development has been a part of my professional learning and development process throughout my career. Based on my experiences, if teacher candidates were provided greater experiences to help develop their perspectives on the relationship between theory and practice and were provided greater opportunity to integrate theory and practice as related academic concepts, then it is more likely that they would positively impact the development of their future students.

During my graduate studies, I realized the importance of integrating theory in my classroom, but this developed even more when I started working with novice teachers. In them, I recognized the disconnect between theory and practice. Theory was often affiliated with the

education program's university course work, and was seen as a separate entity from the practica experiences. In my experiences as a sponsor teacher, and as a teacher candidate myself, it seemed as though teacher candidates were minimally aware of the relationship between theory and practice and did not recognize the importance of integrating theory and practice and the effects this might have on their pedagogy. This has motivated me to investigate novice teachers' perspectives on the relationship between theory and practice and of integrating theory and practice as related academic concepts. From a Vygotskian perspective, integrating theory and practice as related academic concepts is a requirement for both theory and practice to become useful as psychological tools.

Research Design: Qualitative Research

Qualitative methods include semi-structured interviews with open-ended questions that yield in-depth responses about people's experiences, perspectives, opinions, feelings, and knowledge (Patton, 2002). The purpose of gathering responses to open-ended questions in a semi-structured interview, is to enable the researcher to understand and capture the perspectives of other people without predetermining those points of view through selective questionnaires, as seen with quantitative measurements (Patton, 2002). The interviews conducted for this research were semi-structured and artefact-mediated, and consisted of open-ended questions. The interviews were audiotaped using a tablet recording device, and later transcribed and analyzed. It is important to note that as the researcher, and a participant, I did not audiotape my interview, rather I wrote down my reflections to the interview questions in a computer word document.

Ethical Clearance and Informed Consent

Prior to data collection, I submitted an application to the Behavioural Research Ethics Board (BREB), and the committee reviewed my proposal to ensure protection of participants.

Upon ethical approval from BREB, I ensured that all participants were informed of the goal of the research, the purpose and procedure of the interviews, and that their interviews would be recorded, transcribed, and analyzed. I renewed the ethics once during the research to ensure I had continued approval from BREB throughout the research process.

Informed consent was collected prior to the data collection process. According to Silverman (2005), informed consent consists of three factors. The first is that relevant information about the research is given to participants to ensure that the participants are actually making an informed decision about their individual participation. The second factor is to ensure that participants understand what their role is in the study. The third factor is to ensure that participation is voluntary. Confidentiality was considered and maintained throughout the study. Pseudonyms were used in the study to replace specific names of participants and the university in order to ensure anonymity.

Participant Recruitment

Given university policy on student privacy, I did not have access to the names and email addresses of the novice teachers that were recent graduates from the teacher education program. I contacted the university and a member of the teacher education program was able to forward the request for participation via email to all of the science teacher candidates that graduated from the teacher education program the previous year. The email indicated that the research was looking for participants who were currently enrolled in the teacher education program or were recent graduates from the program. In addition, the participants had to have a specialization in science, taught secondary science during their practicum and were willing to participate in two interviews, one in the spring and the other in the summer. This type of data collection falls under criterion sampling as all participants will have taught a form of science in their practica

experiences. Criterion sampling can also add an important qualitative component to an ongoing monitoring system, and follow up interviews can be conducted for further analysis and quality assurance (Patton, 2002). In addition, because I worked with teacher candidates directly as a sponsor teacher, and had the chance to co-create relationships with other teacher candidates, this allowed me to build contacts and, therefore, provided me with the opportunity to expand the potential number of teacher candidates who were willing to participate in my qualitative research.

For various reasons, the email invitation that I shared with approximately 75 teacher candidates yielded only two science recent graduates who were willing to participate in the research. In addition, I sent out a district wide email, to two different districts, in hopes to connect with experienced science teachers who were willing to participate in the research. One teacher responded to the email, and was the experienced science teacher who participated in the research. Given the range of experience in these three participants, I decided to include my own interview as a method of including my own experience in this research. I answered all of the same questions, and typed my responses directly into a word document stored on a computer. The interviews with the other three participants were audio recorded and then transcribed. For the interviews, I made arrangements around the schedules of my participants, and conducted the interviews at locations that were convenient for the participants. This included coffee shops, libraries, schools, and the participants' homes. I also ensured that confidentiality and ethics for the research were approved before starting the interviewing process. In total, there were four participants in this study: two novice teachers who were recent graduates of the teacher education program, and two experienced science teachers with 10 years experience each. All of

the participants completed a practicum in the Lower Mainland, and attended the same university for their teacher education degree.

Qualitative Interviewing

There are several variations in qualitative interviewing (Patton, 2002). These interview variations include informal conversational interviews, general interview guided approach, and the standardized open-ended interview. These approaches differ in extent to which interview questions are determined before the interview occurs. The informal conversational interview relies on the spontaneous generation of questions in the natural flow of an ongoing participant observation. The general interview guide approach involves outlining a set of issues that are to be explored with each participant before the interviewing begins. The guide serves as an outline or checklist to ensure specific topics are covered. The standardized open-ended interview consists of a set of questions carefully worded and arranged with the intention of taking each participant through the same questions (Patton, 2002). This consistency is beneficial for the comparability of responses, organizing, coding, and making meaning of central themes from the data collected. There are predetermined open-ended questions, and the interviewer is able to facilitate, probe, and guide the participants in generating enriched discourse. This allows for the opportunity of capturing more in-depth discourse, in which the interviewer is a part of the process, making the experience a personal form of research as opposed to questionnaires (Kvale, 1996; Patton, 2002; Valenzuela & Shrivasteva, 2013). For this study, I used semi-structured and artefact-mediated interviews to collect data. Both are described next.

First Interview: Semi-Structured, Artefact-Mediated

The first semi-structured, artefact-mediated interviews were approximately an hour in length, and were done separately with the researcher. Open-ended questions were used to

facilitate the interview as a means of collecting information-rich data (see Appendix A). The questions were asked in similar wording from participant to participant in all interviews. The interview questions focused on the participants' perspectives on the relationship between theory and practice, and how theory may have influenced them during their practica, and teaching experiences when creating lesson planning, strategies, and designing assessments. I also inquired about the participants' perspectives on their university instructors', faculty advisor's, sponsor teacher's, and secondary students' perspectives on the importance of the relationship between theory and practice. At the end of each interview we co-constructed a concept-map involving the terms theory, practice, university, practicum school, and learning with the intention to form a visual representation of the relationship among the terms (see Appendix B). They were given a large blank sheet of paper, a writing utensil, and I provided them with the following words to guide the co-construction of the concept map: theory, practice, university, practicum, and learning. The artefact was used as a Vygotskian tool to help better understand the participants perspectives, and to add to their voice from the interview. The artefact was created in the first interview, and was revisited in the second interview with the novice teachers. The experienced science teachers participated in one interview, and they did not revisit the artefact or have the opportunity to add to their existing perspectives. The interviews were all audio recorded using a tablet-recording device and were then transcribed into written form in order to conduct a thematic analysis (Braun & Clarke, 2006). Prior to thematic analysis of the first interviews, second interviews were conducted and were also transcribed into written form. It is important to note that the first interviews occurred in the spring, and at this time one novice teacher, Gavin, had completed experience as a teacher-on-call, but recently begun a career in

computer programming. The other novice teacher, Andrea, had also completed experience as a teacher-on-call, and had a temporary contract at a secondary school.

Second Interview: Semi-Structured, Artefact-Mediated

The second interviews were semi-structured and artefact-mediated, and were done individually by the same participants. The interviews consisted of open-ended questions and were approximately an hour long each. The questions focused on the teacher candidates' perspectives on learning, and on the importance of theory and practice in relation to learning (see Appendix C). We revisited the co-constructed artefact from the first interview and added to the existing relationships and connections we made previously. The artefact was used to help probe for new developments in their perspectives on the relationship between theory and practice. We added the word community-based practicum, and built on the existing relationships and connections that we constructed in the previous interview. For the novice teachers, there was approximately three months between their first and second interview, and the experienced teachers had participated in one extended interview that consisted of the same questions and formatting that made up both interviews for the novice teachers. At the time of the second interview, Gavin had decided to leave the teaching profession, and to work full-time in computer programming. Andrea was teaching full-time at a secondary school, and was exploring graduate school opportunities.

Interview Transcriptions

Recording the interviews allowed me to be actively engaged in the interview, rather than being fixated on writing down the conversation. Prior to starting the interviews, I indicated to the participants that our interview would be audio recorded and that at any time during our interview the recording device could be turned off. I recorded the interviews on a tablet and was

able to play and pause the recordings at a pace that allowed me to transcribe the interviews. I included verbal, non-verbal utterances, such as short and long pauses, punctuation, and intonation to help retain the participants' responses (see Appendix D).

It is important to note that although, transcriptions are often considered data they are a preliminary analysis given the kinds of decisions that must be made in order to create a transcript from an audio recording (Ochs, 1979). The transcription process is responsive to cultural biases and itself biases reading and inferences (Ochs, 1979). According to Ochs (1979), during analysis of adult communication, non-verbal communications that take place during the interview immediately are often minimized. Non-verbal behaviours are acknowledged, but such behaviour tends to be treated as a set of variables that co-occur with language, but are not necessarily a part of the idea being conveyed. In addition, having awareness of the conceptual underpinnings of a transcript is valuable during the transcription process to potentially minimize biases that can occur (Ochs, 1979). The transcription process was the first step in analyzing the data. I transcribed the interviews myself as a means of beginning the analysis and then continued to work with the transcriptions throughout the analysis.

Thematic Analysis and Procedure

Thematic analysis is a theoretically flexible approach for identifying, analyzing, and reporting patterns within data (Braun & Clarke, 2006). Through its theoretical freedom, thematic analysis provided a flexible research tool for me to have an active role in identifying patterns, creating codes and themes, and selecting which themes were of interest and responded to the research questions. The process was not a linear process. Instead it was a recursive process that developed over time. The thematic analysis process required me to continuously revisit the data

in an active way searching for and creating meaning in relation to patterns, codes, and themes repeated throughout the process.

According to Braun and Clarke (2006), codes identify a feature of the data that appear interesting, and are basic elements of the raw data. Coding is within the initial stages of analysis that help organize data into meaningful groups. Themes are broader concepts that can be created by collating these codes. A theme captures something important about the data in relation to the research questions, and represents some level of patterned response or meaning within the data set. I used these definitions to guide my creation of themes throughout the analysis process and did not focus on the frequency, or quantifiable measure within the data set, but rather on whether it captured an important aspect in relation to the research questions. Furthermore, themes can be identified based on their levels: a semantic or explicit level, or a latent or interpretative level. With a semantic approach, the themes are identified within the explicit or surface meanings of the codes, which were created prior to identifying themes. This analysis does not search for anything beyond what the participant has said or written. In my research, I used a thematic analysis at the latent level. The latent level goes beyond semantic content of the data and starts to identify or examine the underlying ideas and conceptions that are theorized as shaping and informing the semantic content of the data (Braun & Clarke, 2006). It is important to note that I did not simply use my research questions as the themes identified in the analysis, rather my research questions guided the coding and thematic analysis of the data.

According to Braun and Clarke (2006), there are six phases of thematic analysis. I used these parameters to help guide the process of my thematic analysis process.

- 1) The first phase of thematic analysis was familiarizing myself with the data. I immersed myself in the data in an active way reading and re-reading the

transcripts searching for meaning and patterns. I transcribed the interviews during this phase and started writing down ideas for coding that I went back to throughout the other phases of thematic analysis.

- 2) The second phase included generating initial codes as a way for me to organize the data into meaningful groups. I manually coded for features of the data that was of interest and related to the research questions, using different coloured pens and different coloured post-it notes to organize segments of the data. I used the entire data set and collated data relevant to each code.
- 3) Phase three involved searching for themes. I had initial codes collated from the data and was now able to re-focus the analysis at the broader level of themes. I gathered all of the relevant coded data extracts within identified themes. I examined how different codes may possibly combine to form an overarching theme. During this phase I started thinking about the relationship between codes, between themes and between the different levels of themes, such as main themes or subthemes.
- 4) Phase four involved reviewing and refining the themes. During this phase I considered the validity of the individual themes. I figured out what themes were too diverse, what themes could collapse into one theme, and what themes needed to be divided into separate themes. It was during this phase that I reread the entire data set to ensure the themes worked, as well as looked for additional data that was missed in earlier coding stages. I divided codes into internal homogeneity and external heterogeneity, based on Patton's (2002) criteria for coding. Internal homogeneity included data that belonged together

in a meaningful way, and heterogeneity included data that exhibited differences among codes, and were distinct from other codes.

- 5) In phase five, I defined and named the themes, by identifying what was of interest about the themes and why. For each theme, I provided a detailed analysis and subthemes that were included, all of which mapped to the research questions.
- 6) In phase six, I provided a concise and coherent account of the story the data expressed, within and across themes in relation to my research questions and findings.

After analyzing data that fit together and demonstrated convergence, the next strategy was to examine divergence. This process included building on items of information already known, bridging and making connections among different themes and surfacing, which includes proposing new information that fit and then verify its existence. This process also involved the careful examination of data that did not fit the dominant identified patterns. Ultimately, my effort in discovering patterns, themes, and categories in data involved careful consideration about what is significant in order to interpret data for meaning in accordance with my research questions.

Summary

This chapter presented my researcher position with key information about how this guided my research. The chapter highlighted details specific of the research design, and included information on how I recruited and selected participants. In addition, this chapter explained methods of data collection and analysis with details highlighting the interview process, transcription of the interviews, and a detailed explanation of the thematic analysis process used

to make meaning of the data in relation to the research questions, as well as the procedure for analysis.

Chapter 4: Novice Science Teacher Interview Analysis

Chapter 4 provides an analysis of two participants' interviews based on their perspectives on theory, practice, and learning, as well as the relationship between these concepts. This chapter consists of three sections. The first section characterizes the perspectives of the first participant, Gavin, a novice teacher, and consists of three parts that highlight his perspectives on theory, practice, and learning. The second section characterizes the second participant, Andrea, also a novice teacher, and consists of three parts that focus on her perspectives on theory, practice, and learning. The chapter ends with the third section: a comparison between the two novice teachers' perspectives of theory, practice, and learning, highlighting similarities and differences.

Participant One: Characterizing Gavin's Perspectives

At the time of this study, Gavin had completed his Bachelor of Science degree with a specialization in physics and computer programming. He was a recent graduate from the teacher education program, and had the opportunity to work for one year as a teacher-on-call (TOC) within secondary schools in the Lower Mainland. Since completing the teacher education program, and with experience as a TOC, Gavin was beginning to realize that the teaching profession was not a career path in which he wanted to continue. By the end of this study, he decided to shift to computer programming and stated that he was content with his professional choices.

In the first and second interview, Gavin was asked about his perspectives on theory and practice, in addition to his perspectives of how university instructors in the education program, faculty advisors, sponsor teacher, and students would conceptualize theory and practice, and the relationship between theory and practice as related concepts. This section is divided into three

parts. The first part addresses theory, and highlights Gavin's perspectives on scientific theories that emerge from scientific disciplines, and educational theories as two separate entities. This part also includes the opportunities that Gavin recalled throughout the education program that allowed him to engage in conversation around theory and practice. The second part is on practice and foregrounds Gavin's perspectives on effective practice in regard to student learning. This part also includes Gavin's perspectives on the practicum experience in relation to his learning, the value of practice compared to theory, and the challenges within the practicum. The third part addresses Gavin's perspectives on learning, how learning occurs, and the difficulties of assessing student learning.

Theory as Scientific Theory: What are Educational Theories?

Gavin viewed the word theory as relating only to ideas that were established in the disciplines as scientific theories, such as gravity, atomic theory, and relativity. When asked how he would define theory, educational theory or science theory, Gavin reported that theory relates to science and is supported by proven methods and tested hypotheses. Gavin stated, "Well, I guess a theory would be like a hypothesis that has been proven to be true, until it is proven to be false" (G1, 12). It appeared as though the majority of theory that Gavin remembered being exposed to during his education program was during his physics methods course and was related to concepts that emerged from science disciplines.

Gavin recognized that educational theories are important in teaching practice, and indicated that without theory a teacher cannot have effective practice, and without effective practice a teacher cannot have theory (G1, 257, 444, 448). However, Gavin had a difficult time identifying and defining educational theories. For example, Gavin could not provide an example

of an educational theory. Instead, he stated the relationship between theory and practice in education are an ideal and could not cite a concrete example:

...So I think in order to properly appreciate the theory you have to practice, but in order to be good at practice you have to read theory. I think it is the same in just about any field....you have to understand the theory in order to be good at practice and vice versa.
(G1, 257)

Gavin noted that educational theories were important and valued in teaching practice, but his understanding of educational theories and ability to explain educational theories appeared limited. In addition, it appeared that he did not apply educational theories in his teaching practice, either as a teacher candidate or as a teacher-on-call.

Interestingly, Gavin expressed concern around labeling educational theories as actual theories. He used terms such as research, methods, ideas, strategies and “new aged fluff” interchangeably to represent educational theory. He indicated that educational theories did not have the same value as scientific theories, because teaching is not a hard science. For Gavin, theories typically correlate to disciplines in the hard sciences, like physics, and terms such as tests and hypotheses, rather than the social sciences. He noted, “In physics, ... doing something like...having a student do something is far more effective then telling them this is going to happen. This theory, if you want to call it theory? Has been written a lot, practiced a lot so...” (G1, 30). For Gavin, educational theories were new aged ideas that are simply “fashionable ideas” and were not backed up by theory. He perceived scientific theory and educational theory as two separate entities that do not overlap (G130, G132). Gavin stated,

My perception of what happens a lot is that you have, individuals, politicians that pedal ideas because they become fashionable that are not necessarily backed up by theory and

they push those ideas into the classroom and they don't really work and the kids suffer because of it. So, I would prefer if education as a whole...was dictated by proven theories rather than new ideas that we are just trying out because [someone said to]. (G1, 130)

Categorizing educational theory under the soft sciences, Gavin had a difficult time accepting that these theories were still important, valuable, and relevant in classrooms. Certainly, they were not equivalent to scientific theories. It seemed as though he accepted the idea that professionals within the educational field valued educational theory, but he himself struggled to see the value in educational theories because they were not concrete and fixed like scientific theories.

With this dichotomy, between scientifically “proven” theories and educational theories, Gavin admitted to finding himself uncomfortable during his practica and teaching experiences when he tried to implement “new aged strategies” that were grounded in educational theory. He found it challenging to let go of structural control of the class and assess the students’ learning during the lessons. He indicated that he had a difficult time preparing lessons that involved different theoretically grounded strategies in comparison to the traditional teacher delivery: standing at the front of the classroom completing repetitive practice problems. This is similar to research done by Conway and Clark (2003) that indicated that, frequently, teacher candidates’ first perspectives of effective teaching are focused on themselves and their personal capacity to manage a classroom. In Gavin’s opinion, he demonstrated effective teaching since he was in control of the lesson, and the students were in their seats working on practice problems. According to Gavin, doing repetitive practice problems was how students’ maximized their learning.

Gavin indicated that his faculty advisor valued theory and practice equally, and she reiterated that it was important to balance the two during his lessons (G1, 213). His faculty advisor challenged Gavin to implement differentiated teaching, which was different from his traditional method of teaching, and when asked about his experience he stated,

To me personally! It did make me a little uncomfortable teaching those, those theories, if we want to call them theories? There was this one time we taught a lesson, I did this for review. It was Math 10, I think they were advanced. But what we did was split up into groups, I tried to split them up evenly based on their skill levels. So that some stronger students would be with some weaker students, so they could help each other....She (faculty advisor) ABSOLUTELY LOVED IT! Thought it was the best thing I ever did! Ahh, personally, I would have rather just had them doing as many problems as they can. I think they would have learned a lot better! On the, the average, I feel like that would have been more effective just because they had a lot of fun doing what we did there, but we just didn't do enough. There wasn't enough time. (G1, 213-225)

Gavin's discomfort with learning in heterogeneous groups was consistent with his perception that learning is only positively correlated with the number of homework questions completed in class, which is consistent with Lortie's (2002) research: novice teachers have an affinity for teaching in the same manner that they themselves learned in school.

When asked about theories surfacing during the education program Gavin did not recall educational theories being made explicit during the education program. According to Kubli (2005), theories presented in education programs are often presented to teacher candidates as abstract concepts and may not be integrated into practical experiences. This may make it challenging for teacher candidates to integrate theory and practice as related academic concepts

in classroom contexts. Gavin did remember in his physics methods course, briefly talking about how students learn, but he did not remember educational theories discussed in any other context of the program including the university course work and the practicum experiences. Gavin stated that he did not engage in conversations with university instructors, faculty advisors, sponsor teachers, students, or his peers in the program around educational theories, and also could not recall the name of an educational theory or theories about how students learn. In addition, he did not remember having opportunities to think through educational theory, how to apply educational theory, or the relationship between theory and practice in the education program. Consistent with Kerr et al.'s (2011) research, teacher candidates must engage in thoughtful application of theory and practice to teaching situations in order for them to engage in an informed and critical examination of theories in their practice. This did not seem to occur for Gavin and it may have resulted in his lack of ability to implement educational theory in his practice. Although, Gavin recalled one instance in which theories around learning was discussed in his physics class, this was not enough for him to internalize the theories. This is consistent with Kubli (2005) and Eun (2008) in that internalization is a process that does not occur after one single social interaction. The interactions that Gavin experienced were not situated in activities that had communicated concrete and clear goals. In this situation social speech did not involve educational theories, and did not transform into Gavin's private speech or inner speech. As a result, described by Kubli (2005) and Eun (2008), educational theory was not even remembered, let alone internalized, and could not be used as a psychological tool in his practica experiences.

Throughout the interviews, Gavin did not provide an example of one specific educational theory. It appeared as though he did not have a clear understanding of different educational theories that may be used in practice, and he indicated that there was this perceived notion that

may have been taught around a “one size fits all” type of educational theory. Theories were general to Gavin and were not presented to him as unique frameworks and, therefore, he did not view them as valuable. He stated that although he knew educational theories were important he did not have time throughout the program to spend on building his understanding of learning and teaching theories, let alone to engage in conversations on how to implement these theories, because he was too busy completing courses and then prepping lessons during this practicum to stay ahead of the students in regard to understanding the course content (G2, 284, 286, G1, 448).

When asked about a potential gap between theory and practice in the teacher education program Gavin stated,

I think it is really hard because when you start out you might have been ok at teaching, Right?...You are better than most people and that’s why you go [into the teaching profession], but then I don’t know, it’s a lot to take in when you are first starting out, learning all these new techniques, it’s really hard to also think about theory and applying them...It is hard to understand why you are doing it, and to do it at the same time it’s new. Right. (G1, 448)

Here, it appeared as though Gavin reflected on his own experiences when he first decided to become a teacher. Initially, he perceived that he was a person who could naturally teach others. At the time of this study, after having completed the education program, it seemed as though his perspectives on teaching, his ability to teach others, and what teaching entails, was different from his perspectives when he began the education program. He seemed overwhelmed with the amount of learning that was expected to take place in the amount of time provided by the teacher education program.

When asked about the value of applying educational theories, and assessing the capacity at which a teacher candidate has applied educational theory during their practicum, Gavin stated,

It is kind of hard right. It is like what we were talking about where it is so rushed, it's kind of a really rushed thing [the education program], I kind of feel like giving, to really integrate a theory, first of all I think you need to know the theory better, rather than just like reading a single paper about it or having someone talk to you about it in the classroom you don't really fully understand you know what you are doing there, you know (laughs) exactly and then it also sort of implies that a sort of one size fits all sort of way of doing it. The paper on the theory is pretty generic, so I don't know. It just seems like it is a lot to take in for someone who's running around trying to survive, yah. (G2, 278-286)

Although, Gavin seemed to allude to the existence of educational theories, learning educational theories in this program was hampered by a lack of time and opportunities for teacher candidates to learn the theories. Teacher candidates needed more time and more opportunities to work through educational theories. Then, perhaps, teacher candidates would be able to apply specific theories, rather than a generic "one size fits all" theory, they understand in their practicum teaching experiences. Again, this is consistent with work done by Kubli (2005) and Eun (2008) that indicates multiple opportunities are critical for internalization. For Gavin the process of internalizing educational theories, and understanding how they can be applied from the university classes to the practica classrooms required multiple social interactions that were situated in purposeful activities. Gavin indicated that the program was "really rushed" and, according to Darling-Hammond (2012), teacher candidates who have had more preparation for teaching are more confident and successful with students than those who have had little or none.

Recent evidence also indicates that improvements of teacher education, such as creating programs that allocate more time to integrate and teach practice and theory together in the university coursework and the practicum setting, produce teachers who are both more effective and more likely to enter and stay in teaching (Darling-Hammond, 2000, 2012).

Throughout Gavin's teaching experiences, it appeared as though he continued to grapple with understanding educational theories, and the breadth of educational theories. He seemed to find the education program difficult in regards to the amount of work involved in such a short span of time. This may have hindered his understanding and application of educational theories. As he noted, he was concerned with time and was "trying to survive."

Effective Teaching Practice and The Value of Practice

Gavin defined effective teaching practice as the teacher directed repetitive completion of practice problems. Gavin noted that if a student engaged in repetitive work and rote practice, then eventually "a light will go on" and the concept is learned. In a physics class for example, he stated that the amount of practice problems that a person completed was positively correlated with learning and, more specifically, equivalent with the amount of learning that has occurred. The more practice problems you do, the more you understand, because practice leads to learning (G1, 173, 195, 221). This is consistent with Sandholtz's (2011) research that noted teacher candidates' and novice teachers' attribute effective teaching to student participation. In this situation Gavin assumed since students participated in completed the practice problems, they were learning.

Throughout the interview Gavin indicated that his faculty advisor and his sponsor teacher had a difference of opinion on how to define effective teaching. Although, he indicated that they respected each other, he mentioned that—depending on who was evaluating his lesson—he

would approach teaching differently. He tried “adventurous stuff” and “new stuff” with his faculty advisor and continued with traditional teacher delivery with his sponsor teacher. He noted he felt concerned about their difference of opinion, and how this affected his learning and assessment (G1, 185-193). When asked to describe a teaching experience in which his faculty advisor was assessing his lesson, and he implemented the “new stuff” he stated, “she ABSOLUTELY LOVED IT! Thought it was the best thing I ever did” (G1, 219). When asked to describe a teaching experience in which his sponsor teacher was assessing his lesson Gavin stated,

You know the kids just need to, they just need to do 20 questions, don’t give them like three to ten questions. You need to give them 20 questions! Because they are not going to understand right now. It’s just rote knowledge, right, and then maybe when they are older a light is going to go on.... (G1,195)

It appeared as though Gavin’s sponsor teacher correlated the number of questions completed to the amount of student understanding. The more questions completed, the more the students understood.

What Gavin learned in his student teaching was the necessity of altering his teaching practice to appease those who were evaluating him on his lessons. He indicated it was a “juggling act” and a learning experience having to work with both his faculty advisor and sponsor teacher. He stated,

So yah that was a big learning experience, because I remember feeling really stressed out trying to, modify my lessons, and really looking through all of the notes she (faculty advisor) had given me in the past and trying to understand why ...you know I don’t want to do something unless I understand why. (G2, 152)

Gavin seemed to have the desire to understand his faculty advisor's perspective and educational theories behind her suggested feedback. As related concepts, it is important to integrate theory and practice, because theory helps develop an understanding of why certain results are obtained from certain practice (Kerr, Mandzuk, & Raptis, 2011). Unfortunately, he did not seem to know the theoretical explanations regarding why a particular approach to learning might be more effective.

Gavin noted that he shared a similar perspective on effective teaching with his sponsor teacher. With this type of teaching strategy students are sitting individually at their desks completing repetitive practice problems, they may not be working within their zones of proximal development and there are few options for assessing learning (Vygotsky, 1987). If they were working in their zones of proximal development, it was by accident rather than due to intentional practice that Gavin facilitated. According to Vygotsky (1987), since learning fosters development in the zone of proximal development, instruction should be designed to reach a developmental level that is just above the students' current developmental level, or just above where the student can operate independently. Completing repetitive practice problems is ineffective if it is guided by instruction toward a developmental level that has either already been reached or is too far beyond the current reach of the student. Further, Gavin indicated that this teaching strategy, completing repetitive practice problems, also reflected how he learned best. Consistent with Lortie's (2002) findings, Gavin stated that how an individual learns would influence how that individual will teach. Although, he admitted that different students learn in different ways, he was most comfortable teaching in a way that demonstrated and validated his own strengths as a learner (G1, 203-207). He reported that when students were engaged in dialogue, and worked in small groups, he was uncomfortable. He argued that, because there

were fewer practice problems completed, less learning occurred. He indicated that he would have much rather approached the overhead projector and completed practice problems, because he was more comfortable and it was much easier to create lessons that facilitated this type of teaching method (G1, 203-207).

While Gavin shared a similar perspective with his sponsor teacher, his view of effective teaching was different from his faculty advisor. When referring to his faculty advisor, Gavin stated,

...she viewed teaching practice in the math classroom as sort of ahh you need to make, she wanted to create a sense of wonder with the kids and so a lot of time when she talked about teaching practice she really tried to get me to emphasize that...it was extremely hard. Because it was just so easy to go up to the overhead! (laughs) And it was extremely hard, to be able to, and I think this is something that will come with practice, but to create a lesson that at the end leaves the kids thinking about he said this, what does that mean? Maybe I should ...craft a problem in a way that makes the kids think about the problem in some obscure fashion and give them insight. She was big on... creating...She was really into researching new math teaching techniques...I don't know how she would balance the two [theory and practice]? To me personally! It did make me a little uncomfortable teaching those, those theories, if we want to call them theories? (G1, 203-213)

It appeared as though Gavin respected his faculty advisor's approach to teaching, but had a difficult time understanding and applying similar theoretically grounded strategies. He indicated that he was more comfortable with traditional teaching: using the overhead for repetitive practice problems. According to Eun (2008), different psychological tools can act as mediators and can

change in different contexts; they are not fixed. Interestingly, it appeared as though Gavin viewed psychological tools to be contextually fixed. Specifically, in a math classroom, there were set tools students could use to learn math concepts. Although Vygotsky (1987) viewed development on a continuum and indicated psychological tools are not contextually fixed, it appeared as though Gavin understood there to be one “math tool kit” that everyone could use individually to learn math concepts. This may have been due to the limited amount of time he had to prepare lessons. Time was “rushed,” and at that point it was easier for him to approach teaching in a way that required less time. He did not have to use time organizing and thinking of new ways to approach teaching. In addition, since he did not understand the theory behind his faculty advisor’s strategies, he was more comfortable committing to teaching strategies he had observed in his past as a student (Lortie, 2002).

Regardless of what Gavin was teaching, he consistently applied the same teaching strategy in all contexts. Gavin indicated that having consistent practices was an important characteristic of a teacher in relation to maximizing students’ learning (G1, 179). Gavin stated his sponsor teacher also valued structure, routine, and repetitive homework questions at the overhead, which reinforced his perspective on effective teaching (G1, 179). This is reminiscent of Thorndike’s (1914) theory of the law of exercise: repetition and practice leads to learning (as cited in Vadeboncoeur, 2001).

When asked about practice, Gavin’s response was parallel to his responses regarding theory. He valued the completion of repetitive practice problems, and indicated that he had a difficult time implementing different teaching strategies. His faculty advisor challenged him to understand and apply different teaching strategies, but he noted he would prefer having the students complete practice problems as opposed to having the students engage in “adventurous

stuff.” It appeared as though factors such as, whoever was assessing his lesson, amount of time and how much theory he understood, affected his perspectives on practice and learning, and his approach to teaching during his practicum.

Similar to the teacher candidates in Britzman’s (1991) research, Gavin noted that the practicum was the most challenging aspect of the education program, and further, that it was the area in which he learned the most. When Gavin and I were working on the co-construction of a concept map, which showed relationships between theory, practice, the university, practicum setting, and learning, Gavin made this statement about the connection between theory, practice, and the university:

That was one thing about [the university], I feel that there was too much theory. We spent a lot of time talking about that [theory]. Well is it theory? I guess, ideas in education. I felt it would have been better if we could have spent more time in the [practicum] classroom. Although, I think three months, like, at the time was a lot!

Totally killed me...I mean I am not an expert so maybe I don’t understand the value for [theory]? (G1, 372, 384)

It appeared as though Gavin placed more value on the practicum, and he was uncertain how to categorize the university coursework. It was not real theory for him—it was “ideas in education”—and time “would have been better spent in the [practicum] classroom.” Still, he noted more time in the classroom would have been beneficial, but also it might have been too much to ask of teacher candidates, since they were already “overwhelmed.”

When asked about how his sponsor teacher valued practice, Gavin noted she viewed practice as more valuable and important than theory (G1, 195, 207, 398). He recalled that she modeled practice problems, and gave “boats of homework! Like tons and tons of homework!

Very repetitive” (G2, 203). Gavin commented that the teacher education program’s university course work was “a total joke” and he “jumped through hoops” to finish, but the hard part was the practicum (G1, 398-402).

The other aspect that Gavin expressed as being important was practicing meaningful reflection. At the time of his practicum, he indicated that he did not take reflection seriously, but he claimed that if meaningful reflection was modeled, explicitly valued, and reinforced by the university instructors, faculty advisors, and sponsor teachers it could have been a valuable tool for his learning as a teacher candidate. For example, if there had been dialogue, or social speech, around how and why reflection is meaningful in all contexts of the education program, more of his own learning could have occurred (G1, 468-488). This is consistent with Vygotsky’s (1987) concept of mediation and the use of cultural tools in social processes to mediate social, private, and inner speech, which could lead to meaningful reflection. During the first interview when asked about reflection, Gavin stated,

Come to think of it, one of the things that we were asked to do ...while teaching, was, I never did this, but sometimes, after every lesson we were asked to reflect on the lesson. What went bad, what went well? It was something stupid, it was like they wanted us to [complete] three of them. I remember some people I knew writing them up the night before, just as it is due [at the] end of the year, they didn’t do it during the year and made up some...It was forced, compulsory. I feel like maybe...to encourage students to reflect...if the FA...coming in and saying have you reflected lately? Ahh, can I look at some of your reflections? I feel like that might be valuable just to show the student that it [reflection] is important. To tell, to make it clear that doing this is important, but I think once you start forcing someone to do it then you get into the situation we’re talking

about, it doesn't become meaningful anymore because you are doing it because you have to, where as [if] there is this light encouragement explaining that it is important if you want to be a good teacher. And in the end your FA could say this person didn't really see reflection as an important aspect and I don't know how I feel about them as a teacher.

(G1, 468-490)

Gavin desired to understand why reflection was important in teaching—he seemed to feel that it could be meaningful—but neither the purpose of reflection on practice, nor the “why” teacher candidates and novice teachers should use reflection was explained. Dewey's (1916) and Falkenberg's (2010a) research supported the idea that when teacher candidates and novice teachers engage in reflection as a way to make meaning of their experiences, they can better understand theory and practice. In addition, reflection for Gavin was “forced” and “compulsory,” which may reflect Dewey's (1938) notion of miseducative experiences: defined as experiences that do not lead to further learning. If reflection was encouraged and supported through dialogue and time, rather than mandatory, Gavin may have been better able to reflect, learn, and develop. It is important that teacher education experiences are designed to encourage teacher candidates to engage in meaningful activities, such as reflection, and to encourage future learning and development. With time in such short supply, and no understanding of the role reflection plays in teaching, Gavin did not take the faculty advisor's request to reflect seriously.

Gavin valued reflection and recognized that it can be an important tool for learning, but the reflection that he was a part of was not “genuine reflection.” During the interviews Gavin noted that when the teacher candidates returned back to the university and were completing classes the reflection that took place was more of an informal sharing circle. A place in which the teacher candidates shared practicum experiences, but did not engage in discussions around

why and how specific situations occurred, rather it was simply listening to others speak about their experiences. It appeared as though the importance of reflection was not made explicit, and modeling of reflection did not occur for Gavin, in any context of the education program. He would have liked to see university instructors, faculty advisors, and sponsor teachers explain the value of reflection and encourage reflection.

To Gavin, since reflection was not assessed, and the teacher education program did not provide time for the teacher candidates to engage in meaningful reflection, then it was not valued. Instead, what was explicitly assessed was teacher behaviours, such as teacher delivery, tone of voice, and clarity of presentations, classroom management, and time management. As a part of the teacher candidates' assessment, and a major focus during the university course work, behaviours appeared to be valued by teacher candidates. Perhaps, if meaningful reflection was co-defined and modeled, teacher candidates could have better understood its value. Meaningful reflection could have been used as a psychological tool to help teacher candidates learn a variety of effective teaching strategies grounded in theory, and reflection might have helped them think through ways to apply these in their practica.

Learning: Where it Occurs and How it is Assessed

According to Gavin, learning was a challenging concept to define. He described learning as a pursuit of trying to understand something you do not know, and defined understanding as being able to express the underpinnings of what you know (G2, 24, 26, 36). When asked to explain his perspectives on how his faculty advisor and sponsor teacher would define learning he stated the following,

I think the FA would define learning, she'd use the words like inquiry, engagement, and enjoyment even, she was very big into the new wave. I don't know if it's called the new

wave, teaching math where it is very inquiry-based, just exploratory kind of learning.

And so my SA was more I think she would define it more with words involving like rigor and to an extent...I feel this way. I think she would, you know in order to learn math very well you have to, it is just something you have to do a lot of, you know. And so, I think a light bulb goes off and I think it is really hard to force that. Light bulb to go off.
(G2, 181-183)

Gavin noted that his faculty advisor had a different perspective and approach to student learning. Gavin recognized a dichotomy between his faculty advisor's and his sponsor teacher's perspectives. He indicated he had a similar perspective to his sponsor teacher's approach to learning, alluding to repetitive completion of practice problems would lead to a students' epiphany: "a light bulb goes off."

Gavin also indicated that learning can take place in a variety of contexts and that there are different methods in which people can learn, such as asking questions and asking somebody that understands the concept. Although he indicated that there are different methods to learning, he still felt strongly that, in math, you just have to continue doing repetitive homework questions in order to learn the concepts, again reminiscent of Thorndike's (1914) instrumental conditioning.

At times, Gavin's definition of learning supported the idea that learning can occur through social interactions, yet he indicated that when his students were engaged in social interactions with each other during class, he did not think that they learned as much as they could have if they spent more time doing repetitive practice problems (G1, 195, 213, 217, 221; G2, 44). Research has indicated that when teachers facilitate students' learning, when students are working with others within their zone of proximal development, and have helped to co-create

their classroom environment, then students tend to become more interested in the course material and reach beyond their potential (Kubli, 2005; Wentzel & Wigfield, 2007).

In the second interview, he described a situation in which his own learning took place. He indicated working with computers for his job, he initially did not understand why he was doing what he was doing. He said that during the process of completing repetitive non-meaningful practices, he finally understood the concepts. A light had gone off for him, and suddenly the reasoning behind his practice became obvious (G2, 74-78, 184). Gavin stated,

Ah, it just sort of (laughs) a whole bunch of things that I had been doing in the past, have, very rote tasks, something that I just memorized, something that you just have to do suddenly became obvious why I am doing them. I just sort of accept the fact that I have no idea what is going on and then ah, every once in a while you will do something random and this moment, the ‘ah ha’ moment. In your head and suddenly half of the things you were doing, just suddenly, wow, now it makes sense. (G2, 76-88)

For Gavin, learning was a process that occurred behaviourally through repetition and trial and error much like Thorndike’s (1914) law of exercise, which emphasized repetition and practice in learning. In his work experience, the computer provided him with quick summative feedback that helped him learn what he needed to do his job (G2, 292-294). This method of immediate feedback is also reminiscent of Skinner’s “teaching machine” (for discussion of Thorndike and Skinner, see Vadeboncoeur, 2001).

For Gavin, his learning took place only during his practicum at the secondary school. He stated,

Yah (breathing out) and I mean how else are you going to learn? You can’t... [rely on just] theory, like they have to constantly [practice] a lot of it in order to get a good

understanding of how to do it because that was one thing for me right, like, it [practicum] was extremely difficult, but I feel like I learned a large amount, far more than I did for the rest of my school. (G2, 382)

Learning did not take place in the university classroom (G2, 126). The university classes consisted of, but were not limited to, developmental psychology and educational philosophy courses, assessment courses, and science methods courses. He also stated that he did not learn during the community-based practicum (G2, 126). His community-based practicum was a 3-week practicum at Science World that took place after his 10-week practicum in a secondary school.

In the second interview we revisited the concept map that we co-constructed in the first interview, which was used as an artefact to help communicate relationships among theory, practice, university, practicum setting, and learning. Gavin drew a circle representing his community-based experience at Science World, but he physically spaced it out far from the other concepts, and shaded in the circle to emphasize it was not an important experience that contributed to his learning and development. He did attach an arrow connecting learning and the community-based practicum (see Appendix E). He indicated, “ok, ah, so Science World, ah did I really learn much? I don’t know, maybe I...maybe I won’t draw anything, doesn’t apply...it was a nice break...I don’t think it made me, did me better” (G2, 300-314). Gavin did not see his community-based practicum as contributing to his preparation as a teacher.

When asked about assessing his own students during the practicum, Gavin stated that student learning was challenging to assess formatively during the lessons (G2, 176). He indicated that his sponsor teacher completed homework checks that consisted of observing the individual student’s work and noting if the homework was done, rather than actually marking or

checking to see if the students' questions were completed correctly. He noted, "She did homework checks. But she didn't mark the homework, wouldn't even check if the answers are correct" (G2, 221-223). When asked how he assessed his students' learning formatively during the lesson he indicated, "If I explain something, if I gave them a picture and even the looks on their faces, do they have good questions to ask, if I gave them a worksheet to work on, were they able to complete it..." (G2, 132).

He indicated that he could have done a better job checking in with the students during the lessons to check their understanding of concepts. Although he knew it was valuable and important to assess student learning, he stated he was extremely busy and rushed and reiterated he could have done a better job in this regard. He noted,

I think that I could have done a better job on assessment. I think that is a big part of teaching being able to not only teach a lesson but have the meta thing going on where you are actually...thinking about are they getting it, or making mental notes, [writing] stuff down that they don't understand. That was something I didn't do, I think because it was just so rushed, that whole thing was just so rushed for me! (G2, 176, 222, 224)

Gavin recognized that it was important to formatively assess his students' understanding throughout the lesson, but found it difficult to focus on anything else other than his own teaching during the lesson.

Gavin seemed to understand the value of formative and summative assessment, but found it challenging to implement formative assessment during his practicum experiences. What Gavin initially thought was that teaching continuously changed and became more challenging as his time in the program progressed. Teaching was not just explaining a concept to another person, which was the perspective Gavin had had when he entered the education program. He indicated

that he was “extremely busy” and “rushed” during the practicum, and it appeared as though he did not think he had time to check-in with students during the lesson to ensure their understanding. His focus was on his delivery and working through repetitive practice problems. If he took time away from this, less questions were completed, and from his perspective, less learning occurred. It is important to note that throughout the interviews Gavin did not mention university instructors, sponsor teachers, or other teacher candidates modeling formative assessment, and he did not indicate any assessments of his formative assessment practices.

In regard to his own personal learning, Gavin reported that his learning as a teacher candidate was not assessed during the education program. He mentioned that his learning during the second practicum was assessed by his sponsor teacher and faculty advisor using checklists that focused on time management, connections with students, and other aspects of teaching that did not measure his students’ or his own learning (G2, 268-270). Indeed, neither his faculty advisor, nor his sponsor teacher, assessed his understanding of any educational theory or his ability to implement any educational theory in his practice. This is reminiscent of Waggoner and Carroll’s (2014) research that indicated concerns around the validity of teacher candidate assessment practices. According to Quatroche et al. (2012), teacher candidates must be expected to be able to demonstrate that they can link educational theory to practice. One challenge is the development of teacher candidate assessments that validly measure this aspect.

During the university classes, he remembered that teacher candidates were given a pass or fail grade. Teacher candidates were given a letter grade in only one of the courses. He could not remember which class in particular provided a grade, and he stated that it was not made clear to him what was assessed during this particular class. He also indicated he did not know why that particular course was the only one in which the teacher candidates were given a letter grade.

He recalled that for the other university courses, assessment was based on their enthusiasm and engagement level in the classes. He quoted, “As far as classroom goes, there wasn’t much there [assessment]” (G2, 264).

In addition, although the university instructors mentioned inquiry-based learning, Gavin did not recall being assessed on his understanding of inquiry-based learning, the theory behind inquiry-based learning, or his application of inquiry-based learning in this teaching practice. He also indicated that the university instructors did not practice inquiry-based strategies during their teaching of the teacher candidates. He quoted,

I remember thinking how ironic it was that they were constantly preaching about this inquiry type of learning, this new wave and you need to teach, and you have to be something greater and yet all of my [university] instructors well the vast majority of them did not teach like that! A lot of lecturing and like ok...I mean a lot of them were academics and so that makes a bit of a difference. I mean with Richard and my FA there was a definite difference. It was a very engaging kind of class....whether or not you would be learning the stuff, you were like wow, this is amazing...But then there were those other professors that were, didn’t do anything the whole time. I had a teacher that would sit like this (hands folded) and he would talk about something. (G2, 249-262)

It appeared as though Gavin saw a dichotomy between types of university instructors: those that taught “theory” and those that taught “practice.” Since Gavin valued practice, he preferred the instructors who approached teaching with a practical approach.

Some of Gavin’s university instructors were faculty members of the university, which, to Gavin, correlated with a specific type of teaching. He noted that the faculty members taught in a way that was lecture based, and did not engage the teacher candidates in their learning. The

faculty member instructors talked about inquiry-based learning, but did not explain its importance and did not model what this type of learning and teaching could look like in a classroom. Gavin indicated that the other university instructors were not faculty members, and were secondary science classroom teachers. To Gavin, these instructors were more engaging and involving, and captured the attention of his classmates. While he had respect and admiration for the university instructors who were also secondary science teachers, he noted that despite the classroom being more engaging, it appeared as though he did not learn more, or better, in this environment, and this engagement did not help him understand inquiry-based learning. Gavin would have preferred his teaching and learning to be based on repetitive practice. The more opportunity he had for practicing and presenting lessons would have been an ideal for his learning and development as a teacher.

In general, Gavin indicated most of his learning occurred during his 10-week practicum. He recalled that his faculty advisor and sponsor teacher, through the use of checklists, assessed his learning based on his time management, classroom management, and organization. For example, Gavin indicated that he had a difficult time formatively assessing his own students' learning and, perhaps, this was due to minimal discussions around how to implement formative assessment throughout his lessons. His sponsor teacher did not model meaningful formative assessment, and only did homework checks to see if the questions were completed, rather than the work being completed and accurate. If formative assessment was not demonstrated and valued by his sponsor teacher, this could have affected Gavin's perspectives as well. Although he noted formative assessment was important, he was not being assessed on his ability to implement formative assessment. Time was limited, and he did not choose to spend more time on understanding how to implement formative assessment, since it was not a component of the

teacher candidate assessment. In addition to minimal discussions around formative assessment, Gavin stated there were minimal discussions around inquiry-based learning as well. Certain university instructors indicated that inquiry-based learning was important, but Gavin did not recall discussions around how to define or implement inquiry-based strategies, and how to assess student learning during inquiry-based learning.

Participant Two: Characterizing Andrea's Perspectives

At the time of this study, Andrea had completed a Bachelor of Science degree with a specialization in biology and business. She was a recent graduate from the education program at TMU, and after her graduation had the opportunity to work as teacher-on-call within secondary schools in the Lower Mainland. She had several long-term placements, and at the conclusion of this study, she was a full-time teacher, teaching junior science and business classes to secondary students in the Lower Mainland. Andrea indicated that she enjoyed being a teacher, and was actively pursuing graduate school programs within the field of education to expand her learning as a teacher.

In the first and second interview, Andrea was asked about her perspective on theory, practice, and learning, in addition to her perspectives on how university instructors in the education program, faculty advisors, sponsor teacher, and students would conceptualize theory and practice, and the relationship between the concepts. This section is divided into three parts. The first part highlights Andrea's perspectives on theory, the value she placed on theory, and her understanding of educational theories. The second part is on practice and includes Andrea's perspectives on practice related to the act of "doing" by students, as well as a discussion of her personal practice as being focused on teacher delivery, rather than on student learning. The third

part focuses on Andrea's perspectives on learning, including her perspectives on engagement, grades, and her perspectives on the assessment of learning.

Theory: Understanding Educational Theories

Like Gavin, Andrea viewed theory with a scientific lens and related theory to concepts in the scientific disciplines. She indicated that theory was something that we believe to be true based on various tested hypotheses, experiments, trial and error, and principles (A1, 32; A1, 185). Andrea related theory to factual information, textbooks, and university courses. She indicated that, "It's lecture! It was all PowerPoints. All videos. All this is theory, this is why this is true" (A1, 46). When asked about her perspectives on how her university instructors, faculty advisor, and sponsor teacher would define theory, Andrea stated that they would all define theory in a similar manner, in that it is "something we believe is true" (A1, 78, 130, 161). She seemed to assume—since the university instructor, faculty advisor, and sponsor teacher all had studied sciences at one point in their educational backgrounds—they would also share the same perspective in defining theory as scientific theories. Throughout the interviews she did not define or elaborate on educational theories, and when asked about theory in general, she only identified examples of theories from the science disciplines.

Andrea recognized that educational theories were valuable and an important aspect of teaching, but found it challenging to discuss educational theories because she did not recall any educational theories being made explicit. This is reminiscent of Otero's (2006) research indicating that theory and practice should be explicated together. When asked about her experiences with theories in the education program she indicated that she did not learn any theories throughout the education program. The only time theory was discussed was in science methods courses and the theory discussed was related to a particular scientific discipline, such as

the atomic theory. When asked about theory in the education program, she stated, “I don’t remember specific theories, to be honest with you” (A1, 42). Andrea did not remember educational theories being discussed, nor did she remember having opportunities to engage in discussions around educational theories or the application of these theories in her future teaching practice (A1, 42).

In addition, Andrea reported that university instructors, faculty advisors, sponsor teachers and her peers did not engage in discussions around educational theories. Explicitly introducing and discussing theories is important for teacher candidate development (Otero, 2006). Andrea noted that she was “supposed” to apply theory she learned in her university classes to her teaching during her practicum, but she could not because she did not know specific educational theories. In fact, theories were not introduced until after the practicum. She stated,

Umm, not so much because he was my biology instructor, showing us all the different biology lessons we could have [done in our practicum]. I don’t remember any theory in that class. Actually I don’t think we learned about any theories until after the practicum.

It was afterwards. (A1, 86-92)

Andrea recalled her Biology methods instructor only demonstrating laboratory methods, organization and experiments that could be implemented in classrooms. She did not recall educational theories being taught during her science methods courses, or other courses. If educational theory was embedded in the science lessons, it was not made clear for Andrea. In fact, she indicated that she only learned about educational theories in the summer courses after her practicum, if at all. In addition, what was taught in the summer courses was valued less because the practicum component was already completed. Andrea placed more value on practice

than on theory, and because theory was taught after the practicum was an indication that it was not as important.

Andrea seemed to perceive a dichotomy: the science methods instructors taught only concepts and theories related to the scientific disciplines and not educational theories. Educational theories neither emerged from education courses, nor were they included in the different contexts in the education program, such as the practicum experiences. While there were classes for theory, according to Andrea, they were taught after the practicum. The class for learning science methods, which was taught before the practicum, did not include educational theory.

Andrea noted that she must have applied some educational theories during her lessons, but could not discuss what theories she used because she did not have the language to support her perspectives on theory (A1, 340-346). This is in accordance with Vygotsky's (1987) sociocultural theory: language to engage in dialogue, developed through social speech, enhances inner speech and is critical for the development of concepts (Vygotsky, 1987). Andrea stated,

The problem with this is, I don't know all of the teaching theories, [and] I am probably applying most of them, right? But I don't know...which ones. And I just get [a] feeling that a lot of teaching theories might be common sense. So, I am doing it [applying theory], but I don't realize that I am doing it. (A1, 340-346)

Andrea seemed to have a sense of educational theories. Indeed, she likely did not have a full understanding of educational theories in general, or even one educational theory in particular. She was not consciously aware of what she was doing, and she did not have a sense of how to apply any one theory in her teaching practice. If theories were common sense they would remain experiential and as everyday concepts. Theory helps differentiate why certain strategies work for

some students and in other contexts. Since she did not have the language or setting to engage in dialogue around educational theories, it appeared as though educational theories were not being discussed in any context of the education program. If they were studied and/or discussed, she did not recognize them as educational theory.

Practice: Effective Teaching Practice as “Doing” and Teacher Delivery

Similar to the teachers in Lortie’s (2002) research, Andrea defined the concept of practice through to the act of doing. She noted that learning occurred best if the students were actively engaged in hands-on activities during the lesson and that when students were “doing” then they were learning. For this reason, she indicated that practice is more valuable than theory. Lortie (2002) indicated that teacher candidates highlight the importance of student participation, in and of itself, as the reason the lesson was effective. The idea that practice is more important than theory was reinforced for Andrea during the education program in two ways. First, she indicated that she did not recall educational theory being taught at anytime throughout the education program, and continuously referenced her learning taking place during the practicum. Second, her faculty advisor stated, “ ...That I am going to learn when I really teach” (A1, 386). Andrea perceived this to mean that most of her learning would be during her practicum experience. He reinforced an idea that she already perceived to be true: that the majority of her learning would indeed stem from her practicum experiences, because learning occurred through the act of doing.

Of interest, Andrea indicated that she did learn from one university instructor and her methods course in general, because the instructor had the teacher candidates complete lab experiments and activities as if they were playing the role of the secondary student. Andrea stated,

It was a lot of classroom management, classroom activities. We walked outside a lot...he'll give us, he treated us like students, right. He would give us the worksheet...actually get us to do it [dissection]. We were the students, he actually didn't do a lot. It was mostly us doing, which was good. I learned from that, that it is important for kids to do things, the hands on stuff. Then you can sit back and watch them do it.

(A1, 102-116)

This indicated that she perceived learning as doing, and because the university instructor had the teacher candidates participate in the secondary lab experiments, she was therefore learning. Although engagement is an important component of teaching, teacher candidates, and novice teachers, seem to overlook the possibility that classroom activities, the “doing,” can be engaging without leading to student learning (Wertsch, 2007). For Andrea, it appeared as though she learned new skills, such as how to organize a lab for multiple students, how to use equipment that she may not have been comfortable with prior to the course, and, therefore, she perceived that she did learn during this experience.

Andrea was in the role of a student during the lab experiment, and learned from a student's perspective, rather than how to approach the lab from a teacher's perspective. Although these skills are important, and are applicable in secondary science classrooms, they are limited in that she did not learn about how students learn during labs from a teacher's perspective. The focus was on behavioural teaching tips to help make the lesson run smoothly, rather than the application of educational theory in lab settings, and for Andrea it seemed as though participating in the lab became “an occasional event rather than a staple of pedagogy” (Schwartz & Bransford, 1998, p. 505). According to Schwartz and Bransford (1998), the opportunities for noticing features when conducting an experiment as a student can be quite

different from when analyzing activities as a teacher. For Andrea, she was in the role of a student and, thus, she may have focused on completing the lab, rather than being focused on thoughts and behaviours from a teacher's perspective. In Andrea's science methods class, if the goal was to have students think like teachers, perhaps they should have participated like teachers during their learning.

While teacher candidates were engaged in the lab activities, Andrea stated that educational theories did not surface because it was Biology and the methods instructor simply focused on Biology lessons. The experiments, which the teacher candidates conducted in the role of students, were valued because Andrea recognized that she could use these lessons during her practica teaching. They were useful take-away activities that she could immediately implement in her lessons (A1, 102-114). Andrea did not see the connection between educational theory and practical experiences in a science classroom. The two concepts were dichotomous, and had little overlap in that the university instructor's Biology content, and educational theory was not a part of the lesson (see Appendix F). When asked if the instructor discussed theory, Andrea indicated that the Biology instructor did not discuss theory, the application of theory, or provide significant feedback. Although theory was not a part of the science methods course, Andrea valued her experiences from the course because she was actively involved in the labs and demonstrations. Doing the labs was an effective way for her to learn, because doing is learning, and it is not until you "do" the teaching that you "really learn." She stated,

No, I am just trying to think of any theories from the education program that I remember?

Hmm, because I mean it is a great program, but...it is hard to apply theory. It is not until you teach that you really learn. (A1, 139)

Andrea perceived that the majority of her learning, if not all of her learning, took place during her practicum and teaching experiences. She had a difficult time thinking of educational theories, in addition to not understanding them well enough in order to apply them. There was a disconnect for Andrea between educational theories and teaching: educational theories were separate entities from actual teaching, and it was in the act of teaching in which she would learn the most.

Andrea discussed her own preferred method of learning when she identified herself as a hands-on learner by stating,

...And I always felt that if they just made us act it out that would be better. It's so much when you read about something, you are not really internalizing it, than if you just do it.

I mean maybe because I am that type of person? (A1, 246)

Although Andrea recognized that there may be different types of people who learn differently, she identified as a student who learns best when she is engaged and in the act of doing. Similar to Kerr et al.'s (2011) research, Andrea entered the teacher education program with prior beliefs about education, epistemologies, and ideas of how students learn and develop and she expected to apply her "working theories" to her own classroom, as effective teaching for all students. As a hands-on learner, all of her students could learn using similar strategies. Since the educational program methods courses supported her own "working theories," she wanted to provide her future students with an opportunity to learn in the same hands-on way. Engaging the students in "doing" was significant, because "doing" translated into understanding information and learning. As models, it appeared as though her university methods course instructors supported her perspectives on learning as doing; since university instructors were teaching this way, it must be an effective teaching approach.

The focus of Andrea's teaching practice was on her own delivery, rather than the students' learning, similar to the teacher candidates in the research done by Sandholtz (2011). Andrea focused on the layout and design of her PowerPoint presentations in comparison with experienced teachers' presentations, the tone of her voice during the delivery of her notes, and her time management. The university may have reinforced the importance of teacher delivery, because during the university course work she completed classes that included modeling lessons and video recording her lessons. The feedback that she received from her peers was based on her observable behaviours: public speaking abilities and the delivery of her lessons. In addition, when asked about her mid-way and final assessments during the practica, designed by the university and conducted by the faculty advisor and sponsor teacher, she indicated that these assessments focused on teacher preparedness, delivery, time management, and classroom management. She recalled,

...I remember him [faculty advisor] saying that he likes how I incorporate technology in the classrooms. He likes my PowerPoints...he likes like the animations and videos that I show and...the activities...Mostly, what I could do better and classroom management. He gave me tips, and I remember he would tell me if this happened again, this is what you should do. Not so much the theory. (A1, 165; A1, 282)

Her faculty advisor gave her advice about what she "could do," rather than inquiring into what she thought or felt on how she made decisions for the lesson. Andrea seemed to value the tips he provided because these were the aspects of her practicum that were being assessed. When asked if her faculty advisor explained why or how she could approach her lesson differently, Andrea indicated that she did not recall any discussions that supported the reasoning behind his feedback (A1, 167). Assessment did not appear to focus on the teacher candidate's understanding of

educational theory, or on the ability to apply educational theories in the classroom. Similar to Waggoner and Carroll's (2014) research, this highlights concerns around how to assess teacher candidates, and the validity of these assessments. Andrea recalled the majority of her assessments and feedback focused on teacher preparedness, delivery, and classroom management. Similar to Gavin, Andrea did not recall assessments on the ability to link educational theories and practice, which is an important aspect of teacher education, and teacher candidate assessment (Quatroche et al., 2012).

Learning through Engagement and How to Assess Learning

Andrea made connections to learning related to actively being engaged in the lesson and the amount of “doing” that occurred in the classroom. According to Andrea, learning entailed engagement, and was a continuous, creative process that included making new connections and relating this to your everyday life and experiences (A2, 12-14). She reported that learning was not related to good grades. She referenced her own learning and shared that she received good grades in science classes throughout her secondary schooling, but in retrospect, now as a teacher, she realized that she had just memorized information. As a secondary student, she could not answer the “why and how” to help her explain concepts. She said that she still knows the names of certain concepts from her high school science classes, but cannot explain scientific disciplinary concepts to show a full understanding. It was not until she had to teach these concepts that she realized she had simply memorized terms, rather than understand the terms and the relationships between them.

When asked about the difference between “knowing a concept” and “understanding a concept,” Andrea indicated,

I think you can know something cause you can memorize something like Avogadro's number 6.02×10^{23} (laughs). See you know something, right my Chem[istry] teacher taught me. But did I really understand it? To be honest...I thought I did in high school, but it was not until I taught Chemistry, it's like, 'ahh, I get it now what he was talking about!' He wrote the number, but it would have helped if he would have actually drawn the particle (laughs) yah! With chemistry, like Chem 11 and Chem 12, I got good grades but it doesn't mean that I understand Avogadro's number. I don't! Right! (A2, 28-40)

In the interviews, Andrea reflected on her past learning experiences since becoming a teacher. She recognized that there is a significant difference between knowing, which she defined as memorizing a concept, and truly understanding a concept. She indicated that she knew information in secondary science classes, received good grades, but upon reflection indicated that she did not understand these science concepts. It also seemed as though Andrea assumed that if she was more engaged in her learning, such as by practicing drawing the molecular structures, she would have had the opportunity to understand the concept. She assumed that participating in the act of doing would lead to understanding.

For Andrea, learning as the act of "doing" related to her perceived understanding of teaching, at the time of the interviews. During her practicum and in her current classroom she taught using certain strategies that were modeled by university instructors, sponsor teachers, and peers during her education degree, but she did not know why she was using particular strategies or how the practices related to educational theories. For example, Andrea reinforced to her students that making connections from what they learned in class to their everyday experiences was an important aspect of learning and development. She indicated that she was trying to

facilitate the development of their perceptions on the relationship between theory and practice. In the first interview when we co-constructed an artefact Andrea initially drew a Venn diagram representing her secondary students' perspectives on the relationship between theory and practice. In the Venn diagram Andrea did not draw the circles connecting or overlapping, and indicated that they two concepts were disconnected for the students. One of her goals as a teacher was to help the students bridge the gap between the science theory they were learning in class to their everyday experiences (see Appendix F). Although, she indicated that she was trying to reinforce the importance of students making connections to their everyday experiences in different contexts outside of the class and science, it appeared that she might have found it challenging to make connections between what she had learned in the university education courses to her own teaching practice during her practicum and in her current classroom. By co-creating an environment between the university classes, as well as between the university and the practica settings, these connections may have been made, and facilitated Andrea's development. Co-creating this environment could have provided Andrea more opportunity to engage in discussion, which is an important aspect of development (Vygotsky, 1987). Working within a collaborative environment could encourage teacher candidates to be more actively involved in their learning, interested in the theory, and provide more opportunity to link theory and practice. From a research perspective, this helps demonstrate the influence of, and importance of, Vygotskian perspectives in understanding teacher education programs (Kubli, 2005; Wentzel & Wigfield, 2007).

After her classroom based 10-week practicum, Andrea also completed a 3-week community-based practicum at Science World. Andrea indicated that the community-based practicum was not designed in a way that maximized the potential to learn and did not contribute

to her learning as a teacher. Although, she did take the 3-week practicum seriously, she indicated that she was told that she had already successfully completed her other practicum, and this placement was simply, “an additional” experience. She reported that a significant amount of time was spent working behind the front desk and answering the questions from the general public that were not science related questions. She stated,

Yah, we did take it seriously, but at the same time we felt like the way they had it set up is a ‘good idea’. But I think after the first week I was kind of tired, cause we didn’t [always teach]... [it] would have been cool if it was improve all day, but they kind of made us work there too. We were a part of the team. So...not always just teaching!

Like, half the time I was telling people that’s the bathroom over there. (A2, 188-194)

Her experience at her community-based practicum reinforced the notion that gaining experience does not always mean learning (Croninger & Lee, 2001; Sandholtz, 2011), which contradicts Andrea’s perception of learning as doing. During her 10-week practicum at the secondary school, it appeared as though doing a task, and gaining experience directly correlated to greater understanding, which is similar to teacher candidates’ perspectives in Sandholtz’s (2011) research. To be educative, experiences must live on by being linked in a system of purposeful relations, while miseducative experiences are fragmented, unusable, and can inhibit future learning (Dewey, 1938).

Andrea remembered assessment discussions and assessment practices that she could use in a classroom with her own students being limited throughout the education program. She indicated that the majority of her learning about assessment took place during her 10-week practicum based on her own student teaching experiences, interactions with her sponsor teacher, and through observations of other teachers. When asked about her assessment class, Andrea

reported that the university assessment class was taught after her practica experiences, and it was a class that the education students took during the summer prior to completing the program. She reported that assessment strategies were only discussed with her sponsor teacher, rather than being embedded in the university classes (A2, 132). Andrea claimed, "...We did have an assessment class and to be completely honest with you I don't think I learned anything. I just don't remember getting anything out of that class...I actually learned more about assessment from my [sponsor teacher]" (A1, 254-262). As a teacher candidate, Andrea remembered that her university courses in the education program were mostly a summative pass or fail assessment. She recalled one of her classes used a letter grade system, but she did not remember which course it was that resulted in letter grades or why letter grades were received. She did not know why a letter grading system was used for the one course, or how the courses compared.

Formative feedback from her university instructors appeared to be limited, and when asked about feedback provided during her courses, she recalled that the one time an assessment was presented was when other teacher candidates provided her with constructive criticism. The feedback was given after she modeled lessons during her science methods classes, as well as her communications class, and the feedback focused on her behaviours: tone of voice, body language, and delivery of content. When asked about feedback provided by her faculty advisor, Andrea indicated that she was assessed on her time management, organization of lab experiments, and was provided with "tips" on how to manage students who were distracted and not fully engaged in the lesson (A1, 165; A2, 298). The immediate feedback given to her by her faculty advisor was perceived to be changes she could apply immediately in her practice. Andrea indicated that her faculty advisor had vast experience as a teacher and a principal, and she respected his feedback, which she assumed to be from his own personal experiences, rather

than from his education or from educational theories (A2, 344). During her 3-week community-based practicum, Andrea had a different faculty advisor that “checked-in” with her and used a similar assessment tool that was used by her other faculty advisor for the mid-year report. It focused on time management, organization of the workshop, and teacher delivery. Andrea stated that there were limited opportunities to discuss assessment strategies in the education program, and few that focused on how to measure her secondary students’ learning.

In general, Andrea perceived learning to occur through the act of doing and through having experiences. In addition, she indicated that she wanted her current students to try and make more connections between what they are learning in science class and the world around them. Thus, it appeared as though Andrea had a difficult time making connections with the theory she thought she was supposed to learn in the university course work to her practicum and teaching experiences. Andrea noted that there was minimal opportunity for discussions around educational theories, such as the importance of making connections, and how to assess student learning.

Comparing Novice Teachers’ Perspectives on Theory, Practice, and Learning

This section is divided into three parts that focus on similarities and differences that surfaced throughout the interview. The first part presents a comparison between Gavin and Andrea’s perspectives on theory. The second part offers a comparison between Gavin and Andrea’s perspectives on practice. The third part highlights a comparison between their perspectives on learning, and discusses the challenges of assessment.

Theory: Similarities and Differences between Participants

The only theory that Gavin and Andrea recognized in the teacher education program was the theory from scientific disciplines that formed the core of their degree prior to entering the

teacher education program. Both participants had earned a Bachelor of Science undergraduate degree and related the word “theory” to scientific theories, concepts, and hypotheses that are tested repeatedly to help prove an idea to be true. The only theory that they discussed during their interviews related to concepts from their scientific disciplines, such as gravity, relativity, and atomic theory. Each participant entered the education program with their own “working theories” and everyday concepts that shaped their understanding of theory and practice (Hedges, 2012; Kerr et al., 2011). It appears that they both had a difficult time perceiving scientific theories and educational theories to be different, albeit equivalent theories. This may have been exacerbated by their perception that there was little time or opportunity to engage in discussion around educational theories. Both participants indicated that they were “rushed” and “busy” throughout their practica experiences. Gavin and Andrea agreed that theory was important in practice and that effective practice should include theory, but they could not identify any educational theories, did not feel that they learned any educational theories, and did not feel that they successfully applied educational theories in their teaching during their practica. Although, interestingly, Andrea noted that she probably was using educational theories.

Educational theories were not made explicit in the education program. Although there is every reason to believe that educational theories were indeed mentioned in their teacher education classes, Gavin and Andrea did not recognize them as such and, it was not supported in other classes or their practicum experiences. Neither of the participants recalled university instructors or sponsor teachers initiating discussions around educational theories, nor how they could be implemented in their lessons. If theories were mentioned, they were not identifiable. In addition, educational theories were not shared between contexts within the education program, for example between university courses or between university courses and practica experiences.

Research done by Allsop, DeMarie, Alvarez-McHatton, and Donne (2006) indicated that partnerships with the university and the practicum schools could lead to more meaningful relationships made by the teacher candidates between the content and theory learned in their university course work and their practicum experiences.

Gavin and Andrea did not have the opportunity to think through the relationship between theory and practice. There was no language used throughout the education program to help define or engage in discussions to better understand educational theories. Neither participant recalled being given an opportunity to build a conception of educational theories at any time during their education program, nor did they have the language to engage in discussions around theory and practice. Engaging in social speech to facilitate the internalization process is a critical component of learning and development (Vygotsky, 1987).

In addition, there was minimal dialogue among university instructors, faculty advisors, sponsor teachers, and teacher candidates around educational theories, how they could be implemented in teaching, and how they may overlap in different contexts. Gavin struggled with accepting educational theories as theories, and described educational theories as simply “new aged fluffy” strategies that some teachers are trying in their classrooms. It appeared that because these educational theories were not proven—in the same way as the theory of gravity—Gavin had a difficult time seeing educational theories as theories. For Gavin, theory was based on proven facts, hypotheses, and the scientific method. As such, Gavin’s view of theory was that it did not change and remained fixed as in textbooks. New research could not lead to new theories, and practice could not lead to new theories, because theories had been established in the past. Although Andrea did not express her understanding of educational theories, she noted that there are educational theories that are effective and emphasized that through practice she expected to

have a better understanding of educational theories that she can implement in her classroom. This reinforced her perception that learning results from experience, engagement, and doing; Andrea used all of these terms as synonyms.

Although, neither of the participants could provide an example of an educational theory, both participants thought that the teacher education program at TMU focused too much on theory and not enough time was given for the practicum, which is where they both recalled most of their learning took place. Indeed, anything related to the university was perceived as theory, and if they were not “doing” then it was theory. The participants communicated that at TMU there was too much talking and not enough doing, which affected the amount of learning that took place. Both participants seemed to have entered the education program with a perception that university work was related to theory. In their past experiences, university classes focused on theory, and therefore there was a correlation between the education program focusing on theory, and their respective Bachelor of Science programs. Perhaps if there was more dialogue around co-defining educational theories and how they may be applied, teacher candidates could better understand educational theories and apply them to their teaching. Educational theories could then become psychological tools that teacher candidates are using throughout their teaching experiences, which could support student learning.

Practice as Doing: Similarities and Differences between Participants

There was a shared understanding that practice led to learning and that the more practice you do, the better teacher you will be, and more student learning will take place. However, the two participants defined “more doing” differently. For Gavin, answering repetitive practice problems led to the eventual understanding of concepts. This did not include hands-on experiences; rather continuous rote practice problems that led to an understanding of concepts. The notion was that

“a light will go off” and the student will finally understand concepts you have been working on in class. Interestingly, the way in which Gavin preferred to learn was similar to the way in which he perceived his students to learn. The more practice he did presenting lessons and demonstrations led to great learning for him as a teacher; similar to the more repetitive practice problems his students completed lead to student learning. For Andrea, the idea of “more doing” was perceived differently. Doing was engagement in a hands-on manner during practice that led to understanding concepts. Sitting at one’s desk and answering questions would not lead to student learning, rather the more actively engaged a student was, the more the student would learn. This is also how Andrea viewed her learning as a teacher. The more engaged she was in the lesson during the university education courses, the more she would learn.

In addition, their perspectives on the relationship between engagement and learning differed. Gavin noted that the more students engaged in-group discussions when working on repetitive homework questions, the less time they had for more practice problems and, therefore, less learning occurred. It appeared that Gavin perceived teaching practice to be synonymous with student practice and, hence, learning. Andrea noted that more engagement positively correlated with more learning. It appeared as though Andrea perceived engagement to be synonymous with doing, which was synonymous with learning. Engagement was assumed in “doing” and the more doing a student participated in, the more learning occurred.

Learning: Similarities and Differences between Participants

The participants defined learning as a continuous process that involved trying to understand concepts at a deeper level than memorizing. Once you understand a concept you should be able to explain the concept well to another person. Although, they expressed their perspectives on learning in a similar manner, their perspectives on how learning occurred differed. Gavin stated

that learning occurred in a structured environment that provided multiple individual opportunities to complete repetitive practice problems. Andrea stated that learning occurred in an environment that provided opportunities for students to engage in hands-on activities: opportunities in which the students were actively involved in their learning. Having said this, they seemed to also think that teacher candidates could have different perspectives on how learning occurs, yet each of them chose one main teaching strategy that they were comfortable with because that was the strategy in which they learned best (Lortie, 2002). More dialogue throughout the education program around different effective teaching strategies could have enabled the participants to understand the theory behind strategies, and provided them with greater opportunity to implement a variety of teaching strategies.

Gavin and Andrea both claimed that the majority of their learning took place during their teaching practicum (Britzman, 1991). Little learning was done at the university before or after their practicum experiences. In addition, little learning occurred in their community-based practicum. They indicated that the university provided tips on public speaking and teacher delivery, and at times it appeared as though the participants used the terms “presenting” and “explaining” as synonyms for teaching. When asked about her own learning, Andrea indicated, “I learned about public speaking a lot” (A2, 74). The idea that if you focused on delivery and presentation, then someone could learn from the presentation, was implicitly expressed by both of the participants. In addition, the assessments related to teacher candidates learning focused on delivery and presentation, thus, reinforcing a few observable aspects of teaching as important, and perhaps the only important features of effective teaching. Since these aspects were assessed, the university placed value on these aspects, and thus, they were an important piece within teaching according to teacher candidates.

The participants also indicated that secondary students' learning was difficult to assess, and the majority of their understanding of assessment was learned during the practicum from conversations and observations with their sponsor teacher. Although, they completed an assessment course, this was after their practicum experience, and it appeared as though their understanding of assessment strategies was limited. Neither Gavin, nor Andrea, mentioned learning from this course, which they explicitly stated in the interviews.

The university instructors in their methods courses continuously mentioned that inquiry-based learning strategies should be implemented during their practica. Although the university emphasized inquiry, the university instructors did not model inquiry-based learning strategies. They simply talked about how inquiry-based learning was the best way for students to learn. There was no discussion around what it was, how to assess it, or why it was an effective teaching strategy. It appeared as though there was a universal approach, "a one size fits all approach" to teaching inquiry-based learning, but Gavin and Andrea did not know enough about it to apply inquiry-based learning strategies in the practica.

The majority of the assessment on teacher candidate learning, conducted by the university instructors, the faculty advisor, and the sponsor teachers focused on behavioural criteria: the organization of lessons, teacher delivery and presentation, and checklist provided by the university. As a result, the teacher candidates focused their lessons around teacher delivery, which was the focus of the assessment during their classes at the university, and their mid-year and final assessment done by the faculty advisor and sponsor teacher. This assessment checklist determined if the teacher candidates were successful during their practicum. Similarly, during university classes, peers evaluated the lesson based on the appearance of PowerPoint slides, composition of worksheets, and organization of the classroom space during lab experiments. The

teacher candidates' focus was not on the students' learning, implementation of theory or personal reflection, rather was on their delivery of content. Focusing on student learning, implementation of theory and effective personal reflection may have maximized their own learning and helped in their identity construction as teachers.

Identity construction is an important aspect of teaching, and can be a challenging transition. How teacher candidates move from being students to being teachers is an important process that should influence the teacher education program. According to Britzman (1991), the tension is between being and becoming a teacher. The participants had a difficult time seeing themselves as a teacher and more often connected with being a student. They expressed that at the university they were “treated like students” and were asked to complete labs and engage in the lesson as if they were students learning the material for the first time. According to Britzman (1991), “identity always requires one’s consent, gained through social negotiations...identity is contingent in that it is always positioned in relation to history, desires and circumstances” (p. 25). Identifying and developing as a teacher is a continuous process, and teacher candidates may be exposed to difference experiences that affect their identity construction. However, the liminal state of teacher candidates—as both student and teachers—is difficult to overcome and potentially problematic for some teacher candidates (Vadeboncoeur, 1998).

Summary

For Gavin and Andrea theory related to science disciplines, and educational theories were not theories per se. Educational theories were also neither recognizable nor identifiable in the teacher education program. Neither Gavin nor Andrea had time to think through any one theory and its relationship with practice, let alone more than one theory. They indicated that educational theory was important in teaching, but they could not provide examples or

demonstrate the application of any theory in practice. Throughout their experiences Gavin and Andrea did not use theory to help with their decision-making processes in their practice.

Practice was related to experience, engagement, and repetitive practice problems. If students were engaged in experiments and practice problems, then learning took place. Both participants also indicated that they taught in a way that was similar to how they learned best in a classroom. In addition, Gavin and Andrea also focused on behavioural aspects of teaching, because this is what was emphasized through modeling and assessed in the teacher education program.

Chapter 5: Experienced Science Teacher Interview Analysis

Chapter 5 provides an analysis of the experienced science teacher participants' interviews based on their perspectives on theory, practice, and learning, as well as the relationship between these concepts. The chapter consists of three sections. The first section characterizes the perspectives of an experienced science teacher, Isabella, and consists of three parts that highlight her perspectives on theory, practice, and learning. The second section characterizes my perspectives as an experienced science teacher, and consists of three parts that highlight my perspectives on theory, practice, and learning. I end the chapter with a comparison between experienced teachers' perspectives on theory, practice, and learning, emphasizing similarities and differences that surfaced in the interviews.

Participant One: Characterizing Isabella's Perspectives

At the time of this study, Isabella had completed a Bachelor of Science degree with a specialization in Chemistry, prior to successfully graduating from the teacher education program at TMU 11 years ago. In the education program, her specialized disciplines were secondary Sciences and French Immersion. She had been teaching secondary Sciences, in both French and English, within the Lower Mainland for 10 years. During this time, she had worked with several teacher candidates from two different education programs, completed a Master of Education degree in Leadership and Administration, and was actively involved with extracurricular activities within her school community. In addition, Isabella was the Coordinator of Inquiry at her school, and worked directly with the literacy and professional development committees to enhance her professional growth and support her colleagues in reaching department and professional goals.

Isabella participated in one extended interview: it included all of the questions that the novice participants completed in two interviews. This section is divided into three parts. The first part addresses theory and highlights Isabella's perspectives on theory and her perceived understandings of her students' perspectives on theory. This part also includes Isabella's perspectives on the importance of making theory explicit in the education program and in her own classroom. This part ends with Isabella's perspectives on the importance of professional development in relation to understanding educational theory. The second part is on practice and foregrounds Isabella's perspectives on effective teaching practice being more than just the act of doing. This part also includes her perspective on a disconnect between theory and practice. The third part addresses Isabella's perspectives on learning, and highlights her perspectives on learning as the process of internalization. This part also includes Isabella's understanding of theory in assessment for learning and the importance of reflection for learning.

Theory: Isabella's Perspectives

Isabella defined theory as a set of ideas supported by literature that is continuously evolving and building upon pre-existing theories. In the interview, she indicated that theory is the background to why we do specific things, but theories are works in progress and can be challenged and discussed (I1, 35, 435, 523). Isabella stated that theory could be overlooked. During her undergraduate degree, in Chemistry, Isabella remembered that the majority of her chemistry and math courses revolved around abstract theories that were challenging to apply to lab experiments and discussions. Throughout her undergraduate degree, theory was related only to topics and concepts emerging from the conventional science disciplines. During the interview she connected her experiences, in her undergraduate degree, to those of her secondary students, as well as those of the teacher candidates that she had worked with in the classroom. She stated

that secondary students' perspectives on theory, as well as the teacher candidates', were exemplified in abstract concepts presented in content courses in university: the theories behind the concepts were so abstract, that they were not practical (I1, 21). The teacher candidates in Kubli's (2005) research also noted that theories were often abstract and not practical. Having said this, Isabella recognized the importance for her secondary students to understand educational theory in relation to topics and concepts that emerge from science disciplines, and worked with her secondary students to build skills for applying these theories to their classroom work.

Isabella indicated that she continually worked to co-create a classroom, with her secondary students and teacher candidates, to facilitate discussions around educational theories. When asked about theory in learning, Isabella stated, "Even learning, teaching the kids [secondary students] theory, about learning...I think it is important for the kids [secondary students] to know since they are doing the learning often" (I1, 457). She indicated that is important for teacher candidates as well. If the theory is made explicit, then teacher candidates could be assessed on how well they are able to apply educational theories during their practicum.

Isabella did not recall educational theories being made explicit during the education program. When referencing her experience in the education program, she indicated, "...I remember, I remember it being very practical, I don't really remember a lot of theory in the education program" (I1, 55). When trying to think of an example she stated, "I don't know if we learned about theory necessarily? I am trying to think of an example. Hmm...I am drawing a blank, sorry" (I1, 77). She also mentioned,

I don't know how well they did at expressing the theory to us! I think it was maybe embedded into what they know and how they do things. They probably have theory

down and they get it, but in terms of expressing to us the theory, they didn't do a good job of that. I don't think. (I1, 843)

Theory was perhaps modeled, but not made explicit to the teacher candidates. Isabella's experience confirmed Otero's (2006) research emphasizing the importance of making theory explicit for teacher candidates in order to facilitate opportunities to integrate theory in practice.

Later in the interview, Isabella remembered learning about Bloom's taxonomy during the teacher education program, which she said helped her create assignments and test questions. This was the only theory that she recalled from the education program. She indicated that it was not until her further education and professional experiences in which she learned and understood educational theories. She stated, "...[I] learned a lot later in my teaching career and my other education. Yah, which was like oh, well why didn't I learn about [educational theories] when I was learning to teach?" (I1, 129). "I never learned about theories of learning until my Masters, which is ridiculous, ridiculous!" (I1, 505). Isabella expressed frustration: "It makes me really mad actually that I only learned about theories of learning now" (I1, 157).

Isabella placed value on teaching educational theories and practice together, explicitly "upfront," throughout all contexts in the education program. She suggested that university course work, as the introduction to the education program, would be a good place to start discussions on the relationship between educational theories and practices. Isabella indicated, "Theory and practice should be taught together! Everywhere!" (I1, 847). When Isabella and I co-constructed an artefact Isabella placed theory and practice into one circle, emphasising that the concepts were related, and should be taught together (see Appendix G). This is in accordance with Vygotsky (1987) who indicated that theoretical ideas, knowledge and skills, and practical ideas, knowledge, and skills should be taught in dialectical relation, because they are

dialectically related. She indicated that bridging the gap between theory and practice could be done by “incorporating theory and really talking about theory, actually having vocab to talk about it” (I1, 851). The importance of dialogue is critical for mediating the internalization process (Vygotsky, 1987). Once teacher candidates have more understanding of the language of educational theories, discussions can be initiated and educational theories can be translated into other university courses, the classroom practicum, and the community-based practicum (I1, 143). It seemed as though when educational theory did surface, such as her example of Bloom’s taxonomy, it was isolated and did not cross over into other contexts within the education program. Teacher candidates were not aware of how theory and practice were related across other aspects of the education program. They were not given time to engage in discussions or reflect on how they can make sense of theory, and the relationship between theory and practice.

For Isabella, having time to engage in meaningful discussions with colleagues involving educational theories and practice, as well as to reflect meaningfully, would have been valuable within teacher education as it supports the notion that reflective inquiry into one’s own and others’ teacher practice is an integral component of continuous teacher education (Kerr et al., 2011). Isabella indicated that teachers might not have the time to engage in meaningful discussions or reflection with colleagues. She stated,

But I think somehow it [theory] has to be incorporated or revisit[ed], or there has to be sometime between when you are done university to [when] you’re a teacher for a couple years. You need to have some time to reflect, I don’t know if it has to be a formal process or informal but some way to bring it [theory] to the forefront...People who aren’t in their Masters don’t often have the opportunity to talk about anything in a deep way,

which is ridiculous because you're affecting all these kids' learning, so you should know [how to do something] and the theory behind it. (I1, 559)

Isabella indicated that theory needs to be continuously incorporated in teacher education courses. Once you complete the program, novice teachers are consumed by preparing lessons, but there is nothing in place that supports teachers as they develop an understanding and apply theory in their classrooms. She indicated that there needs to be opportunities for all teachers, regardless of their experience and education, to engage in conversations and reflection around theory in classrooms.

Isabella indicated a similar problem during professional development workshops. There were times in which new ideas were introduced, but then they were forgotten, perhaps due to lack of time and encouragement to go back and think through what was presented at the professional development workshops. This occurred particularly when the new ideas presented were not practical strategies a teacher could implement easily in their classroom. She stated,

But in previous ones [professional development workshops], like if we are talking about assessment for instance, this is a huge [topic in teacher education]. Obviously a huge topic. Often what ends up happening is that you talk about this big idea of assessment, the theory behind it, but you don't necessarily get to follow that through and revisit the topic. It's often the one off thing and you don't really get the chance to apply that theory into practice... Then by the time you think about it on the Monday, you're like 'oh what', and I need reinforcement on [what we discussed] and it's important because without the theory the practice doesn't really work. (I1, 89-191)

Again, Isabella highlighted the importance of continuous opportunities for teachers to engage in conversations for professional development. One workshop was not enough exposure for

teachers to understand and implement new strategies and assessment practices that were grounded by educational theories, which was the case for Isabella at professional development workshops. The importance of on-going professional development and the support of professional learning communities is well established in the literature (Darling-Hammond, Wei, Andree, Richardson, & Orphanos, 2009; DuFour, 2004; Eun, 2008). Development of teaching practice is a process and teachers need multiple opportunities to work together to better understand ways in which effective teaching can be supported with educational theories.

If teachers are not using time to reflect and engage in discussions on how to apply theory in practice, then the quick “take away” activities presented at professional development workshops, similar to “un-demonstrations” in the teacher education program, are valued because they can be used immediately (I1, 81). Due to time constraints, and the amount of work that teachers are involved with, the practical activities seemed to be valued more than theory. Isabella noted that having additional time to reflect on experiences and discussions around theory can facilitate teachers’ learning, and could be valuable as an ongoing process throughout a teacher’s career (I1, 155).

For Isabella, it seemed as though theory integrated in classrooms is important for teachers, teacher candidates, and secondary students. She noted that making educational theory explicit for teacher candidates and secondary students is an important component of learning and development. She indicated that multiple and continuous opportunities, such as professional development workshops and meaningful reflection with colleagues, should be required for teachers and teacher candidates to engage in discussions around educational theory. This can facilitate continuous development and allow teachers more opportunities to implement practices in their classrooms that are grounded in theory.

Practice: Effective Teaching Practice is More than just the Act of Doing

At the time of this study, Isabella perceived practice as more than just the act of doing and organized routines. She noted that practice should constantly be evolving, and challenged through questioning, to facilitate student learning. Although, she characterized practice as useful and applicable, she reiterated that the more experience you have or the more practice you do, does not always lead to a greater understanding of a concept for students, or a more effective teacher (I1, 117, 580). Isabella stated,

...There should be something in place that forces you to talk about the theory and the practice and to revisit [theory in practice]...cause a lot of people, for assessment for instance, so many people know that rote practice for instance is useless, do you really need to do 12 million activities on what 1 plus 1 is? No! Like after the first five you get it right. Yet so many people still do it [rote practice], because that is just what they do!

So something in place to question what they are doing [and why they are doing this]. (I1, 580)

For Isabella, practice is important, but practice and repetition alone, did not correlate with more students' learning. Although, it seemed as though Isabella thought most teachers understood this, Isabella indicated that repetition might still be common practice in a classroom. She proposed that there should be something in place to encourage teachers to reflect on their practice, to ensure that teachers are demonstrating effective teaching. She cautioned against getting caught in a routine that includes completing repetitive practice problems simply because, in Gavin's words "it's the easy thing to do."

Isabella noted that she perceived her faculty advisor, sponsor teacher, and secondary students to have a similar view on the importance of "doing" and structured routines. When

asked about her own secondary students' perspectives on practice, she indicated they thought more practice leads to more understanding. She stated,

I think they think it is important, I think they have been drilled on the more you do something the more it's going to stick in your head. Whether that is true or not, may not always be the case, cause of course...some students get it right always, and some students can work their tails off 10, 000 plus hours and still [not get it]...the more you do something the better you are at it, which they can see through their experience with sports and stuff too. (I1, 515-519)

Isabella seemed to recognize that some students would understand some concepts more readily than other students, and her students figured if they kept practicing then they would eventually understand a concept. For the students, this "working theory" between practice, repetition, and learning was reinforced by their perspective on the relationship between practice and sport: The more hours of practice a person completed, the better a person would be at the sport. Although engagement can lead to learning and development, it does not always (Schwartz & Bransford, 1998; Wertsch, 2007).

When asked about her sponsor teacher's perspective on theory and practice, and their value in a classroom, Isabella indicated, "if it didn't apply immediately she probably would have just dismissed it" (I1, 279). When Isabella was in the teacher education program 11 years ago, she remembered her sponsor teacher as having meaningful lessons due to her sponsor teacher's experiences, rather than theory that grounded the lessons. Isabella stated,

I think more [importance was placed on] practical...this works because I am an experienced teacher, this works not necessarily [because] the theory behind it...you

should do this because it's more engaging for the students, but not necessarily why it is engaging. (I1, 270, 275)

It appeared as though Isabella did not engage in discussions with her sponsor teacher around why and how certain strategies were used during a lesson, or the theory that grounded the strategies, if in fact they were grounded by theory. What her sponsor teacher modeled, was seen as important, because her sponsor teacher had experience teaching and therefore, her sponsor teacher knew what strategies were effective for student learning.

When asked about the university courses, Isabella remembered the focus being on modeling teaching methods, organization, and time management, rather than spending time on discussing educational theories and the practical component of implementing educational theories (I1, 250). She did not recall theoretical connections being made explicit between being a “good teacher” and student learning, and the focus throughout her education program was on practice. Her perspective on the university instructors’ views on practice being more valuable than theory was reiterated throughout the teacher education program. She stated,

...the emphasis was more on practice like how was your lesson structure, what should it look like...it should have these key components, not necessarily the why those things are important, which I have kind of learned more recently. But these things [strategies grounded in theory] should be included in your lesson. Ridiculous [be]cause I felt like I learned it [educational theories and the importance of implementing theory into the lesson] maybe last year, [or] the year before. (I1, 250-254)

With experience in the classroom and further education, Isabella had come to realize the importance of understanding educational theories and the role they played in teaching practices.

This more recent realization made her wish that she had been given an opportunity to develop a better understanding of the potential purposes theory could have for teachers earlier.

When she was a teacher candidate, Isabella noted that she, herself, perceived the practicum to be the most challenging aspect of the education program, and the part of the program that was most valuable for her. Although, she indicated that she valued theory, she stated about the courses that occurred after the practicum, “Like we already did the hard part [practicum], so what are we doing now? It didn’t seem connected at all. A waste of time. Just a waste of time” (I1, 825). It appeared as though Isabella, as a teacher candidate, understood that theory was important, but since educational theory was not made explicit and she did not recall opportunities to discuss the importance of educational theory, she perceived theory to be less valuable than the practicum experience. Once she completed the practicum, it seemed as though she already learned what she needed to in order to be successful in her own classroom. Theory and practice were two separate entities and the connection between theory and practice was not important in teaching. This is reminiscent of Kubli’s (2005) research that indicated educational theories that are presented in teacher education programs are often presented to teacher candidates as abstract and may not be integrated into practical experiences making it challenging for teacher candidates to apply theory and practice as related academic concepts. However, there is importance in bridging the gap between theory and practice in teacher education programs (Kerr et al., 2011).

Isabella indicated that there was disconnect between educational theory and practice, and valued the importance of teaching these concepts together (see Appendix G). She stated,

I think even just to have them [theory and practice] taught in the same time and the same place, with the same person, would make it useful. [For example] read this article about

this [theory], this is...so and so, who has these qualifications who talks about whatever theory and this [theory] applies, this is how we do it [implementation of a teaching strategy] because of this theory...Having it [theory and practice] integrating together. So reinforce the theory through practice...So everything taught same time same place...I think that whoever is teaching your whatever class if it is your methods course, or your exceptionalities course or whatever course...hopefully all of those courses are based on some sort of theory...[and] the responsibility would lie with the teacher education program. For the first site because, that is the first time you are going to see the theory [and/]or the practice. (I1, 133-143)

For Isabella, throughout the education program theory and practice were not taught together. She did not recall theory being taught explicitly, let alone discussed in the same context as practical experiences in any of her courses at the university. She indicated that teaching theory and practice together, in a variety of the education courses, might be a valuable approach for teacher candidates to understand theory and practice, and the relationship between the two concepts, which is fundamental in Vygotsky's (1987) sociocultural theory. According to Isabella in order to improve teaching practice, it is imperative for teachers to be engaged in dialogue, collaborations, and self-reflections involving theory and practice both throughout the teacher education program and their teaching careers (I1, 580-582).

For Isabella, practice was more than just the act of doing in a classroom. Having said this, throughout the education program, she indicated that her university instructors, sponsor teachers, and secondary students placed more value on practice than on educational theory. Engaging in repetitive practice problems and modeling demonstrations was perceived to be the most important, and this influenced Isabella's perspective during the education program as well.

Since most people involved in the education program were placing more value on the practice, she assumed that it must be the most important aspect of teaching and learning. Educational theories, which were likely taught, were not made explicit, and were not taught in connection with practice. It was not until Isabella completed years of teaching and further education that she shifted her perspective on effective teaching away from the act of doing and student engagement toward a deeper understanding of what learning requires (Conway & Clark, 2003).

Learning as Internalization

Isabella defined learning as being able to internalize a concept in an explicitly Vygotskian sense, and demonstrate an understanding of a concept. She indicated that learning could occur in a variety of contexts (see Appendix G). It is a process that can use a variety of methods, can be measured using a variety of assessments, and might involve unlearning, relearning, and adjusting what we think we already understand (I1, 608-610, 628, 773).

In the education program, Isabella indicated that the majority of her learning took place during the practicum and during her science methods courses (I1, 653, 787). Isabella recalled the science method instructors did a significant amount of modeling on how to perform lab experiments and science demonstrations. The teacher candidates observed the instructors and then practiced the labs and demonstrations on their own in front of their classmates: a description that sounds similar to Gavin and Andrea's description of the science method courses several years later. Isabella's university instructors reinforced the idea that experience by doing relates to learning (Sandholtz, 2011). Isabella stated, "I feel that methods course in general. Hmm, I feel like I learned a lot, especially after you do something in front of the class and it flops or goes really well" (I1, 653). Isabella measured her learning based on the feedback provided by her peers, which focused on the organization of the lesson, the demonstration and modeling of an

experiment, and her delivery. This is similar to research done by Sandholtz (2011) that indicated teacher candidates initial perspectives on effective teaching focused on organization of the lesson, teacher delivery, and classroom management. She noted that if the demonstration of the lab had gone well, for instance the demonstration worked properly, then her lesson was successful. She assumed that if she repeated this lesson in the same fashion, then it would be successful with her own secondary students during the practicum.

The assessments completed by university instructors and her peers were both formal and informal. When asked about assessment that took place based on her learning she recalled, “There was no marks, but there was still marks” (I1, 661). The assessments were based on a pass or fail basis, and the teacher candidates were given a “P or P+” evaluation on formal assessments. The assessments did not include a component that measured how well the teacher candidates’ applied educational theory in practice, rather they focused on teacher organization and delivery. According to the current website of TMU, linking theory and practice is an important aspect of the teacher education program, however it is not clear if this emphasis existed when Isabella attended the university. In addition, the development and implementation of teacher candidate assessment that focuses on teacher candidates’ ability to understand theory and practice, and the relationship between them can be challenging (Quatroche et al., 2012; Waggoner & Carroll, 2014). For Isabella, the teacher candidate assessments had minimal influence on her understanding of theory and practice, and the relationship between them. With continued teaching experience, including classroom practice, workshops, and further education, Isabella indicated that she had time to reflect on her teaching and had a greater understanding of the significance of educational theories related to how students learn.

When asked about reflection, Isabella noted that after the practicum teacher candidates were asked to reflect on their new teaching experiences, but these reflections were not meaningful. She recalled reflection was mostly teacher candidates sharing their experiences from their practicum that involved informal discussions around particular characteristics of students. She did not recall any discussions around how sharing and reflecting on different experiences could become learning experiences for the other teacher candidates. She indicated that learning could take place through meaningful reflection, but did not recall the opportunity to reflect meaningfully. She said, “Cause part of it too at TMU is just that you are reflecting to reflect and write something down. And it’s not useful” (I815). Isabella considered reflection in dialogue and reflection in writing to be a valuable tool, but stated that it is not used well throughout the education program. She noted that meaningful reflection could build a greater understanding of theory and how it can relate to practice. Reflection during the practicum and after the practicum requires teachers to confront the complexity of students learning and teacher’s teaching and learning, and should be an important aspect of teacher education programs (Dewey, 1916; Falkenberg, 2010).

For Isabella, learning was defined as a process of internalizing and coming to understand concepts. She indicated that the majority of her learning as a teacher candidate took place in the practicum and her science methods courses by observing university instructors complete demonstrations that she could implement in her classroom. It appeared as though her learning occurred through and reinforced a behavioural approach: observations of behaviours and modeling led to learning. Although she indicated that her peers and university instructors provided feedback based on her delivery and organization of the lesson, she noted that meaningful reflection could have been a valuable learning tool. Defining meaningful reflection

and understanding how meaningful reflection could be used, in addition to having meaningful reflection being modeled, could have contributed to her personal learning as a teacher candidate in the education program.

Participant Two: Characterizing the Researcher

At the time of this study, it had been 12 years since I completed a Bachelor of Science degree with a specialization in both Biology and Psychology, and 11 years since I graduated from the teacher education program at TMU with a focus on secondary sciences. When I began teaching, I was a teacher-on-call for one year and then I became a full-time secondary science teacher in the Lower Mainland where I have worked for the last 10 years in the same district. When I first started teaching, I was a part of a mentorship program, which was designed for beginning teachers in our district, to build relationships with experienced teachers in our school, and to facilitate new teachers' learning, lesson plan development, and assessment development. Over the course of my teaching career, I was a sponsor teacher for teacher candidates involved in the TMU teacher education program.

Throughout my teaching career I have been actively involved in my school working with student extracurricular activities and on a variety of committees to help support my professional growth and support colleagues reach department and professional goals. For example, at the time of this study, and in addition to my full-time teaching schedule, I worked directly with the learning support services to create and develop differentiated science assessments. In addition, I worked closely with colleagues around co-constructing school literacy goals and literacy strategies that can be translated and implemented within all curricular areas. My involvement within the district and my school helps support my continuous learning and professional growth.

For this study, I reflected on the same interview questions that I had asked the other participants. My reflections highlighted my perspectives on theory, practice, and learning, in addition to my perspectives on how university instructors in the education program, faculty advisors, sponsor teachers, and students would define theory and practice, and the relationship between the concepts. This section is divided into three parts. The first part addresses my perspectives on theory and my perceived understanding of my students' perspectives on theory. This part also includes my perspective on the importance of making theory explicit throughout the education program. The second part addresses my perspectives on teaching practice. The third part highlights my perspectives on learning.

Theory: Researcher's Perspectives

From my perspective, a theory is an idea, or set of ideas, that is supported by experiences and research that is used to question, build curiosity, and further one's understanding of concepts (T1, 4). Theories are continuously being developed and evolved based on new research and experiences. When I thought about my secondary students' perspectives on theories, there was a common perspective that theories were old, have existed historically in time and are fixed concepts that people do not question, but were informational tools that help us learn new concepts, especially in a science classroom. Secondary students in a science classroom seemed to relate theories to the scientific disciplines, such as the theory of evolution and natural selection, rather than considering educational theories (T1, 79). My secondary students' and teacher candidates' perspectives were similar. Given my experiences as a sponsor teacher, I thought that science teacher candidates' perspectives on theories were that they are related to concepts in science disciplines, and that educational theories were not noticed and/or not understood well enough to be applied in practice.

Reflecting on my own experiences during my own undergraduate degree in science, theories that surfaced were related to the science disciplines, such as understanding theories within evolution, classification, development, motivation, and calculus proofs. In my biology and psychology undergraduate courses, I do remember having to demonstrate my understanding of the different theories through essays, research papers, and lab experiments. In math classes, I remember having to solve problems and show proofs of theories, but my understanding of theory, as an undergraduate student, was not assessed.

Reflecting on my time as an experienced teacher, I recognized that I continue to try and make educational theories explicit to my secondary students. Explaining the educational theory that foregrounds the assignments and assessments is helpful for my secondary students learning and development. Explaining the reason behind activities conducted in class can engage my students in thinking through the theory and/or the reasons behind why we do what we do in class. If we were doing group work, I would explain to my students that learning is a social process and it is important to work with others to build on our own current levels of understanding. Recognizing that we may be at different levels of understanding, but that collaborating with others can build our own curiosities and understandings (T1, 83), is consistent with a Vygotskian (1987) perspective of learning.

When I was a teacher candidate in the teacher education program, I recalled reading about theories in one educational psychology course (see Appendix H). We read about theories, for example, by Freud, Erikson, Piaget, and Skinner. I did not recall discussing these theories in general, or taking the time to discuss their relevance and/or the potential impact they may have on learning and/or teaching:

The only theory that I remember in my education degree was in an educational psychology class. We were given readings from the textbook on theorists' ideas of developmental stages. Development theories by Freud, Erikson, and Piaget...I remember we did not dissect the theories, explore the potential value of these theories in education settings. Rather, the theories were memorized concepts and were not used in a practical setting. (T1, 108)

Given that I remembered the names of these scholars, it did appear theory was introduced in the education program, but there was minimal opportunity to engage in discussions around how theory can be useful and/or meaningful in a classroom, and we did not discuss the application of theory. Although I remember their names, I could not remember anything about what they advanced. Having the language to discuss educational theories is an important component of the teacher education program in order to facilitate teacher candidate learning (Vygotsky, 1987).

In addition to this course, I remembered using strategies that were perhaps grounded by theory in the education program, but this was not made clear to teacher candidates. I recalled in my biology methods class using Bloom's taxonomy, and in my communications class I remembered the "sandwich model" that teacher candidates used when providing feedback. In the biology methods course, I remembered discussing Bloom's taxonomy, in relation to designing test questions for assessing student understanding. The theory behind the taxonomic levels was not discussed; I simply remembered having to include a set amount of questions for each taxon level. For instance, what I learned was that a test should include three "recall" questions and include two higher-level "analysis" questions. I had no understanding as to why this was being suggested and/or the conditions under which knowing about this might be helpful.

When reflecting back to my science methods class, I did think that the instructor incorporated theory in the lessons, but it was not made explicit to the teacher candidates in the classroom. At the time, I believed that the instructor knew of educational theories she included, but she did not present them as theories, nor did she explain or facilitate discussions around their importance during teaching practice. I had a reason to think that she included theory in her lessons: she was a university instructor. I assumed that she applied theory in her practice simply because she was a university instructor. I did not recognize theory that was embedded in her practice, but I accepted the fact that, as an instructor, what she demonstrated to teacher candidates as effective teaching strategies must be based on some theory. When I did a mini lesson for my teacher candidate peers, I simply included what my sponsor teacher included in samples that were given to us.

My lessons mimicked my instructors' lessons and included learning outcomes addressed by the content, examples, and organized worksheets that avoided "cognitive overload." I completed assignments without knowing and/or understanding what, how, and/or why theory was involved. I recalled the focus was on teaching strategies, rather than understanding the educational theories grounding these strategies. In my auto-interview, I wrote:

I remember making assignment worksheets that were not 'too busy' and were not representative of cognitive overload. I remember creating tests that included a variety of questions that ranged from memorization, application, and conceptualization. I also remember providing formative feedback for the students [other teacher candidates]. These were simply strategies that were presented to me and were suggested that I do during my teaching, they did not have any theoretical meaning as to why I was implementing these strategies. (T1, 132)

Although I observed and implemented strategies that were modeled to me by university instructors and my peers, the theory was not visible. As Lortie (2002) suggested, I observed other teacher candidates and only saw behaviours: I had no access to their thinking. My perspectives on effective teaching were similar to the teacher candidates' highlighted in Sandholtz's (2011) research, and my perspectives appeared to be supported by the university instructors teaching practices and assessments. University instructors modeled effective teaching, and the assessments did not focus on teacher candidates' ability to identify or explain how theory was used to arrive at the meaning of effective teaching.

Overall, when I reflected upon my perspective on theory as a teacher candidate, it seemed that theory is very important and is highly valued. I don't think it is always understood, and can have much more of an impact on teaching and learning if it is discussed in all aspects of the education program (T1, 116). If educational theories were presented in the education program they were isolated; discussions of theory did not translate into discussions in other university classrooms and I was not able to apply them in the practicum (see Appendix H). I could not recall an instance in which I engaged in a discussion around an educational theory, so I also could not have continued the discussion in a different context of the education program.

What stood out for me was that, in regard to the implementation of theory in practice, "No clear connection was explained that I remember. The 'why' we use something, was not answered, it was just understood it was important, and therefore, we should model the same teaching behaviour in our teaching practices" (T1, 36). When I was in the education program, I recognized that I did not know of educational theories and did not implement theory in my lesson planning. I do remember during my practicum the secondary students asking, "Why do we need to do this?" Looking back, I realize that I could not answer them. Although understanding why

we were doing certain activities, and using theory to support my decision making for lessons, would have been helpful for my secondary students during my teaching practicum—for example, to explain the importance of group work and/or assessment practices that surfaced throughout our lesson—I could not share this information because I did not understand it myself (T1, 81).

Assessment is an important tool for learning, and, yet, as a sponsor teacher, I did not recall teacher candidates' understandings of theory ever being assessed during the TMU teacher education program. The mid-point and final evaluations, conducted with faculty advisors and sponsor teachers, did not include a section on assessing the teacher candidate's use of theory when designing lessons or assessing student learning (T1, 64). I did not remember specific instances in which my faculty advisor, sponsor teachers, or university instructor discussed my application of educational theory into my teaching practice. I did remember we discussed lesson planning, classroom management, and classroom climate, but the discussions were more around the organization and time spent on each activity. There may have been theory embedded in constructive criticism and feedback, but it was not made explicit that the suggestions were grounded in and could be explained by theory (T1, 62). Without discussion about and assessment of applications of theories, teacher candidates are unlikely to learn them (Waggoner & Carroll, 2014).

Practice: Presenting synonymous with Teaching

During my auto-interview, I wrote about my definition of teaching practice as a process that involves working with teachers and students in an environment that builds curiosity and understanding, enriched from previous knowledge. Teaching involves creating lessons and differentiated assessments, scaffolding, explaining concepts, building relationships and communicating with parents, teachers, and students to facilitate student learning (T1, 12). My

perspective on how university instructors, faculty advisors, and sponsor teachers would define teaching practice includes the importance of modeling, understanding content, teacher organization, teacher preparation, and time management within a lesson (T1, 32, 34, 52, 71).

Throughout the education program, modeling was presented to be an effective strategy to learn how to be an effective teacher. In the science methods classes, I recalled modeling being the only teaching strategy that we used to build on our perspectives of effective teaching. When reflecting on how teaching practice surfaced in my education degree and how practice was being used, I recalled that practice was used to demonstrate and model “good” and “not so good” teaching practices. In science methods classes, we discussed what had gone well during the mini lesson done by the teacher candidate, and provided feedback to our peers on how they could improve their teaching. At that time, my attention was on what teaching looked like as an observer so my feedback was on delivery, organization of the handouts and the lesson, and how well the teacher candidate acted like she/he knew the subject content (T1, 16). This is similar to the teacher candidates’ perspectives on effective teaching highlighted in Conway and Clark’s (2003) research. It seemed as though my perspectives on effective teaching, focused on teacher delivery, and organization, matched the university because that was what was modeled and that was also assessed.

I remembered the science methods instructors demonstrated how to use the science equipment and model a lab experiment before the teacher candidates would demonstrate their lesson. For me, I perceived that the instructors wanted the teacher candidates to construct their lesson in the same fashion, so I understood that in order for my lesson to go well, be effective, and get a good grade, I should mimic what the instructor had done previously. In reference to the university classrooms, I stated, “No clear connection was explained that I remember. The

‘why’ we use something [strategy grounded by theory], was not answered, it was just understood it was important, and therefore, we should model the same teaching behaviours [as our instructors] in our teaching practices” (T1, 36).

In addition to the university course work, my sponsor teacher also reinforced modeling as an effective strategy. I recalled my sponsor teacher modeling teaching strategies that included lecture delivery, note taking, formative assessment, and classroom management. I did not recall having discussions with her as to why she chose to apply specific strategies during the lesson. Practical experiences did not appear to relate to theory, and I wrote, “The theory behind such practice was not discussed” (T1, 56). Throughout the education program I did not recall discussing theory, let alone theory in practice.

In regard to classroom management, I recalled having discussions with other teacher candidates around effective strategies that could be used in classrooms. We read classroom based scenarios involving a variety of student behaviours in a variety of contexts, and we discussed whether we agreed or disagreed with the strategies performed by the teachers in the scenarios, and what we would do differently. It is important to note that we did not discuss why we “should or should not” manage our classrooms in a particular way in relation to educational theories. I did not recall our ideas being supported by research, it was simply based on what we thought was best, perhaps based on our personal experiences, everyday concepts, and our “working theories” that we entered the teacher education program with (Hedges, 2012). We all entered the program with different everyday and academic concepts, different perspectives on education, and ideas of how students learn and develop. We used our “working theories” to facilitate discussions that provided feedback and suggestions for other teacher candidates and those were not necessarily grounded in educational theory (T1, 14).

From what I recalled during my experiences in the education program, practice was not supported by theory, although it is my perspective now that theory is the underlying component that facilitates effective teaching and learning. At the time of the education program, I did not understand educational theories, and did not have the language to engage in discussions around how theories can be implemented into practice. When I was a teacher candidate it seemed that:

...I do not remember having conversations with my [secondary] students that connected practical experiences...to theory. I recognize where these conversations could have occurred, but at the time did not make the connections, nor did I have the conversations with the [secondary] students. (T1, 102)

As a teacher candidate, it appeared as though I did not have the language to engage in discussions with my secondary students around the theory behind learning. Language could have been a starting point to generate dialogue and social speech, developing into private and inner speech, all of which are important in the process of learning educational theories (Vygotsky, 1987). In addition, emphasizing to my secondary students the theory behind the practice was not something I recalled being explicitly valued by faculty advisors or sponsor teachers during my teacher education program. As a result, my focus remained on teacher delivery, classroom, and time management, which again were behaviours I recalled being modeled and assessed by my university instructors, faculty advisor, and sponsor teachers.

Learning what is Effective Teaching

At the time of the study, when reflecting on learning, the first six things I thought of when I heard the word learning was “teaching, groups, understanding, a process not an outcome, asking questions and making mistakes, and curiosity” (T1, 138). I defined learning as a social process that involves being engaged with others, sharing information, asking questions and

trying to make sense of concepts, which can then be internalized. The process of learning involves building on prior experiences, knowledge and understandings of concepts, and is supported by providing students with tools and feedback to facilitate their learning (T1, 140, 142).

As a teacher, it is important to recognize the difference between when learning has taken place and when students have simply memorized concepts. When reflecting on the difference between to know a concept and understand a concept, I noted “To know is to memorize information and is a temporary concept. To understand is to internalize and to continuously use and build upon, apply and critically think about [concepts] in different contexts” (T1, 145). For secondary students this difference may be unclear, and the two concepts may be seen as synonymous with each other. A challenge for teachers is to understand how to effectively assess what students have learned, and not just memorized.

When reflecting upon how teachers recognize that student learning has taken place, I indicated that when someone is in the process of learning and building on their current level of understanding they can ask higher-level questions than they could previously. They can engage in discussions, explain their understanding to a student who understands less about the topic, they can teach the concept to other students and they can understand feedback from others, which can facilitate their own understanding. Having discussions with secondary students is a simple, yet effective strategy to show their level of understanding (T1, 147).

When I reflected on when most of my learning took place as a teacher, I indicated that the majority of my learning took place over the first five to ten years of my teaching, starting with my practicum. I continued to find that working with colleagues, other teacher candidates, professional development workshops, graduate studies, and my own passion to learn more on

effective teaching and effective learning, has provided me the opportunities to build on my current perspective of learning (T1, 153). I measured my own learning based on my ability to have discussions with colleagues and students, my ability to ask new complex questions, my ability to understand feedback provided, and personal reflection. Making time to reflect is an important aspect of measuring learning and learning in and of itself, and it has been significant for my own development (Falkenberg, 2010).

During the university classes, my learning was focused on my teacher delivery and organization; helping me look like a teacher. In my science methods classes, my learning involved ways to organize a lesson template, examples of science demonstrations, and how to use science equipment. In my communications class, we conducted numerous video recordings of ourselves talking about prepared and impromptu topics. Our peers provided feedback based on our tone of voice, volume, gestures, and body movements. I recalled over analyzing my own body movements and being critical on the tone of my voice when talking on camera. I learned what gestures I did repeatedly and what words I may have overused. The learning that took place during these university classes focused on teacher delivery and presentation. At the time my perspective was that “presenting” was synonymous with “teaching,” and that a good teaching presentation equates with student learning (T1, 151), which is similar to teacher candidates’ perspectives on effective teaching (Conway & Clark, 2003; Sandholtz, 2011). Since the assessments focused on my ability to present, my perspectives on effective teaching were supported.

The majority of assessments that took place during the education program revolved around summative checklists, verbal feedback from peers and formative feedback on how to improve the lesson templates. Sponsor teachers and faculty advisors completed summative

checklists during the practicum, which focused on teacher preparedness, delivery, time management, and professionalism. I also recalled university instructors providing teacher candidates with feedback on their lesson templates. As teacher candidates, we submitted lesson templates that included a framework for how much time would be spent on each component of the lesson, the learning outcomes for the lesson, and section that indicated what the students will be able to learn based on the lesson. University instructors evaluated our templates using a pass-fail assessment, and provided written suggestions on how we could improve the template. In my auto-interview I wrote:

In [the science] methods courses we did group work during the class, doing lab activities...mini lessons and demonstrations, group lessons and group demonstrations in front of the class. Individual lesson planning and organizing a template were always handed in to our instructor. These were evaluated based on a 'check, check minus or check plus' system. The templates that I developed, I did need to create one for every lesson, so I did use these during my practicum. It was a helpful tip that I definitely used, not sure it was a pivotal learning piece in the program, but a relevant tool. (T1, 151)

The assignments and feedback I received seemed like helpful suggestions that I could readily implement into my teaching that would directly improve my lesson. Upon further reflection, I recognized that I was not aware of what else I could have learned from these experiences. At the time, I was not aware that I could have learned about the importance of educational theories to improve my own learning and develop my perspectives on effective teaching for student learning.

Another example of learning that I remembered was during my practicum. A Biology 11 class performed a lab, and I was not as prepared as I could have been with the lab equipment and classroom set-up. I wrote:

I was able to make the adjustments for the next class and experienced a more organized lab. Whether or not the students learned more, or better, it was important to not have a chaotic class so that the classroom was more conducive to learning. Students were focused on the activity instead of focusing on where the equipment was, where they were going next. They had more time to focus on the objective of the lab without distractions getting in the way of their learning, such as looking for equipment that was not set up.

(T1, 183)

My perspectives assumed that students learn in a classroom when there are fewer distractions, and time is spent on the prepared lab activity that is organized for smooth presentation delivery. I understand the importance of being organized, but I do feel that too much of the feedback was on organization and teacher delivery. Assessment done by university instructors, faculty advisors, sponsor teachers, and peers that emphasized teacher delivery and presentation reinforced a notion that teacher delivery and presentation are the most important aspects of teaching to facilitate student learning, and perhaps synonymous with each other.

It was my perspective that university instructors, faculty advisors, and sponsor teachers related student learning to teacher preparedness and organization. As a result, my perspective at the time was that if teachers were prepared and organized then students would learn in the classroom. Now, I realize there is much more to teaching than being organized. Throughout the education program I recalled teacher candidates' "checklist assessment." This assessment focused on teacher candidates' competencies in organizational skills, time management, and

professional relationships, to indicate a few areas. With the assessment of teacher candidates on teacher delivery and organization, the value of these aspects was reinforced more so than other aspects, such as understanding educational theories and practice as related academic concepts, and the ability to apply educational theories in practice, and reflection on practice.

I believed that there was a significant relationship among theory, practice, and learning. In my auto-interview, when reflecting on theory in relation to practice and learning, I wrote:

I think that you can learn a certain amount without theory, regardless of the field of study that you are studying. However, without understanding different theories and applying these theories in practical contexts, I don't think that learning and development is maximized, regardless of your field. Studying piano, nursing, working with patients, and teaching. All are examples of professional contexts that indicate if you understand theory and can integrate the theory into your work, then more learning can take place. I think the two are strongly related. I think you learn during your practice, and once you learn theories and can apply them in practice, you learn even more ways to [demonstrate and support] effective teaching and student learning. (T1, 155)

The most amount of learning can take place when theory and practice are interrelated.

Understanding a theory and how it informs a set of practices is valuable for all learners, not just teacher candidates. In turn, theories may be changed by what emerges from practice.

Based on my experiences in the teacher education program at TMU, educational theories were not made explicit. Practice was valued by university instructors, faculty advisors, and sponsor teachers, and was often presented to teacher candidates through modelling behaviours and doing demonstrations of classroom activities. At the time, I assumed effective teaching was

the result of having an organized lesson and a good presentation, which logically translated into students' learning.

Comparing Experienced Teachers' Perspectives on Theory, Practice, and Learning

This section is divided into four parts that focus on similarities and differences that surfaced between the interview with Isabella and my auto-interview. The first part presents a comparison between Isabella's perspectives and my perspectives on theory. The second part offers a comparison between Isabella's perspectives and my perspectives on practice. The third part highlights a comparison between our perspectives on learning and discusses the challenges of assessment. I conclude this section by highlighting research that supports the characterizations.

Theory: Similarity and Differences between Participants

Isabella and I defined theory as a concept that is supported by research and experience, can evolve and is not fixed, and should be discussed throughout the education program and one's teaching career. We both did not recall educational theories being made explicit to us during the education program, and we both identified that the majority of our learning of educational theories came from our graduate programs. In the teacher education program the only educational theory we both remembered was perhaps identified in Bloom's taxonomy. Although, it was more likely than not that educational theories were indeed mentioned in the educational courses, Isabella and myself did not recall having in depth discussions around any educational theories, although I still remembered names of theorists like Freud and Skinner. When I constructed the artefact, I drew a line between theory and learning, but indicated that the only theory discussed was in an educational psychology class and the theory was not applicable or made relevant to the decision making process as teachers. We did not engage in dialogue on

how teachers could integrate theory in a variety of classrooms, such as a science methods class (See Appendix H).

Both Isabella and I indicated the importance of time and opportunity to meaningfully reflect in order to process theory; otherwise it remains too abstract to use. The time in the education program is limited, and the majority of time is focused on learning the course material, preparing assignments, and handouts. There seemed to be little time available for teacher candidates to define, discuss, and understand educational theories. In addition, the time used for reflection was not meaningful and, therefore, seemed as though it was not valued. During the teacher education program, reflection was not understood as a valuable learning tool for either of us, but with more experience, and perhaps time, we realized the value of reflection in our teaching practice.

Although we indicated that reflection was significant for learning we provided different examples that highlighted its importance. For Isabella, reflection surfaced in conjunction with theory and professional development. She indicated that professional development is an important aspect of teaching, but she noted that in order for professional development to be effective, there needs to be time allocated for her to reflect on her experiences. She indicated that often what is discussed in professional development workshops is a “one-time” learning experience, and she noted that in order for her to truly understand educational theories and new strategies that are grounded in theory, she needed to allocate time to reflect in order to implement her new understandings, which is reminiscent of Dewey (1916) and Vygotsky (1987). She may have dismissed what was presented to her because she did not know it well enough to be able to apply the new information. She indicated that otherwise, the workshop was not as effective,

because she might dismiss what was presented to her during the professional development workshops.

Reflection for me was related to theory and assessment. I indicated that throughout the education program, teacher candidates were not assessed on their understanding of educational theories. I noted that meaningful reflection could provide teacher candidates with an opportunity to assess their own understanding of educational theories, reflect on their own experiences, and facilitate their understanding of how they can implement educational theories into their practice.

Throughout the interview with Isabella and my auto-interview, there was little difference with our perspectives on theory. One difference I noted was that Isabella was frustrated by not having access to educational theories earlier in her teaching practice. She indicated that she just recently learned about educational theories from further education, and wished that she could have had more opportunities to think through and make sense of educational theories to then apply in her practice.

Practice: Similarity and Differences between Participants

Isabella and I had a shared understanding that practice is a process that involves working with others, and is more than being engaged. We agreed that our students perceived practice to relate to experience. We recalled our secondary students having similar perspectives: the more practice and experience you have, the more you can learn. Having said this about our students, this perspective on experience relating to learning was similar to what Gavin and Andrea noted during their interviews. This is discussed later in Chapter 6. Although now we agreed that practice is more than just the act of doing and modeling strategies, as teacher candidates we viewed learning as a direct result of engagement and doing. At the time of our education program it seemed as though it was the only component of practice that was assessed, and as a

result was perceived to be valued by the university and, therefore, the teacher candidates.

Overtime, our perspectives developed and we perceived practice to be more than the act of doing, and to include strategies that are grounded by educational theory.

We also shared the understanding that practice was not supported by theory. Discussions throughout the education program did not involve how teacher candidates could apply theory in practice. We recalled discussions that involved how we could improve teacher delivery of content, how to improve student handouts, and PowerPoint slides. We noted that there was disconnect between theory and practice, which dichotomized the concepts and influenced what teacher candidates valued during the education program. From what we recalled based on our experiences, practice was more valuable than theory throughout the education program.

Throughout the interview with Isabella and the auto-interview, there were no noted differences in perspectives on practice.

Learning: Similarity and Differences between Participants

Isabella and I defined learning as a social process that leads to internalization of a concept. We agreed that learning focuses on the process, not the outcome, and truly understanding a concept is different than memorizing information. When a person understands a concept this concept can be applied to new contexts. When referencing our learning in the education program, we shared the understanding that we learned the most during our practicum and our science methods courses, another feature we shared with Gavin and Andrea and is discussed further in Chapter 6. At this time we noted that we learned the most through observations, and university instructors' and sponsor teachers' modeling was what we perceived at the time as effective teaching practice. We gained insight on what effective teaching can look like, and perceived our learning to be beneficial for our teaching in the classroom. The more

practice and experience we had was perceived to facilitate our learning on what is effective teaching. Based on the feedback provided to us by our university instructors and peers, we recalled that learning occurred because we received helpful tips on how to improve our delivery of content and organization.

Assessment was not always made clear in the teacher education program. We understood that the education program was a pass/fail system, but it was not made clear how we were assessed, and what exactly was being assessed. Since teacher delivery and organization was assessed through formative feedback, it was perceived that this was valuable in teaching. In addition to formative feedback, we were required to complete reflections after our practica experiences. At the time these reflections did not seem meaningful. Overtime, with more teaching practice and further education we valued reflection, and used it as a tool for our learning and development. Although, we agreed reflection is valuable tool for learning, it was not used well in the education program.

Regardless of the assessments, Isabella and I shared a common notion when we graduated from the program that we had completed the program successfully because we learned how to look like effective teachers in a classroom, and we “passed.” Now, we understand that learning is a continuous process and upon further reflection, we shared an understanding that our learning during the education program may have been limited. It was not until we had more experience in the classroom—and further education—that we realized the value of understanding educational theories within practice to facilitate effective teaching. Our learning evolved when our perspectives on effective teaching evolved. During the education program, our understanding of effective teaching was based on teacher delivery. Therefore, our learning revolved around behaviours such as tone of voice and volume, and well-designed student

handouts. Over time, our perspectives on effective teaching shifted focus toward the students' learning, similar to teacher candidates' perspectives in the research conducted by Conway and Clark (2003). Our focus now is on working together with colleagues, and students, to understand what strategies, grounded in what theory, are best for different student learning.

A difference between the interviews was that for Isabella she noted the importance of professional development workshops to facilitate teacher learning and development. She reiterated that having multiple opportunities to engage in discussions around what was presented at the professional development workshops is mandatory in order for teachers to effectively use new strategies, grounded in theory, in their classrooms. She indicated that having one workshop is simply not enough exposure to potential new language and new theory, and would not provide teachers with enough support to implement what was presented in the workshops (Vygotsky, 1987). In addition, Isabella indicated that novice teachers and experienced teachers should engage in more reflection on their teaching practice to facilitate their learning and development. Isabella indicated reflection could be informal or formal, but should be in place so that teachers have the opportunity to think through theory in their practice. In my auto-interview, I reiterated the importance of dialogue and social speech to help teachers engage in discussions and reflection with colleagues that could facilitate teacher learning and development. But it is interesting to note that even though I did not mention in my auto-interview, I have engaged and continue to engage in ongoing professional development by organizing and presenting workshops to colleagues in my school and the school district.

Summary

Educational theories are important to apply in order to facilitate effective teaching, but based on Isabella's and my experiences in the teacher education program, teacher candidates

were not made aware of educational theories. There was minimal time and opportunity to discuss and reflect on theory, which made it difficult to understand let alone apply it in practice. Although practice was not supported by theory, practice was highly valued by university instructors, faculty advisors, sponsor teachers, and our secondary students. Modelling classroom activities was an important aspect of the teacher education program, and we were provided with feedback after we completed a demonstration. Feedback was based on behavioural aspects of our lesson, and this led us to believe that presentation was synonymous with teaching. For Isabella and I, our learning in the teacher education program was mostly through observation during our practicum and our science methods courses. If we looked similar to our teacher educators and had a good presentation, then the lesson was effective and students must have learned as a result of our effective teaching.

When reflecting on our current perspectives, it was not until Isabella and I both had more experience teaching in a classroom, multiple experiences with professional development, and further education that we realized the importance of understanding and applying theory in practice to demonstrate effective teaching.

Chapter 6: Findings and Conclusion

Chapter 6 provides a summary of the five key findings that have emerged from this research. The chapter compares perspectives across novice teachers and experienced teachers in relation to theory, practice, and learning, and addresses the research questions. In addition, the chapter highlights recommendations for teacher education programs, limitations of the research, and questions for future research. A short summary concludes the chapter.

The Perspectives on Educational Theory

The first finding highlights the differences between the participants' perspectives on educational theory. Gavin and Andrea related theory to concepts within scientific disciplines, such as atomic theory and the theory of relativity. They perceived theory to relate to hypotheses and tests that were fixed concepts proven over time. They had a difficult time recognizing, identifying, and understanding educational theories, and could not provide an example of an educational theory. This was similar the perspectives that Isabella and I had as novice teachers as well.

For Gavin, he perceived that educational theories were not true theories because they were not fixed, and did not stand the test of time like theories within the scientific disciplines. New research could not contribute to new theories, because theories are not dynamic and do not evolve over time. In addition, Gavin also noted that there seemed to be a "one size fits all" educational theory, and he did not understand how this one theory could be applied to all teaching contexts. Gavin seemed to feel, intuitively, that "one size" does not fit all circumstances, and used this as a reason for disregarding new theory based strategies that were shared. Andrea perceived educational theory to be important and valuable, and indicated that she

must be applying theory in practice. Integrating theory was common sense to her, although, she was not sure which theories she was using or how they shaped her practice.

With more teaching experience and further education, for Isabella and me, theory was not narrowed to theories from the scientific disciplines. Theories could emerge across disciplines. Theories were dynamic, constantly evolving and could be challenged based on new research and teaching practice. The role of educational theories in our practice evolved for both of us. We understood educational theories to support student learning and effective teaching practice, and were also able to provide examples of educational theories. This shift in perspective occurred for us with more teaching experience and, specifically, further education.

Although there was a difference of perspectives on educational theories between novice teachers and experienced teachers, all participants in the interview indicated that theory was not made explicit in the teacher education program. As teacher candidates, all four participants related the university course work to theory, but they could not recall discussions around theory or theory related to practice. When the participants reflected on their time as a teacher candidate, the word theory was associated with the university, although it is unclear why, and the university did not appear associated with practice. Theory and university were inseparable and were seen as dichotomous with practice and practicum, which were also inseparable.

The relationship between theory and practice was challenging to understand, and the two did not appear to overlap. If theory was taught in the education program, it appeared as though it was not used across contexts between university courses, or between university courses and the practicum settings. Perhaps if this had been different, if theories that were raised in one course were reinforced and discussed in another course and then applied in the practicum, the teacher candidates would have had multiple opportunities to develop an understanding of a theory, and

the relationship between theory and practice. Minimal exposure to theory, or a single experience reading material that describes a particular theory, was not sufficient to internalize the meanings and importance of theory in practice. Although, the participants indicated that theory was important, they left the teacher education program without any sense of educational theories or the relationship between theory and practice. As noted by Isabella, it is important for teachers to have opportunities to revisit educational theories throughout their teaching careers once they have graduated from teacher education programs. Teachers can challenge themselves to perhaps unlearn, relearn, and adjust their current perspectives on both theory and practice when they are integrated. In order to do this, ongoing professional development is likely to be required along with further education.

The Differences Between Teaching Practice, Student Practice, and Learning

The second finding for Gavin and Andrea is that teaching practice, student practice, and learning were used synonymously; these were differentiated for Isabella and me. All of the participants indicated that their practicum experiences were the area in which they learned the most on how to be an effective teacher during their time in the education program. For Gavin, the more opportunities he had to practice teaching lessons, the more effective he became as a teacher. His perspective on how his students learned through the completion of repetitive practice problems was parallel to his learning as a teacher. Andrea had a similar perspective in that the way she perceived her students to learn best, by engaging and doing, was also the way she learned best to become an effective teacher (Lortie, 2002). Her learning involved “doing” the lessons, for instance engaging in a lab experiment as if she was the secondary student. Although, how Gavin and Andrea learned best was different from one another, they indicated that they learned the most when they were practicing in a way that fit their learning style. They

indicated that students do learn differently, but they did not demonstrate differentiated teaching, they kept with their preferred learning methods. Thus, their teaching practice required that students did repetitive practice—either as completing practice problems or by doing—and this was assumed to lead to learning.

When Isabella and I reflected on our time as teacher candidates, we shared a similar perspective to the novice teachers. Gavin and Andrea maintained their perspectives with more experience, but there was a shift in perspective for Isabella and I in terms of teaching practice, student practice, and learning. Although, Isabella and I recognized the importance of engagement, the act of doing, and completing practice questions, our perspectives on teaching practice, student practice, and learning were differentiated. Teaching practice involved using theories to make decisions for developing lessons and assessments, and did not relate to repetitive practice. For student practice completing rote practice problems was neither a necessary component for learning, nor sufficient for learning. Just because a student was engaged and gained experience, did not directly relate to the amount of learning that occurred.

As experienced science teachers with more education, Isabella and I know that students could be engaged in experiences over time and still not learn what we were trying to teach (Wertsch, 2007). We included differentiated teaching strategies in our lessons, and did not limit our teaching strategies to ways in which we learned best. We were able to apply theory in practice, which facilitated our decision-making in classroom management, as well as the development of strategies and differentiated assessment. Gavin and Andrea were not aware of educational theories and, thus, they were unable to intentionally apply theory in their practice.

There was a shift in how teachers defined learning, and how learning took place. Gavin and Andrea viewed learning as the ability to explain and understand concepts. It appeared as

though Gavin and Andrea had the perspective that practice would contribute to learning if secondary students were engaged, were involved in the act of doing, and repeated practice problems. For Gavin and Andrea, secondary students in their classrooms were not likely to be working within their zones of proximal development, and if they were it occurred accidentally, rather than intentionally. Gavin and Andrea were not aware of the concept the zone of proximal development. If a student who required more support was working with another student who understood the material, then this dynamic was not a strategy that either one of them facilitated with the intention of students working within their zones of proximal development. The experienced science teachers indicated that learning could be defined as being able to explain and understand concepts with the importance of internalization from a Vygotskian perspective.

Perspectives on Effective Teaching

A third finding that emerged from this research is how the definition and perspective on effective teaching changed with more teaching experience and education. For Gavin and Andrea, effective teaching focused more on teacher delivery, time management, and behaviours, and it appeared as though effective teaching was synonymous with presentation. Effective teaching was demonstrated if the teachers projected their voice with an appropriate volume, spoke with a clear voice, presented material in a way that was understandable using easy to read PowerPoint slides or overhead notes, and prepared structurally organized student handouts. When Isabella and I reflected on our time as novice teachers, we had the same perspectives as Gavin and Andrea. Over time, however, there was an evolution in the way in which our perspectives on effective teaching developed.

When the participants reflected on their time as a teacher candidate, it appeared as though all of the participants constructed their definitions and perspectives on effective teaching and

learning with a behavioural lens, which appeared to be supported by the teacher education program. Throughout the teacher education program modeling, demonstrations, and assessments focused on behavioural criteria: the organization of lessons, teacher delivery and presentation, and checklist provided by the university. Since effective teaching was perceived to relate to observations, modeling, and demonstrations, teacher candidates assumed that more experience with these behaviours would translate into their own learning as new teachers.

With further teaching practice and education, Isabella and I indicated that the focus shifted from our own teacher presentation and delivery strategies to a focus on how students learn in the classroom. This was similar to research done by Conway and Clark (2003), which indicated that perspectives shift from self to student. In the current research, the shift from self to student learning was apparent for experienced teachers, but the critical component in this shift was that experienced teachers focused on the implementation of educational theories in practice that mediated student learning. For example, Isabella and I focused on understanding why certain strategies and assessments were more effective for student learning. The strategies and assessments were grounded in theory, which was understood, perhaps, as a result of further experience, education and reflection.

The research by Conway and Clark (2003) highlighted increasing teacher experience as leading to a shift in perspective: from a focus on the self to a focus on students and their learning. The current research, however, indicates the importance of both more experience and further education. Along with time in the classroom, Isabella and I became graduate students, learned more educational theory, and learned the language through which specific theories are created and communicated. It is likely that this further education has shaped both how we perceive

effective teaching, and how we use theory in practice as a psychological tool to think about what constitutes effective teaching (Vygotsky, 1987).

The Role and Identity as Students

A fourth finding that emerged from the research was the importance of the role in which teacher candidates participated during the teacher education program (Schwartz & Bransford, 1998). When the participants reflected on their time as teacher candidates, they indicated that in the university course work they were “treated like students” and did the lab experiments as if they were the secondary students in the class. The role the teacher candidates’ play can influence what they learn (Schwartz & Bransford, 1998). In this case it appeared as though they were learning as students, and did not have time to think through the lesson from a teacher’s perspective.

The role played by teacher candidates has implications for identity construction as well. Following Britzman (1991), teacher candidates were caught between the university and practicum school—Gavin’s experience most strongly reflected this—and this complicated the shift from being a student to being a teacher. The problem of student teaching as a liminal or in between space has surfaced in the literature with implications for the learning of teacher candidates (Vadeboncoeur, 1998). Competing perspectives between faculty advisors and sponsor teachers exacerbates this problem, in particular, as teacher candidates must navigate different requirements in order to pass their student teaching.

The structure of the teacher education program was of interest as well. All of the participants indicated that during the practicum they were “trying to survive” and had minimal time and opportunities to think through and make sense of their experiences. They were extremely busy, perhaps more busy than they had anticipated before entering the teacher

education program. By the end of the research all of the participants were continuing with their teaching career, but Gavin. Research by Darling-Hammond (2000, 2012) indicated that having a teacher education program with an extended practicum could allow for more opportunities for teacher candidates to make sense of their experiences and integrate coursework to their practice, and perhaps this would have influenced Gavin's decision to leave the teaching field.

Building on Existing Relationships Between the University and the Practicum School

A fifth finding that emerged from the research, which is consistent with research conducted by Betts (2011), is the importance of co-creating environments with teacher educators and teacher candidates in both the university and the practicum setting. Specifically, Gavin was trying to navigate between his faculty advisor's perspectives on effecting teaching and his sponsor teacher's perspectives. Having more consistency between the university and the practicum school, represented by the faculty advisor and the sponsor teacher, may have benefited Gavin and reduced the difficulties he experienced. This would have also addressed the fragmentation to form a connection between contexts. As a result, working within a collaborative and coherent environment may have encouraged teacher candidates to be more involved in their learning.

Recommendations for Teacher Education Programs

Throughout this research there were eight barriers that appeared to affect teacher candidate learning and development that emerged for the all participants when reflecting on their experiences in the teacher education program. Based on these eight barriers, recommendations are offered.

The first barrier identified was that, for whatever reason, the theory that was taught in the teacher education program was not recognizable to the teacher candidates and few, if any, links

were made between theory and practice. A recommendation is for teacher education programs to examine ways to make theory explicit and to discuss how to apply theory in practice (NCATE, 2006). A further recommendation would be to create ways to provide opportunities for theories to be reinforced across contexts in the education program, for example between university courses or between university courses and practica experiences. In a teacher education program it can be valuable for teacher candidates and teacher educators to co-create meaning and understanding of educational theories. Teacher candidates are entering the program with prior experiences and understanding of theories, their “working theories,” and it is important to discuss these working theories in relation to educational theories. In order to develop teacher candidates’ perspectives on theory and practice, dialogue needs to occur to facilitate the use of theory and practice as related academic concepts, and psychological tools that can mediate their learning and development.

A second barrier for teacher candidates was that there did not seem to be an assessment of educational theory and its relation to practice, either in the university courses or the practicum. A recommendation would be to develop assessments that assess teacher candidates’ understanding of theory, and ability to apply theory in practice. It is important to have a form of assessment that focuses on the teacher candidates’ ability to understand, explain, and demonstrate theory in practice. Adding a theoretical component to the teacher candidates’ assessment could help teacher candidates’ develop a better understanding of theory, the relationship between theory and practice as related academic concepts, and help develop their perspectives on effective teaching. Two suggested ways in which this could happen in teacher education programs are the following: 1) If teacher candidates are required to create templates for their lesson, perhaps they can include a section on theory and a rationale for choosing

specific teaching strategies, assignments, and assessments, explaining the theory in which they are grounded; 2) The checklist evaluations that the sponsor teacher and the faculty advisor complete with the teacher candidate could include a section on understanding, explaining, and demonstrating the use of education theories in practice. Both suggestions require that faculty associates and sponsor teachers are familiar with and can assess the theory in practice that form the foundations of teacher candidates' lessons and evaluations.

Third, and a common barrier for teacher candidates was time during the practicum for their own learning and development. The participants indicated that during the practica in the classrooms they felt “extremely rushed” and “too busy.” They were so focused on “surviving” that they did not have time to reflect and make meaning of their experiences. They were not thinking about what theory could help them create an assignment or assessment or how they could differentiate their instruction; they were reliant on personal past experiences, as well as sponsor teacher suggestions on what to do in the classroom that was previously successful. A recommendation would be to incorporate more time to have guided discussions with teacher candidates around the importance of educational theories in practice. Providing teacher candidates with time during the university course work—and the practicum—to engage in dialogue around educational theories is important component for teacher education programs. The lack of time for dialogue may have contributed to the challenges teacher candidates faced when trying to understand and develop their perspectives on theory, practice, and the relationship between them.

A fourth barrier was the emphasis on learning through observations and modeling. This seemed to reduce teaching to observable behaviours, rather than engaging teacher candidates in the “intellectual side” of teaching, for example, the thinking, feeling, and decision-making

processes that are required for teaching. A recommendation would be to increase the discussions around why certain strategies are used in different contexts, and how theoretical grounding changes that way we think about approaching classroom lessons and issues. We might expect that this is already happening in the TMU teacher education program, but the theories that likely were included in the content of teacher education courses were not recognized by teacher candidates as theories, and in the science methods courses the focus was more on teacher delivery, presentations, and demonstrations. The teacher candidates did not see links between courses or between the university and the practicum settings. At the end of the study, Isabella and I seemed to have our “working theories” of teaching and learning grounded in sociocultural theory. We indicated the importance of dialogue, multiple opportunities to help internalize new strategies that are grounded in theory, professional development workshops, and reflection with colleagues all of which are socially situated processes grounded by a Vygotskian framework. For novice teachers, their perspectives on effective teaching and learning appeared to remain grounded in behavioural practices, emphasizing what teachers look like as observable behaviours, rather than how teachers think and how they make decisions about a certain course of action.

A fifth barrier was that the participants, as teacher candidates, could not make use of the few opportunities they had for reflection. While reflection was an aspect of the teacher education program that the participants were aware of, they did not take it seriously as teacher candidates or as novice teachers given time constraints. All of the participants indicated that reflection could have been meaningful for their learning and development, but they indicated that as teacher candidates and novice teachers they did not use reflection as a tool to help with their development. A recommendation for teacher education programs is to examine ways in which

reflection on experiences can be made meaningful. For instance, university instructors, faculty advisors, and sponsor teachers could engage in dialogue around the theoretical importance of reflection, model reflection, and provide formative feedback on reflection to help teacher candidates develop their use of reflection as a psychological tool that can be used to mediate their own learning and development.

A sixth barrier, related to those mentioned, was that the participants noted that they did not have the language to engage in dialogue about educational theories, for example, those related to how students learn and how learning is assessed. Ideally, theories should be used to ground the construction of assignments, activities, and assessments. If theories do not aid practice, then, given practical experience, theories can be changed and or updated. The ideal relationship between theory and practice is a dialectical one: theory is informed by practice, and practice is informed by theory. This perspective on theory and practice is integral for teacher candidate and novice teachers' learning and development. Engaging in dialogue with university instructors, faculty advisors, sponsor teachers, and secondary students can help mediate the development of private and inner speech, which can then mediate the process of internalization for understanding theory and practice as academic concepts. Understanding theory and practice as academic concepts can then be used as psychological tools to mediate teacher candidate learning and development. Although, the practicum experience is extremely busy and teacher candidates are trying to survive, a recommendation for programs would be to examine ways in which dialogue can facilitate the development of theory and practice as related academic concepts, as well as to consider structural changes that would enable the integration of theory in practice. A possibility may be reducing the separation between time at the university and time in

the schools, and integrating courses more closely with student observation and teaching in schools.

A seventh barrier was identity construction as teachers. Similar to the teacher candidates in Britzman's (1991) research, the teacher candidates found it challenging to identify as teachers. In the university classes, the teacher candidates indicated that they completed assignments and labs in the role of the secondary students. The roles teacher candidates take on during their involvement in the teacher education program can influence their learning and development (Schwartz & Bransford, 1998). For teacher candidates and novice teachers, identity construction as teachers, rather than as students, is an area of interest for suggested future research in how it relates to the construction of perspectives on theory, practice, and learning.

An eighth barrier to teacher candidate development that surfaced for one participant was the conflicting perspectives between his faculty advisor and sponsor teacher, and the necessity of navigating the difference between them. The faculty advisor and the sponsor teacher had differences of perspectives around effective teaching strategies. The teacher candidate noted he was conflicted between the two, and would change his lesson plan accordingly depending on who was evaluating him, which "was exhausting." Having a university partnership with the practicum school is important (Betts, 2011), but also having relationships between faculty advisors and the sponsor teachers is key to facilitate teacher candidate learning and development. The process in which faculty advisors and sponsor teachers are selected is of interest to ensure that both are a good fit for the teacher education program to help facilitate teacher candidates' learning and development. Having a conflict of perspectives can hinder the teacher candidate's learning, and can allow them to become distracted and less focused on their own learning.

Reconceptualizing what teacher education requires in order to create a program that consistently supports this is a further recommendation.

Limitations of the Research

Limitations that have surfaced during the research process include playing the role of the researcher and also being a participant in the research, researcher power, how the interviews were conducted, and the number of participants.

Playing the dual role of researcher and participant complicated this research. Drawing on Denzin and Lincoln (2005), the qualitative researcher is always implicated in the research and the narrative told of the research. Given the parallels my own experience has taken—graduating from TMU, acting as a sponsor teacher to teacher candidates from TMU, and now as an experienced science teacher—bracketing these experiences was impossible. Rather, than bracketing my experiences, I chose to write my recollections alongside of the participants, in part, because it made more obvious my own biases and motivations. Being a participant in the research, as well as being the researcher, was at times challenging with respect to analyzing the auto-interview. Throughout the research process, I continued to read literature and develop my perspectives, and there were instances when I wanted to add to my auto-interview or make changes based on emphasizing certain points. I refrained from making any changes to the original auto-interview, but this may have affected my continued analysis of the auto-interview.

Researcher power may have played a role during analysis of the participants' interviews. There were times in which what the participant indicated was different than my perspective and perhaps my behaviours and responses to their perspectives influenced how they responded to further questions. For example, there were moments in which it appeared as though the participants were trying to provide the “right” answer, or say what they thought I wanted to hear.

This may have been due to establishing good rapport with the participants throughout the research process, or simply characteristic of their personality, and their first time participating in research and wanted “to do well.” Once Gavin shared that he was not pursuing teaching, I also wonder if this made him feel less comfortable. Perhaps knowing that he was pursuing a career outside of teaching had an influence on my interpretive analysis. The participants graduated together from the same teacher education program, started teaching-on-call at the same time, but by the end of the second interview the novice teachers were pursuing different career paths. He seemed to be the most concerned about getting the responses “right,” although this was common for Andrea and Isabella, and even me to some extent.

Another limitation may have been the way in which the interviews were conducted. Although the same questions were asked on theory, practice, and learning, Gavin and Andrea participated in two interviews, whereas Isabella and I participated in one extended interview, and auto-interview respectively. Thus, Isabella and I did not have the opportunity to revisit our artefacts and add to our existing perspectives on the relationships between theory, practice, learning, the university, and the practicum school. Also, the order in which the interviews were conducted may have influenced my responses. I completed my auto-interview after I conducted the other interviews, which may have had an affect on my perspectives. I had more time to think through my responses in relation to the research questions.

Further, the number of participants that participated in the research. Although there were only four participants in the research the focus was depth over breadth. The findings from the research were not intended to generalize all teacher candidates’, novice teachers’, and experienced science teachers’ perspectives, rather they were intended only to reflect the current perspectives of the participants given their experiences.

Questions for Future Research

In relation to definitions and perspectives on theory and practice, and the relationship between them, questions emerged from this research. What difference does the educational background of teacher candidates and novice teachers make with respect to their perspectives on educational theory and practice? For the participants in this research, having been prepared as science teachers, how were their perspectives on theory in the scientific disciplines, at least in part, influencing their perspectives on educational theories? Would a novice teacher from a social studies or languages background have a similar perspective on theory as a novice teacher with a science background?

In addition, several questions related to perspectives on effective teaching emerged. How does the definition of effective teaching change over time as novice teachers become more experienced teachers? What factors in teaching experience influence this shift? How does further educational experience influence this shift? How can dialogue be used to support the development of teacher candidates' perspectives on theory, practice, and learning?

Summary

Gavin and Andrea related theory only to scientific theories, and these were understood as unchanging over time. For Isabella and I, theories emerged across disciplines and were dynamic; in education, theories could be informed by current research and practice. Experience in teaching and further education facilitated our perspectives on theory, practice, and the relationship between them to develop. Theories were perceived as malleable frameworks that were applied in practice to facilitate effective teaching and learning. Although Gavin and Andrea indicated that experience led to learning, Isabella and I did not see this as the only way in

which students can learn. Also, Gavin and Andrea demonstrated teaching strategies in their respective classrooms that reflected the way in which they learn best.

With more experience, time, opportunity for dialogue and reflection, and further education there was a shift in perspective on effective teaching for Isabella and myself. The shift moved away from teacher delivery and specific behaviours toward student learning, and was grounded by sociocultural theory.

Eight barriers and recommendations for teacher education programs to facilitate teacher candidate learning and development were concluded from the research: 1) making theory more explicit allowing opportunities to apply theory in practice in both university and practicum school contexts; 2) examining ways in which teacher education programs can create valid assessments that evaluate teacher candidates' ability to understand, explain, and demonstrate theory in practice; 3) providing time and opportunity for teacher candidates to engage in dialogue around theory and practice in both the university courses and the practicum setting; 4) emphasizing there is more to teaching than observable behaviours, that teaching is a profession that requires thinking, feeling, and learned decision-making, and teacher candidates can do more than learning through observations and modelling; 5) making reflection meaningful and a valuable tool for teachers to learn and develop; 6) making language an explicit component within teacher education programs in order to facilitate dialogue, social, private, and inner speech; 7) facilitating teacher candidates' identity construction as teachers, and; 8) co-creating university-school partnerships with teacher educators both in universities and practicum schools working together to create a consistent approach to teacher candidate learning and development. The intention of these recommendations is to facilitate teacher candidates' development of theory and practice as related academic concepts, which could then mediate their learning and development.

Four limitations surfaced during the research process. Acknowledging these limitations provided opportunities for future research. Future research questions include how are novice science teachers' perspectives on educational theories influenced by their educational background in science? How can dialogue be used to support the development of teacher candidates' perspectives on theory, practice, and learning?

In the teacher education program, teacher candidates recognized theory and practice to be separate paradigms. Theory was linked to the university, and practice was linked to the practical experiences. Educational theories were not understood, and the novice teachers did not make connections on how theory taught in the university class could be applied in practice. With more teaching experience and further education, experienced science teachers were able to understand, explain, and demonstrate the use of theory in practice. Theory and practice appeared to have become related academic concepts that the experienced science teachers used as psychological tools to facilitate decision-making processes in their teaching practice.

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Appendices

Appendix A: Interview One on Theory and Practice

Thanks very much for agreeing to do this interview. Learning about how you understand theory and practice, as well as the relation between them, is central to my research.

I'd like to begin by asking you some questions that are quite general. Then I'll ask questions that are somewhat parallel in relation to specific people that you have worked with, like UBC Instructors, Sponsor Teachers, and Faculty Advisors, as well as what you think your future students may think. Then I'll ask for your responses from your own perspective.

Periodically, I'll check the audio recorder. I'd like you to know that we can stop if you need a break, just let me know.

Do you have any questions before we begin?

A.) The first set of questions is general questions.

Thinking about theory:

1. What are the first five things you think of when you hear the word theory?
2. How would you define theory?
3. How has theory surfaced in your post-secondary education, either in your Bachelor of Science degree or your Bachelor of Education?
 - a. What is an example of theory that has surfaced during your own education?
 - b. In BSc,
 - c. In B.Ed.,

Probe further into education program examples

 - d. In methods courses,
 - e. In labs,
 - f. In practical experiences
 - g. In development course,
 - h. In diversity course

Note: Be sure to probe for both. If the participant mentions one example of theory that has surfaced in their BSc, then probe for example from BEd and vice versa. My goal is to have them identify one or two theories, so I will only use these probes when necessary.

4. When theories surfaced in the education program at UBC, how were they being used?
 - a. Did they surface in a lecture? A textbook? A journal article?

- a. Were they discussed? Discussions around assessment, lesson planning, classroom management, classroom climate
- b. Did you answer questions on a test?
- c. Did you write about the theory in an essay?

Thinking about teaching practice:

- 1. What are the first five things you think of when you hear the word teaching practice?
- 2. How would you define teaching practice?
- 3. How has teaching practice surfaced in your post-secondary education, either in your Bachelor of Science degree or your Bachelor of Education?
 - a. What is an example of practice that has surfaced during your own education?
 - b. In BSc,
 - c. In B.Ed.,

Probe further into education program examples

- d. In methods courses,
- e. In labs,
- f. In practical experiences
- g. In development course,
- h. In diversity course

Note: Be sure to probe for both. If the participant mentions one example of theory that has surfaced in their BSc, then probe for example from BEd and vice versa. My goal is to have them identify one or two theories, so I will only use these probes when necessary.

- 4. When practices surfaced in the education program at UBC, how were they being used?
 - a. Did they surface in a lecture? A textbook? A journal article?
 - b. Were they discussed?
 - c. Did you answer questions on a test? On an assignment?
 - d. Did you write about the theory in an essay?

B.) The next set of questions is in relation to UBC Instructors.

Theory

Think about a specific UBC instructor during your BEd that stood out to you in a positive, influential way.

- a. Why was this person influential to you?
- b. Why do they stand out more than your other UBC instructors?
 1. What are your perceptions of how your educators (specifically the UBC instructor they referenced in the previous question) conceptualize theory? (in relation to education and learning)
 2. When these theories surfaced, were applications of these theories discussed?
 - a. How did these theories surface? Lecture? Textbook? A journal article?

Did they surface in a lecture? A textbook? A journal article?

- b. Were they discussed? Discussions around assessment, lesson planning, classroom management, classroom climate
 - c. Did you answer questions on a test?
 - d. Did you write about the theory in an essay?
 3. When theories surfaced, were implications of these theories discussed? How they could be used in practical settings?
 - a. Explaining the difference between application and implication.
Application referring directly to an actual time in which something has occurred (theory and/or practice). Implication referring indirectly to a general idea that can be applied in the future, deriving from the application. The implication correlates to the value of the application in new contexts.
 - Example: Completing a worksheet in math applying addition rules ($2 + 2 = 4$) and implication thinking about the value this application can have in the future. Perhaps at a grocery store counting money, or making groups or teams requiring a specific number of people per team.

4. What are your perceptions of how your UBC instructors value the importance of theory?
 5. To what capacity do you think UBC instructors view themselves as theorists?

(How would the UBC instructor define a theorist? Are they a consumer/producer of theory?)

- a. Probe here for what they think the difference is between someone who sees themselves as only a consumer of theory compared to someone who sees themselves as a producer? Both?
 - Example: Consumer may just read about a theory or listen to a discussion of a theory, such as a student in a lecture hall (teacher gives notes, student writes notes down). Producer of a theory may be when students are working together in critical thinking task or lab experiment figuring out a procedure and method of application of their knowledge.

Practice

2. What are your perceptions of how your UBC instructor conceptualizes teaching practice?
 - a. Emphasizing to answer this question based on the same specific professor.
3. How has the UBC instructor demonstrated the use of practice during your education degree?
4. Was there discourse around how the practical experiences that surfaced linked to theory? Can you provide examples?
5. What are your perceptions of your UBC instructors' views on the value of practice?

C.) This next set of questions is in relation to your Sponsor Teachers

Theory

Think about a specific sponsor teacher during your practicum that stood out to you in a positive, influential way.

- a. Why was this person influential to you?
- b. Why do they stand out more than your other sponsor teachers?
 1. What are your perceptions of how your sponsor teacher conceptualizes theory?
 2. How did theory surface during your interactions with sponsor teachers?
 - a. Did they surface in a lecture? A textbook? A journal article?
 - b. Were they discussed? Discussions around assessment, lesson planning, classroom management, classroom climate?
 - c. Did you answer questions on a test about theory?
 - d. Did you write about the theory in an essay?
 6. What are your perceptions of how your sponsor teachers value the importance of theory?
 7. To what capacity do you think sponsor teachers, teachers in general, view themselves as theorists?

- a. Are they a consumer/producer of theory?

Practice

1. What are your perceptions of how your sponsor teachers conceptualize teaching practice?
2. How have your sponsor teachers demonstrated the use of practice during their teaching?
3. Was there discourse around how the practical experiences that surfaced linked to theory? Can you provide examples?
4. What are your perceptions of your sponsor teacher's view on the value of practice?

D.) The next set of questions is in relation to your Faculty Advisor

Theory

1. What are your perceptions of how your faculty advisor conceptualizes theory?
2. How did theory surface during your interactions with sponsor teachers?
 - a. Did they surface in a formal observation? Informal observation?
 - b. Were they discussed? Discussions around assessment, lesson planning, classroom management, classroom climate?
 - c. Did you answer questions on theory in a self-reflection?
3. What are your perceptions of how your faculty advisor values the importance of theory?
4. To what capacity do you think faculty advisors view themselves as theorists?
 - a. Are they a consumer/producer of theory?

Practice

1. What are your perceptions of how your faculty advisor conceptualizes teaching practice?
2. How has your faculty advisor demonstrated the use of practice?
3. Was there discourse around how the practical experiences that surfaced linked to theory? Can you provide examples?
4. What are your perceptions of your faculty advisor's view on the value of practice?

E.) The next set of questions is in relation to K-12 Students

Theory

1. What are your perceptions of how your students conceptualize theory?

2. How did theory surface during your interactions with students?
 - a. Did they surface in a lecture? A textbook? A journal article?
 - b. Were they discussed? One on one discussion? Classroom discussions? Group assignments?
 - c. Did you answer questions on a test about theory?
 - d. Did you write about the theory in an essay?
3. What are your perceptions of how your students value the importance of theory?
4. To what capacity do you think students view themselves as theorists?
 - a. Are they a consumer/producer of theory?
5. What would it take to allow students to be theorists? Is this important for teachers to facilitate?

Practice

1. What are your perceptions of how your students conceptualize teaching practice?
2. How have your students demonstrated the use of teaching practice during their learning?
3. Was there discourse around how the teaching practical experiences that surfaced linked to theory? Can you provide examples?
4. What are your perceptions of your students' views on the value of teaching practice?

F.) The next set of questions is in relation to you, as the Participant

Theory

1. How do you conceptualize theory?
2. How has theory surfaced for you during your education?
3. Would theory look different in different subject areas?
 - a. Within Science: Biology? Chemistry? Physics?
4. How have you demonstrated the use of theory during your education degree?
5. Was there discourse around how the theoretical experiences that surfaced linked to practice? Can you provide examples?
6. What are your views on the value of theory?
7. To what capacity do you view yourself as a theorist?
 - b. Are you a consumer/producer of theory?
6. What could help you see yourself as a theorist?
 - a. Would having fewer courses for beginning teachers be beneficial, allowing more time to reflect on one's own practice?
 - b. More preparation time for beginning teachers?
 - c. Mentorship programs?

- d. What could help them during their first five years of teaching that could help them see themselves as theorists? Is this even important?

Practice

1. How do you conceptualize practice?
2. How has practice surfaced for you during your education?
3. Would practice look different in different subject areas?
 - a. Within Science: Biology? Chemistry? Physics?
4. How have you demonstrated the use of practice during your education degree?
5. Was there discourse around how the practical experiences that surfaced linked to theory? Can you provide examples?
6. Did you complete, or design assignments that linked theory and practice? Can you provide examples?
 - a. When?
 - b. Where?
 - c. What course?
 - d. What did the assignment look like
 - e. Was this valuable, why?
7. What are your views on the value of practice?
8. To what extent do you see yourself as a practitioner?
 - a. Are you using new practices?
 - b. Are you creating new practices?

Appendix B: Artefact Co-construction

Words to help facilitate the co-construction of the artefact:

- Theory
- Practice
- University (TMU)
- Practicum School
- Learning
- Community-based Practicum (second interview for novice teachers only)

Appendix C: Interview Two on Learning

1. What are the first five things you think of when you hear the word learning?.
2. How would you define learning?
 - a. Is learning a social construction of knowledge? Individual? How would you differentiate the terms “to know” versus “to understand”?
 - b. Memorization?
 - c. Critical thinking?
 - d. Getting a question correct on a test? Assignment?
 - e. Applying concepts in different contexts?
 - f. Asking questions?
 - g. Making mistakes?
 - h. Critically thinking?
 - i. Valuing a process not an outcome?
 - k. How does learning take place?
 - l. How can learning be supported? Collaborative groups? Routine of the class? One on one interaction? Formative feedback? Summative feedback? Education assistants?

Thinking back to the UBC Instructor you mentioned previously, answer the following questions.

UBC Instructor

1. What are your perceptions of how your UBC instructors conceptualize learning?
2. What are your perceptions of how your UBC instructors conceptualize how people get to know concepts?
 - a. Is learning a social construction of knowledge? Individual? How would you differentiate the terms “to know” versus “to understand”?
 - b. Memorization?
 - c. Critical thinking?
 - d. Getting a question correct on a test? Assignment?
 - e. Applying concepts in different contexts?
 - f. Asking questions?
 - g. Making mistakes?
 - h. Valuing a process not an outcome?
3. What are your perceptions of how your UBC instructors conceptualize how people get to understand concepts?

- i. Is learning a social construction of knowledge? Individual? How would you differentiate the terms “to know” versus “to understand”?
 - j. Memorization?
 - k. Critical thinking?
 - l. Getting a question correct on a test? Assignment?
 - m. Applying concepts in different contexts?
 - n. Asking questions?
 - o. Making mistakes?
 - p. Valuing a process not an outcome?
4. During your time with UBC instructors, can you describe situations of when learning took place?
- q. How do you know learning occurred?
 - r. How was this learning assessed? (formal, informal, self reflection, rubric, formative assessment, summative assessment, descriptive feedback, rubric)
5. How do you perceive your UBC instructors’ views of theory in relation to learning?

Sponsor Teacher

- 1. What are your perceptions of how your sponsor teacher conceptualizes learning?
- 2. What are your perceptions of how your sponsor teacher conceptualizes how people get to know concepts?
 - a. Is learning a social construction of knowledge? Individual? How would you differentiate the terms “to know” versus “to understand”?
 - b. Memorization?
 - c. Critical thinking?
 - d. Getting a question correct on a test? Assignment?
 - e. Applying concepts in different contexts?
 - f. Asking questions?
 - g. Making mistakes?
 - h. Valuing a process not an outcome?
- 3. What are your perceptions of how your sponsor teacher conceptualizes how people get to understand concepts?
 - a. Is learning a social construction of knowledge? Individual? How would you differentiate the terms “to know” versus “to understand”?
 - b. Memorization?
 - c. Critical thinking?
 - d. Getting a question correct on a test? Assignment?

- e. Applying concepts in different contexts?
 - f. Asking questions?
 - g. Making mistakes?
 - h. Critically thinking?
 - i. Valuing a process not an outcome?
4. During your time with sponsor teacher, can you describe situations of when learning took place?
 - a. How do you know learning occurred?
 - b. How was this learning assessed? (formal, informal, self reflection, rubric, formative assessment, summative assessment, descriptive feedback, rubric)
 5. How do you perceive your sponsor teacher's views of theory in relation to learning?

Faculty Advisor

1. What are your perceptions of how your faculty advisor conceptualizes learning?
2. What are your perceptions of how your faculty advisor conceptualizes how people get to know concepts?
 - a. Is learning a social construction of knowledge? Individual? How would you differentiate the terms "to know" versus "to understand"?
 - b. Memorization?
 - c. Critical thinking?
 - d. Getting a question correct on a test? Assignment?
 - e. Applying concepts in different contexts?
 - f. Asking questions?
 - g. Making mistakes?
 - h. Valuing a process not an outcome?
3. What are your perceptions of how your faculty advisor conceptualizes how people get to understand concepts?
 - a. Is learning a social construction of knowledge? Individual? How would you differentiate the terms "to know" versus "to understand"?
 - b. Memorization?
 - c. Critical thinking?
 - d. Getting a question correct on a test? Assignment?
 - e. Applying concepts in different contexts?
 - f. Asking questions?
 - g. Making mistakes?
 - h. Valuing a process not an outcome?

4. During your time with faculty advisor, can you describe situations of when learning took place?

- i. How do you know learning occurred?
- j. How was this learning assessed? (formal, informal, self reflection, rubric, formative assessment, summative assessment, descriptive feedback, rubric)

5. How do you perceive your faculty advisor's views of theory in relation to learning?

K-12 Students

1. What are your perceptions of how your faculty advisor conceptualizes learning?
2. What are your perceptions of how your faculty advisor conceptualizes how people get to know concepts?
 - k. Is learning a social construction of knowledge? Individual? How would you differentiate the terms "to know" versus "to understand"?
 - l. Memorization?
 - m. Critical thinking?
 - n. Getting a question correct on a test? Assignment?
 - o. Applying concepts in different contexts?
 - p. Asking questions?
 - q. Making mistakes?
 - r. Valuing a process not an outcome?
3. What are your perceptions of how your faculty advisor conceptualizes how people get to understand concepts?
 - s. Is learning a social construction of knowledge? Individual? How would you differentiate the terms "to know" versus "to understand"?
 - t. Memorization?
 - u. Critical thinking?
 - v. Getting a question correct on a test? Assignment?
 - w. Applying concepts in different contexts?
 - x. Asking questions?
 - y. Making mistakes?
 - z. Valuing a process not an outcome?
4. During your time with faculty advisor, can you describe situations of when learning took place?

- aa. How do you know learning occurred?
 - bb. How was this learning assessed? (formal, informal, self reflection, rubric, formative assessment, summative assessment, descriptive feedback, rubric)
- 5. How do you perceive your faculty advisor's views of theory in relation to learning?
- 6. Do students have their own theories about their learning?
 - a. Passive recipient absorbing?
 - b. Actively constructing theory/understanding?

Participant

- 1. How do you conceptualize learning?
- 2. What are your perceptions of how people get to know concepts?
 - cc. Is learning a social construction of knowledge? Individual? How would you differentiate the terms "to know" versus "to understand"?
 - dd. Memorization?
 - ee. Critical thinking?
 - ff. Getting a question correct on a test? Assignment?
 - gg. Applying concepts in different contexts?
 - hh. Asking questions?
 - ii. Making mistakes?
 - jj. Valuing a process not an outcome?
- 3. What are your perceptions of how people get to understand concepts?
 - kk. Is learning a social construction of knowledge? Individual? How would you differentiate the terms "to know" versus "to understand"?
 - ll. Memorization?
 - mm. Critical thinking?
 - nn. Getting a question correct on a test? Assignment?
 - oo. Applying concepts in different contexts?
 - pp. Asking questions?
 - qq. Making mistakes?
 - rr. Valuing a process not an outcome?
- 4. Can you describe situations of when learning took place?
 - ss. How do you know learning occurred?

- tt. How was this learning assessed? (formal, informal, self reflection, rubric, formative assessment, summative assessment, descriptive feedback, rubric)
5. How do you view theory in relation to learning?
6. Do you have their own theories about their learning?
 - a. Passive recipient absorbing?
 - b. Actively constructing theory/understanding?
1. Do you think about your active construction of learning? What does this look like?
2. What are your views of theory in relation to learning?

Questions before artefact co-construction:

1. How do you think people's own perceptions of theory, practice and learning can affect their approach to understanding new knowledge?
 - Does this change over time? First five years of teaching compared to more experience teacher?
2. How do you think people's perceptions of others views of theory, practice and learning can affect their personal approach to understanding new concepts?

Artefact will be co-constructed using cut out arrows and separate cut out pieces of paper with the following terms (one term per piece of paper):

- Theory
- Practice
- Learning
- University (UBC)
- Practicum School

The co-construction of the concept map will provide the participant an opportunity to show relationships between and among the terms. The participant will be encouraged to write on the pieces of paper with the arrows, to help explain their perceptions of the relationship and connections between the terms. The process of co-constructing the concept map will provide further information into the participant's perceptions of the relationship between theory and practice.

Questions after the co-construction of the artefact:

1. What are your perceptions of the importance of theory and practice as one concept (not as two separate entities)? UBC instructors? Sponsor teacher's? Faculty advisor's? Students?
2. Do you think there is a gap between theory and practice?
3. What are your views on the importance of bridging the gap between theory and practice?

4. How could bridging the gap between theory and practice be done? At what level would this process occur? What could this look like?

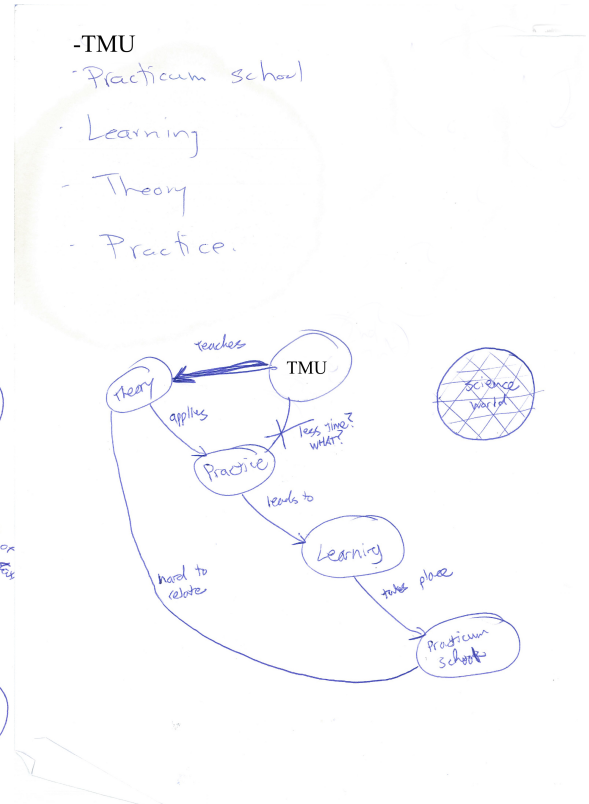
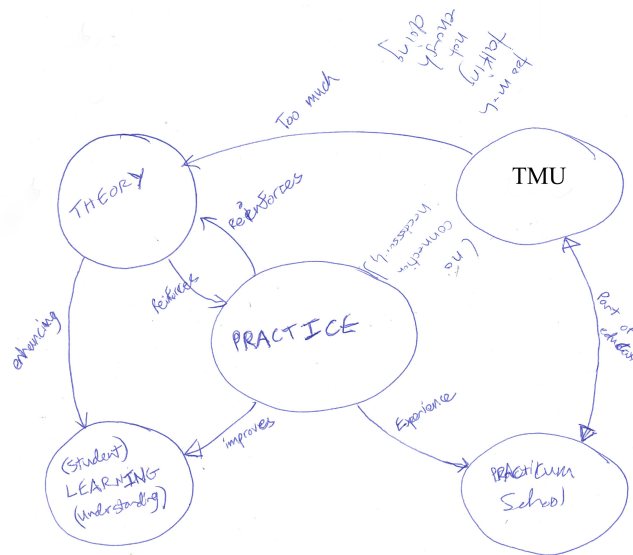
Appendix D: Transcription Conventions

Name of transcription convention	Meaning	Symbol (and example)
1. Simultaneous utterances	Utterances starting at the same time	[[Peter: Hi, nice to meet you [[Susan: Hi, nice to meet you
2. Overlapping utterances	Utterances that overlap, but do not start simultaneously	[Peter: The concert was great Susan: [what a show
3. Continuous utterances	When there is no interval between utterances, no overlap, but the second utterance is immediate after the first	= Peter: Term is ending soon Susan: =the year is going by so quickly
4. Untimed pause	Short untimed pause within an utterance	- Umm - the students were
5. Untimed intervals	Untimed intervals heard between utterances	(pause) Peter: How are things going? (pause) Susan: Not bad
6. Intonation	Voice intonation rises or lowers during utterances	Superscript and subscript “V” Peter: I am ^V thrilled Peter: I am disappointed _v
7. Capital letters	Used to indicate an utterance that is spoken much louder than the surrounding talk. Emphasis on the word.	CAPITOL Peter: I CAN’T believe it.
8. Exclamation point	Indicates an animated tone, not necessarily an exclamation	!

9. Thoughts are being processed before the utterance	Used when the speaker is thinking before they speak, not just a pause	... Peter: ...that is a great question
10. Phenomena that occur in the utterance	Vocalizations, or non-vocalizations, that the transcriptionist does not want to battle	(()) Peter: Excellent ((sneeze)) dinner
11. Change in pace of the utterance	Used when the utterance is delivered at a pace quicker than the surrounding talk	> <
12. Transcriptionist doubt	Used when the transcriptionist cannot truly understand the utterance	/ / Peter: I / / last night
13. Gestures during the interview	Used when the person is listening and nodding at the speaker	(Head nod) Peter: I like what you have done with the place Susan: (head nod)
14. Inaudible utterance	Used when the transcriptionist cannot hear the person speaking	/?/

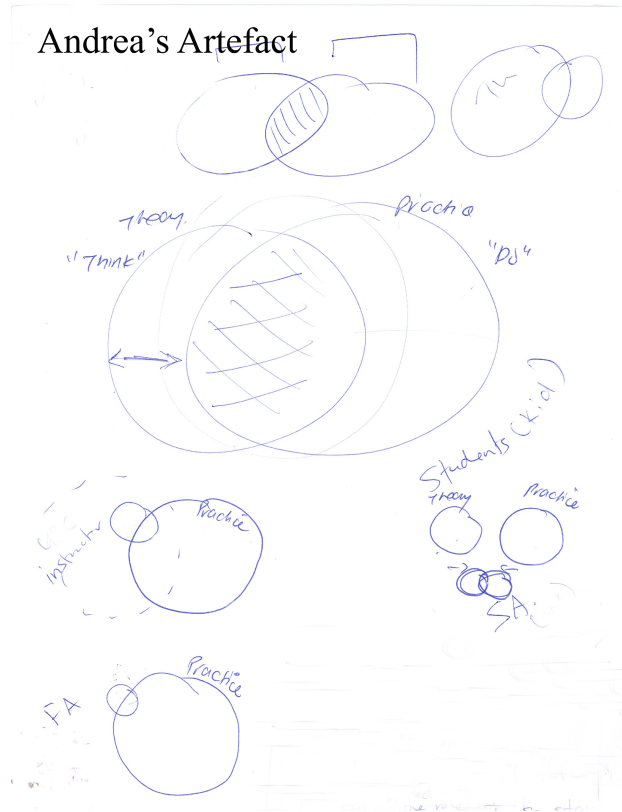
Appendix E: Gavin's Artefact

Gavin's Artefact



Appendix F: Andrea's Artefact

Andrea's Artefact

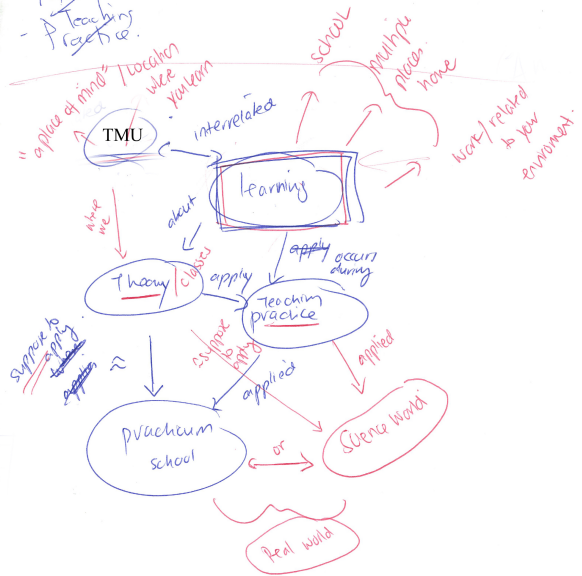


-TMU

~~Practicum School~~

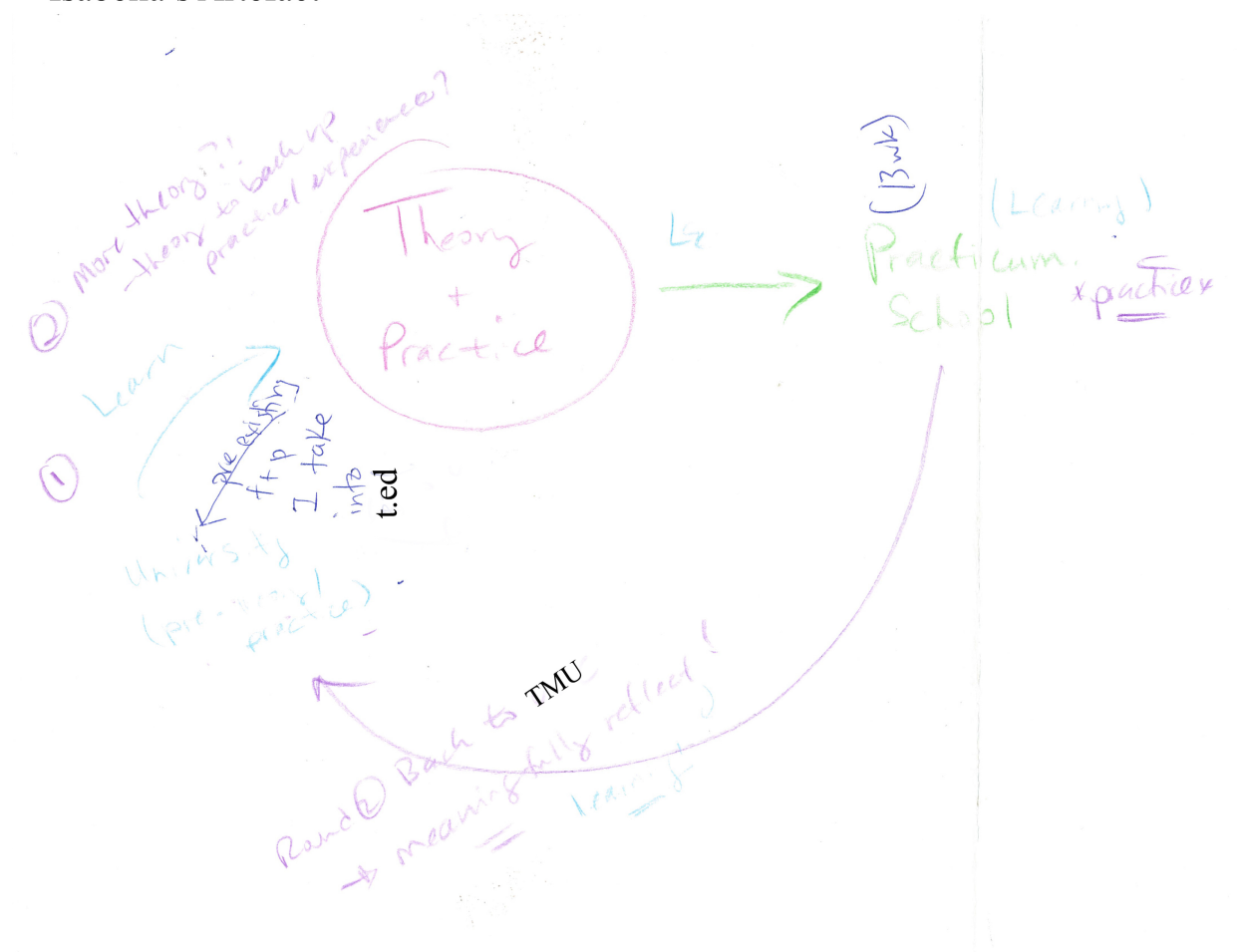
Learning

~~Theory~~
- ~~Teaching~~
~~Practice.~~



Appendix G: Isabella's Artefact

Isabella's Artefact



Appendix H: Researcher's Artefact

Researcher's Artefact

