Bridging the Research-to-Practice Gap: Exploring a Research Community of Practice Model for Supporting Teachers' Change in Practice

by

Karen Andrews

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Abstract

Teacher professional development is generally supported as a means to improving classroom instruction and thereby improving student learning. Yet there are gaps between providing support for professional development, ensuring that practices are research-based, incorporating the learnings within practice and evaluating effectiveness. Communities of practice are becoming a popular strategy for supporting professional development that fosters changes in teaching practice (Wenger, 1998). However, as Verburg and Andrissen (2006) note, little is known about the way these communities work, whether they spread effective practices and how they measure success.

This study explores the potential of Research Communities of Practice (RCOP) as a model of supporting research-grounded professional learning focused on changing classroom practice, while also providing teachers with the opportunity to apply and contribute to research. Multiple cases are used to explore teacher experiences as members of an RCOP focused on implementing technology in inclusive classrooms to meet the unique learning needs of students. Multiple sources of evidence (Yin, 2009) provided important insight into teacher experiences in changing classroom practices and the role of research within RCOPs.

Study findings indicated that research-grounded ideas were successfully infused within teaching practice, through a learning community model that provided members with opportunities to interact with relevant, accessible research that was responsive to their needs and goals. This study provides evidence -for policy-makers, post-secondary institutions, PD providers and school leaders- that certain characteristics and elements of collaborative professional learning provided teachers with the impetus, supports and

skills that resulted in sustained and measurable changes in practice. Characteristics of the RCOP central to instructional change included: 1) Evidence that the practice is worth changing; 2) Shared, student-centred vision and goals; 3) Involved and supportive leadership; 4) On-going professional learning; 5) Expectations and tracked results; 6) Feedback and results; 7) Time to develop new practices; 8) Collaboration; and 9) Experiencing new models of teaching and learning. The findings have implications for policymakers and program designers as they offer insight into aspects of professional learning that are more likely to produce results.

The use and application of research was interwoven within the RCOP model. The results indicated that research played an important role within a sequence of RCOP elements that facilitated teachers' changes in practice. Evidence indicated that the research component of the RCOP supported: 1) Evidence-informed planning; 2) Knowledge translation and instructional design; 3) Application of new practices in the classroom and tracking results; 4) Reflecting and refining practice and 5) Contributing to the knowledge of others.

This study calls for strengthened collaboration between researchers, educators and system leaders as a way to support continuous effective learning within and between educational organizations while also providing opportunities for further research and development.

Key words: professional development, teacher researchers, professional learning, communities of practice, professional learning communities, research communities of practice, research to practice, supporting inclusion, technology communities of practice.

Preface

This thesis is an original work by Karen Andrews. The research project, of which this thesis is a part, received research ethics approval from the University of Alberta Research Ethics Board, Project Name: "Understanding the Implementation Process and Benefits of Technology in Instruction and in the Design of Inclusive Junior High (and Middle School) Settings," No. Pro00037831, May 29, 2013 – May 31, 2016.

The Classroom Observations of the Use of Technology (Smith, 2013) coding rubric and data, used to supplement evidence of change in teacher practice in this study, was contributed by a team of researchers led by V. Smith at the University of Alberta.

Dedication

I dedicate this study to my husband Tom and my kids, Sarah and Parker, who inspired, encouraged and supported me every step of the way on this grand journey.

And to my mother-in-law, Betty Andrews, who was a rural, one-room school teacher, then a university governor and a constant source of support for public education and for this research.

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The participants of the Flexible Pathways RCOP for their willingness to openly participate in research and for their professional dedication and efforts to ensure that all students are included and achieve success in Alberta schools.

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Chapter 1: The Significance of Teacher Professional Learning

Ensuring Highly Skilled Teachers as a Means of Improving Student Learning

Education systems around the globe are seeking ways to improve teacher effectiveness as a means of improving student learning. Teacher professional learning (also called professional development) is seen as a means of improving teacher effectiveness. The Organization for Economic Cooperation and Development (OECD, 2009a) studied the global state of education including professional development, teacher effectiveness and teaching practice that may be linked to student results as measured on the Programme for International Student Assessment (PISA) scores. The OECD study reported that global efforts to improve schools rely heavily on improving the quality of teaching and that better and more targeted professional development (PD) is an important factor towards improvements in student achievement (OECD, 2009a). Likewise, in a meta-analysis of over 800 studies John Hattie (2008) reported teacher professional development to have a significant (d=0.62) influence on student achievement. Although, it is important to note that critics of Hattie's meta-analysis point out the lack of information provided regarding the nature and quality of the professional development, and that the professional programs included in the analysis may be out of date (Terhart, 2011). A more recent report by the OEDC (2014) states that, "given compelling evidence that the calibre of teachers is the most significant in-school determinant of student achievement, concerted efforts must be made to provide high-quality, on-going professional development for educators. Ensuring that teachers are highly skilled is a key issue in all OECD countries" (p. 390).

Professional development of teachers is important because it is connected to student achievement (Hattie, 2008; OECD, 2009a). Most educators would agree with the notion that PD should impact what teachers do in the classroom, and that what teachers do in the classroom has a strong relationship to student achievement (Costa, Garmston & Zimmerman, 2014). Supporting teachers to continually refine what they do in the classroom requires on-going supports. Human resource costs, including professional development, makes up about 80% of education expenditures globally (OECD, 2009b; OECD 2014). As reported by Loveless (2014), governments at all levels spend large amounts of money on teachers' PD—for example, teacher PD expenditures in the U.S. for 2014 was budgeted at about $2.3 billion (U.S. Department of Education). Compared to other OECD jurisdictions, teachers in Alberta report one of the highest participation rates (98%) in PD and also report the highest levels of employer investment and support for participating in professional development (74%) (OECD, 2014).

Assessing the Effectiveness of Teacher Professional Learning

Educator professional development is a significant investment (for the teacher-participants, the school or jurisdictions and PD funders) and many policy makers want to know if the PD is working - if the money is being well spent. Yet there is a surprising gap between providing support for professional development and actually evaluating its effectiveness. In other words, it is common for schools to implement PD programs that expect teacher participation in the learning activity but have no expectation that teachers will actually "do" anything differently or report on the impact of any actions to discover whether or not the PD was effective (DuFour et al., 2010). For example, Gersten et al.

(2014) reviewed 910 professional development studies focused on PD for K-12 Math teachers in the USA and found that only 32 had a methodology that assessed effectiveness, and of those, only five reported empirical evidence of effect. Furthermore, of the five studies, only two found statistically significant positive effects (student math results increased in both studies after teachers participated in intensive content-focused course work accompanied with ongoing site-based collaborative learning and planning) (Perry & Lewis, 2011; Sample McMeeking, Orsi & Cobb, 2012). Two studies, both involving university-conducted professional development, reported limited positive effects on student math proficiency when teachers completed an intensive four-week summer workshop on cognitively guided instruction (Carpenter et al., 1998) and when teachers received ongoing half-day-per-week onsite support from a university facilitator (Jacobs et al., 2007). Finally, one study found no discernible effect on student math proficiency in a study of the impact of PD programs offered by a publishing company (based a three-day summer institute, five full-day seminars and in-school coaching) (Garet et al., 2010, 2011). As this example shows, it is rare for the implementation of PD programs to include any form of assessment as to whether or not the teaching practice or student learning changed. As Mizell states,

> In this era of accountability and emphasis on results, it is remarkable that staff development is so unaccountable and so few people seem to care about its results. There is a widespread assumption among practitioners that beyond assessing how participates feel about their experiences, it is not possible to assess other results. There is great potential to elevate the quality of staff development (in Killion, 2008, p. viii).

Some PD programs that include ongoing, purposeful professional collaboration appear to have a measurable positive impact on both teacher and student learning (Perry

& Lewis, 2011; Sample McMeeking, Orsi & Cobb, 2012). Although growing, this type of collaborative PD is not mainstream. According to Hargreaves (1995) prevailing traditional programs of professional development de-emphasize interaction among participants, which reduces the process to ″a narrow, utilitarian exercise″ that may or may not improve teaching practice (p.26). PD programs could be better informed through studies that examine research-grounded models of professional learning that include collaboration and empirically report changes in teaching practice. A professional development model worth a closer look is the use of communities of practice (COP; Wenger, 1998) as a means of providing meaningful, ongoing PD.

The Emergence of Professional Communities of Practice (COP)

Increasingly, schools in many areas of North America are seeking collaborative approaches to becoming learning communities that continually refine their teaching methods to improve student learning (Schnellert, Butler & Higginson, 2008; Butler & Schnellert, 2012; OECD, 2009b). For example, members of a COP are action oriented: they work together to learn new and better ways to achieve goals, implement and evaluate those strategies and ideas, in an on-going cycle of continuous improvement (DuFour et al., 2010; Lave, 1996). Fortunately, the movement toward collaborative PD is grounded in theory (Schnellert, Butler & Higginson, 2008; Butler & Schnellert, 2012; DuFour et al., 2010; Fetterman, 2002). Collaborative approaches to professional learning have emerged from a strong theoretical base that includes social theories of "collaborative knowing" (also called social learning theory) and community theory (Bandura, 1977; Engeström, 1999; Lave & Wenger, 1991; Turner 1994; Wenger 1998;

Wertsch, 1985). These theories are largely congruent with Vygotsky's notion that human interactions are central to building both collaborative (group) knowledge and culture and for individuals to understand and internalize what their groups know (individual understanding). According to Vygotsky (1978; 1986), human intelligence (attainment of knowledge) is the result of individuals internalizing artifacts and language that are generated socially, at the group level. So individual learning is dependent on socially constructed cognitive processes. As such, according to Vygotsky (1978), in both the developmental process of the human species and that of each person, meanings are generally internalized from some external, inter-personal, group or social form, before they can be (re-) externalized. Therefore, external meaning generally precedes internal meaning, and external meaning is generated during social interactions through which we acquire language, practice, and abilities (Bruner, 1990). Informed by a social constructivist paradigm that sees learning as mediated through social processes, it is important to design professional learning in ways that enable social interaction or collaboration. Furthermore, the literature on PD substantiates that when professional learning activities are deeply situated within collaborative communities, they are more effective (as compared to PD such as workshops and conferences) in changing teacher practice and more likely to improve student outcomes (Cashman, Linehan & Rosser, 2007; Costa, Garmston & Zimmerman, 2015; Guskey, 2003; Joyce & Showers, 2002; Killion, 2008; Lieberman & Miller, 2001; Waldron & McLeskey, 2010). According to Étienne Wenger (1998), "communities of practice are groups of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly" (p.1). Communities of Practice provide a professional development approach

that focuses on people and on the structures that enable them to interact, learn with and from each other over a period of time. Furthermore, proponents of COPs believe that they enable practitioners to take collective responsibility for managing the knowledge they need, creating a direct link between learning and performance, as they develop, apply and critically evaluate practice with each other (Schnellert, Butler, & Higginson, 2008; Stoll, Bolam, Wallace & Thomas, 2006; Wenger, 1998).

Communities of Practice to Support Technology-Enabled Learning

In Alberta, COPs reflect Wenger's characteristics and are a relatively popular way of fostering innovation through collaborative professional learning. For example, in addition to local COPs within school authorities and universities, both Alberta Education (since 2004) and the Alberta Regional PD Consortia (ARPDC) (since 2011) have supported provincial COPs (Alberta Education, ARPDC). Communities have wide variability but generally they are networks of educators (teachers, leaders, education professionals, academics) that implement new research-grounded programs and practices to support the attainment of educational goals; they meet regularly to discuss issues, solve problems, share best practices and build a shared knowledge base (Gray, Andrews & Schroeder, 2012). COPs are supported as an approach to elevating the quality (and possibly the accountability) as well as the student impact of educator professional development (Joyce & Showers, 2002). In addition, COPs can be used to support educator learning and application of almost anything (Wenger, 1998).

The literature provides support for the premise that collaboration within COPs may have a positive impact on teachers′ ability to implement technology for student

learning (Fullan & Langworthy, 2014; Slatter & France, 2008; Wubbles, 2007). Fullen and Langworthy (2014) report on how some education systems are successfully implementing new technology-enabled pedagogies through educational innovation that includes continuous, collaborative practices and feedback within professional learning communities. Further, they report that new technology-mediated pedagogies were effectively spread across schools where "teachers and school leaders were engaged in processes of continuous collaboration of what worked and how best to achieve improvement" (Fullan & Langworthy, 2014, p. 53).

A summary of Alberta research initiatives found that the professional development method most highly valued by teachers and project leads for fostering the adoption of technology, was the community of practice model that linked teachers to each other, as well as to researchers, resources, and provincial leaders (Alberta Education, 2010; Gray, Andrews & Schroeder, 2012). More specifically, one of the Alberta initiatives (Emerge; Alberta Education, 2010) involved 250 teachers learning to incorporate technology within their teaching through participation in a COP. The Emerge (Alberta Education, 2010) initiative utilized a COP, which included ongoing job-embedded activities, online and face-to-face collaboration, research-focused professional development, progress tracking and measurement and in-school coaching and mentoring. The university-based research team used a mixed method including surveys, classroom observation, interviews and focus groups to capture the experiences of the 250 teachers over three years. The professional development method most highly valued (as compared to more traditional workshop methods) by teachers and project leads was the community

of practice, linking teacher to teacher, as well as experts, resources, and provincial leaders.

Emerge (Alberta Education, 2010) participants and researchers observed that:

- Teachers need to experience first-hand and internalize the use of technology for learning as a step toward using it within their practice.
- The transformation from paper-based (no technology use) to technology-supported (a mix of digital resources) learning happens incrementally as teachers deepen their skills and knowledge, and requires time to mature.
- Targeted, authentic professional development opportunities contribute to incremental increases in teacher proficiency (their use of technology).
- Peer interactions with other teachers are the most valuable learning experiences.

Likewise, another Canadian study (a comparative analysis of the relationship between use of ICT in teaching practices and the nature and extent of teacher engagement in a COP in three schools) found that teacher participation in a COP allowed for greater collaboration and experimentation that contributed to their ability to use technology in the classroom (Wideman & Owston, 2003). Improving teachers' ability to implement technology is important because the use of technology can help them better meet the unique needs of their students (flexibility, modifications, formats), can increase the relevance of class material (real-life connections) and also improve the students' ICT skill level (employability, productivity) (Fullan & Langworthy, 2014). Furthermore, researchers are working on new, empirical ways of measuring the impact of technology-related PD on teacher technological pedagogical content knowledge that may be useful in evaluating future technology-related COPs (see Chai, Koh, Tsai, & Tan, 2011).

The Challenges of Communities of Practice

Within a COP, learning is both encouraged and fostered across the community. One concern is the potential to spread ineffective practices or practices that are not informed or tested or critically examined in any way. It is challenging to find evidence of the application of research within professional learning programs documented in studies, other than the fact that a researcher was reporting on the COP itself (usually from the outside of the COP). In other words, it is difficult to find any evidence of how the professional development activities promoted best practice, were informed by research or contributed to research. In a review of PD research, only two articles out of ten empirical PD studies made any references to supporting the acquiring of research-based practices. Clarke and Clarke (2009) noted that academics supported the teachers in their use of "authentic" research-grounded assessment practices, and Hadar and Brody (2010) indicated that the first phase of their COP included exploring current theory and applied research—although the nature of the theory or applied research was not described.

Another challenge is determining whether or not COPs produce any results. Research linking communities of practice to positive outcomes for educators or students is sparse (Louis & Marks, 1998). In addition, there is recognition in the literature that due to their dynamic and often informal nature, it is difficult to systematically or empirically evaluate the quality of learning that takes place within COPs (Killion, 2008; Verburg & Andrissen, 2006). As Verburg and Andrissen (2006) state, "although COPS have become relatively popular, little is known about their way of working and what would constitute useful success conditions" (p. 14). Although rarely measured, there is a common assumption that teachers who commit to improving their teaching practice through

participation in professional development will succeed in becoming better teachers - meaning that they will be more effective with students (Louis & Kruse, 1996; Louis & Marks, 1998). However well intentioned, COPs do not always have a positive impact on student learning. In fact, a study investigating the failure of a COP found that a narrow focus on student achievement without addressing improvements in pedagogical practice resulted in no teacher-reported impact on student achievement (Sims & Penny, 2015). Vescio, Ross, and Adams (2008) reported that of 11 studies supporting evidence of change in practice due to participation in a COP, only five mentioned specific changes that teachers made in their classroom and only one collected data on teacher skills prior to the COP. Likewise, Wideman and Owston (2003) reported "ample evidence of a complex causal relationship between the dimensions of level of infusion of ICT and the range of participation in the COP" (p. 14). Nevertheless, they do not indicate exactly how they determined causality, nor do they provide details as to which aspects of the COP were salient in producing the results reported. A study of the Innovative Design for Enhancing Achievement in Schools (IDEAS) community of practice by Andrews and Lewis (2007), documented changes in practice through several direct quotes indicating that participants felt that their practice had changed. What was missing in these accounts is any specific detail on the nature of the changes or what the participants actually learned and how.

This general trend of providing self-reported perception of general changes, without specific information on content or changes in pedagogy, is pervasive in professional development literature (Killion, 2008; Vescio, Ross & Adams, 2008). Therefore, additional studies would be beneficial in providing evidence of change in

practice (multiple classroom observations, indication of practice before and after COP implementation) coupled with a rich description of the nature of the professional learning, to contribute a complete picture of COPs and their impact.

Research Communities of Practice (RCOP)

Waldron and McLeskey (2010) noted that, "research-based practices have been infrequently used by teachers to improve student outcomes" (p. 58). Although some studies note the importance of research, they lack detail regarding how the practices within the COP were research-grounded, or how evidence was collected and provided to teachers to better inform changes in practice (Vescio, Ross & Adams, 2008; Wideman & Owston, 2003).

Ensuring that professional practice is grounded in research-based methods and providing the opportunity for members to contribute to research, are central elements factored into the design of research-based or 'R' COPs. The purposeful application of research (moving current theory into practice) coupled with conducting new research (testing, refining, data collection, evaluation, analysis, sharing), is what sets RCOPs apart from COPs. A shift from COPs to RCOPs may help address the long-held concern regarding the research-to-practice gap (research not influencing classroom practices) in education (Anwaruddin, 2015). Over a decade ago, Kennedy (1997) proposed several reasons for the research-to-practice gap including that teachers don't access research (too busy, no access to databases), don't understand the research (inaccessible, academic, data-heavy language), don't see the research as relevant (research not responsive, difficult to implement) and that the education system itself is not motivated to use

research (no stimulus to change practice or to use research findings). By design, RCOPs might address these barriers by providing members with opportunities to interact with relevant, accessible research that is responsive to their needs and goals and to put the research-grounded ideas into practice. To this end, the community includes researchers and/or educators with a strong research background to assist in addressing these research-related barriers and to assist in collecting evidence to inform the activities within the RCOP. COPs have been around for some time, and the literature provides both support and caution regarding them. The notion of RCOPs builds on what we know about COPs and may serve to address the challenges with COPs including the research-to-practice gap. Additional research is required in order to more deeply understand the RCOP concept.

The purpose of this multiple case study is to explore the use of RCOPs as a professional learning approach to changing teaching practices. A further impetus is to explore the role of research (the 'R') as it is used within RCOPs. Given the rise in communities of practice, and the desire to ensure that the professional learning has a positive impact on practice, this research aims to provide a clearer understanding of what RCOPS are and how they work in order to inform future initiatives and programs.

Chapter 2: The Study

Study Setting

The study was situated within a two and half-year research and professional learning project involving educators from five diverse school districts and communities across the province of Alberta. The study utilizes multiple data sources (Yin, 2009) to capture the experiences of five teachers (one from each school district), as they participated in a provincial RCOP. The overall goal of the RCOP was to change teaching practices to encourage the appropriate use of educational technology in the classroom to better meet the individual needs of students. Members of the RCOP included teachers, principals, learning specialists (technology and special needs educators), university researchers and Alberta Education (government) staff. The RCOP members participated in professional learning based on implementing research-grounded practices, implemented new practices in their schools/classrooms, evaluated new practices and reported back to each other. At the same time, they also participated directly in university-lead research activities (formulation of research questions, data collection, review of evidence, analysis and reporting). Each of the five school authorities had a unique model of support for their local team (five different communities that belong to the larger provincial RCOP), and unique contexts. For the purpose of this study, the RCOP is defined as a group of practitioners sharing a common interest in research and educational practice and working together towards a common goal of using technology to better support student learning (Wenger, 1998). The study may contribute to a social theory of learning by unpacking central concepts within this collaborative learning approach and by using them to understand the process by which a small group

collaboratively builds new knowing and new practice (Stahl, 2000). The better we can understand how the processes involved in collaborative professional learning actually work, the better we can design effective supports for them and evaluate the effectiveness of the learning and of the support structures.

The following research questions guided this study.

Research Questions

1. How do teachers describe their experiences as participants in a research community of practice?
2. How and why does teacher practice change, if at all, in terms of implementing technology to support student learning?
3. How do the elements of the RCOP impact any changes in teaching practice (adoption of technology)?
4. What is the role of research within the RCOP?

Research Methodology: Multiple Case Study

Yin (2009) states, "if you need to know how and why a program had worked (or not), you would use case study" (p. 10). Case study is a good methodological fit for this study because the research questions deal with how and why things changed (over time) within the RCOP, rather than only looking at a more limited measure of frequencies or incidence of technology use (Yin, 2009). Furthermore, Schramm (1971) indicates that an additional benefit of multiple case studies is that they illuminate decisions that are made such as how and why teachers decided to implement technology and what results they experienced. Another strength of the case study method is that it is situated within real-

life contemporary phenomena (Stake, 1995; Yin, 2009). Learning is a social phenomena and the purpose of this study is to understand deeply (and describe) occurrences within the contemporary context of a research community of practice. Case study is often used to "contribute to our knowledge base regarding individual, group and organizational related phenomena" in education communities (Yin, 2009, p. 4).

In this study, a distinctive advantage of case study is the ability to fully synthesize and interpret a rich variety of evidence – documents, interviews, and observations- to understand if, how and why changes in teaching occurred within the RCOP (Yin, 2009). Multiple case study is used in field (or community-based) research where the investigator has little control over events taking place, but is seeking an in-depth understanding and description of complex interventions by using multiple sources of evidence to create multiple cases (Yin, 2009). Multiple case study offers important evidence to explain what happened within the RCOP and how the various contexts, events, activities and supports influenced the results. Each teacher provides the subject of an individual case, but the study as a whole covers several teachers and in this way, a multiple-case design (Yin, 2009) is used. In this study, the contextual factors are highly pertinent to the phenomenon of study (Yin & Davis, 2007). Yin (2009) describes multiple-case design as having two or more 'cases' with unique contextual conditions bound together within the study.

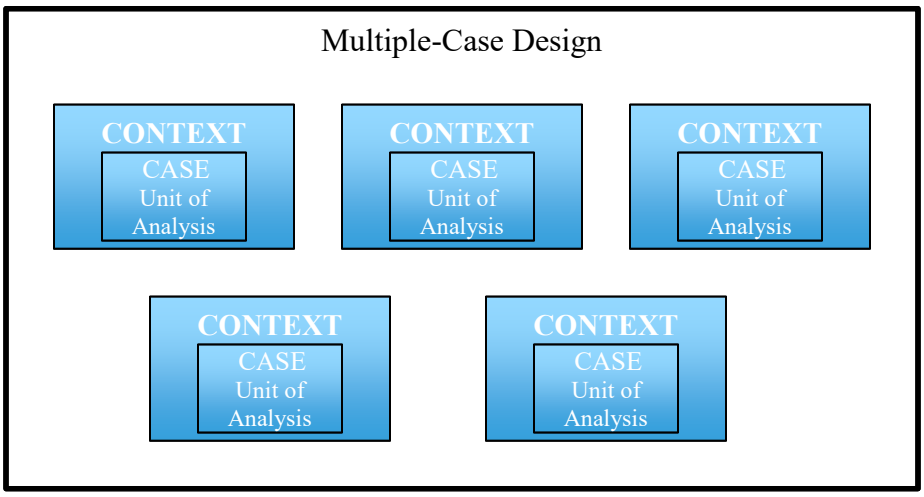

Figure 1. Multiple-case study design with five cases (Yin, 2009, p. 46).

Yin's description fits well with the Flexible Pathways RCOP design since each of the five teachers was situated within unique contexts (differences in community -such as rural and urban, leadership support, technologies, student composition, and opportunities for collaboration), which allowed them to be documented as separate cases bound within one initiative (the RCOP) (Yin, 2009). Furthermore, Miles and Huberman, (1994) indicate that it is relatively common practice to select cases based on sampling parameters including setting (rural, urban), demographics (student and community composition), and program aspects (supports, participation level). Each case represents "a unique configuration providing the ability to compare and contrast the findings across cases and determine the conditions under which the findings hold" (Miles & Huberman, 1994, p. 31).

Research Design

Unit of analysis. Given that the aim of this study is to assess the RCOP's impact on teacher practice and to understand the elements that influenced teacher change in practice, the unit of analysis is best described as 'teacher change in practice.' The research questions were addressed through the contexts and experiences of five teachers.

Procedures and recruitment. This study was situated within a larger initiative (Flexible Pathways RCOP) that included over 25 Junior High teachers with mixed-ability student classes from five different school authorities (three rural, two urban). Each of the school authorities participating in the Flexible Pathways project had a core group of one to five teacher-members of the RCOP over the two-and-a-half-year span. As part of the larger program, the RCOP educators agreed to participate in RCOP events and activities and provide documentation relating to changes in practice (the technology use in their classrooms).

From the core group of 25 teachers, five participants were selected to be 'cases' (one case within each of the five participating school districts in the RCOP). One teacher from each of the five school jurisdictions was invited to participate in the study based on the selection criteria outlined below. Participants were selected because they had an interest in altering their practice to include appropriate technologies. The self-selected teachers in the project were enthusiastic with regard to sharing their insights about participating in research activities so the availability of suitable participants was not a concern.

The five teacher participants were selected based on the following selection criteria:

- Technology incorporation: Since the study explored the 'how and why' change happened, it was important to select participants that had some interest in altering their practice in ways that incorporated technology. Teachers were selected based on their demonstrated interest in using technology and on confirmation that they had/would have access to technology within their classrooms (both teacher and student access). Teachers were excluded if they taught in classrooms where only the students with special needs had access to technology for the duration of the project. This information was available through initial project records (participant information forms and initial site visit records).

- Level of participation: Participation in the full two and a half years of the RCOP. In order to capture enough data to create five robust cases, evidence was collected multiple times over two and a half years. In addition, teachers that participated in the full RCOP had more to share about all of the program elements than teachers that did not.

- Geographic location: One participant was selected within each of the 5 participating school authorities in the RCOP. These five jurisdictions were spread geographically across the province. Having multiple cases across diverse 'constructs' or settings provided a richer cross-section of cases, addressed the risk of atypical or unreliable data (i.e., something might be very different about 'that one' site) and made the study more credible and robust than single or fewer sites (Herriott & Firestone, 1983; Yin, 2009).

- Availability and willingness to participate: Teacher participants provided consent indicating that they were comfortable with sharing their honest experiences and willing to participate in this study.

Data collection. Multiple sources of data were collected for each of the five cases at regular intervals throughout the two and a half years of the Flexible Pathways RCOP as demonstrated in Figure 2.

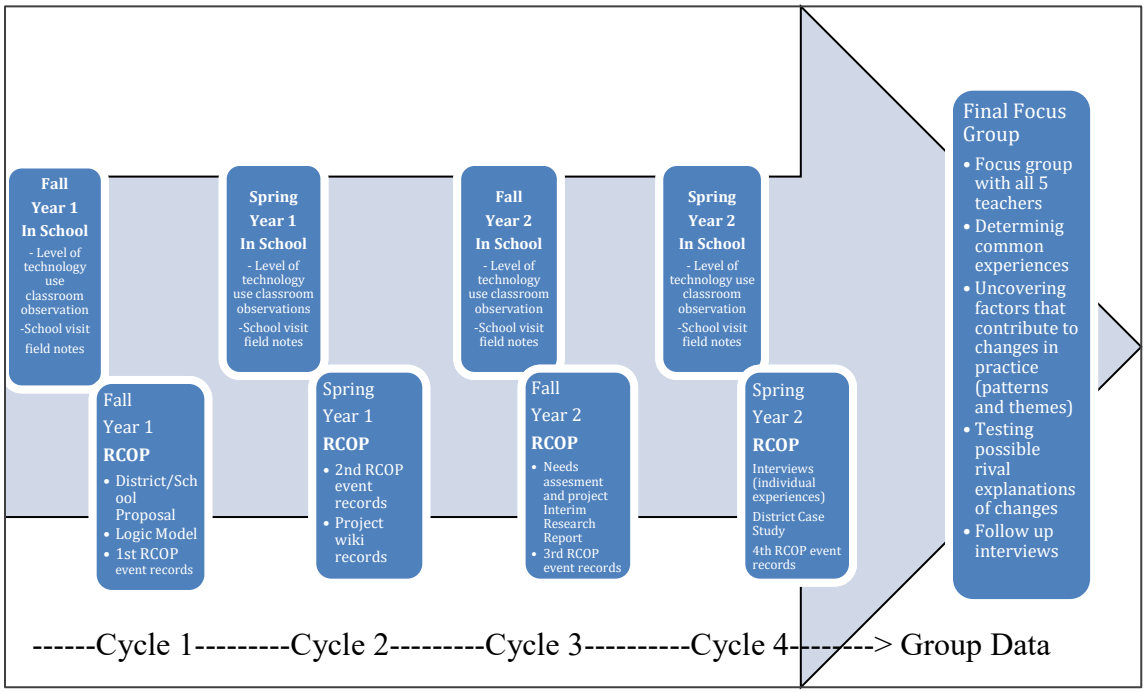

Figure 2. Research design: sources of data over four data-collection cycles

Data sources. Multiple sources of evidence were gathered both within the school and classroom setting (direct observation, field notes and individual and group semi-structured interviews) and within RCOP events and activities (event documents, reports, observations) (for examples of data sources see Appendix 4).

- Document review (proposals, logic models, event records, project online portal, reports, feedback charts, resources used).
- Interviews (semi-structured, 1-3 hour interviews with each teacher; informal interviews during field visits and RCOP events, 2-6 hours per teacher).

- Focus group (semi-structured, 1-hour, focus group with all five teachers).
- Field notes (school-based, twice-per-year, "descriptive notes" including description of classroom, classroom-based direct observations of technology use, informal interviews and RCOP event-based notations) (Creswell, 2009, p. 181).
- Video-captured classroom observations (structured observations of technology use) collected, coded and analyzed by the research team, under the supervision of V. Smith.

Specifically, the design used a concurrent data collection method with four data collections cycles (Fall and Spring) over two and a half years. Each data collection cycle included classroom observation data collection (in-class observation and informal interview twice per year for each teacher) coupled with RCOP data collection (documentation of activities in the RCOP). Toward the end of the project (cycle 4), priority was given to understanding the teacher experience and data were collected via targeted (focused directly on the case study topics) and insightful (uncovers inferences and explanations) interviews (Yin, 2009). In addition, focus group evidence and data from district-level reports (case studies submitted by project leads) were gathered. The four data collection cycles coupled with a final focus group and follow-up interviews were used to provide a rich description of practice changes and experiences over the course of the Flexible Pathways project.

The in-school data were collected using classroom observations and field notes designed to record demonstrated behaviours and occurrences (Creswell, 2009; Fink, 2002). Structured observations are appropriate when the researcher seeks to collect first-hand evidence to supplement and validate self-reported data (Lewis-Beck, Bryman, & Liao, 2004). In this study, structured observations were useful in aiding observers to

focus on those specific elements of the situation being observed that were relevant to the study (in this case, technology use in the classroom) (Lewis-Beck, Bryman, & Liao, 2004). The directness of structured observation means that a researcher can gather data that participants are unable to easily provide through a survey or interview (Lewis-Beck, Bryman, & Liao, 2004). In this study, it would have been difficult to fully capture changes in the levels of technology use within the dynamic classroom setting through a survey or other methods that did not involve direct observation.

Capturing Changes in Practice

The study began in Fall of Year 1, with observation data collection (Cycle 1). The Classroom Observations of the Use of Technology (Smith, 2013) coding rubric with three measures (opportunities to use technology by students and frequency and level of use by teachers) was used by the research team to code two "typical" video-recorded lessons (60 min each) per teacher to gauge initial level of classroom technology use of the five participating teachers (see Appendix 4 for examples of how observations were coded). The same process was repeated three additional times in order to capture any change in technology use over time (24 months) for each individual teacher (Research Question 2). The coding rubric instrument was selected and modified for the project context in collaboration with the RCOP participants and a team of researchers at the University of Alberta. The rubric was based on work of a number of researchers: observed opportunities of technology use by students and universal design for learning (UDL) use by teachers (Rose & Gravel, 2010); 4 levels of technology use and the learning

opportunities that each level provides within K-12 classroom settings: Substitution, Adaptation, Modification, and Redefinition (SAMR; Puentedura, 2013).

The SAMR Model. The SAMR model is a useful instrument for structured observations because the teachers in the project participated in professional development on the model and were already using it to self-evaluate their use of technology. SAMR was designed to help teachers reflect on the different levels of use of technology (from simple transmission of information to having students use technology in creative ways to create and share new knowledge) within instructional design (Cavanaugh, et.al, 2013; Kharbach, 2012; Oxnerard, 2013). It should be noted that, while there is some literature on the SAMR model, critics of SAMR (see Green, 2014) caution that this model is relatively new and has not been well tested through empirical studies. Although not well tested, the SAMR model has usefulness in allowing the documentation of the variety of ways that technology is being used to support student learning and to note any shifts in technology use over time (Cavanaugh, Hargis, Kamali & Soto, 2013; Romrell, Kidder & Wood, 2014). Following is a brief outline of the indicators used to code three constructs (Opportunities to use technology, Teacher frequency of technology use and Technology task level) to capture any changes in technology use throughout the project:

Technology Coding Rubric

1. Observed opportunities of technology use by students:

Low (1, 2) Students have no or limited opportunities to learn with or use technology

Mid (3, 4, 5) Students have some opportunities to learn with or use technology

High (6, 7) Students have ongoing opportunities to learn with or use technology

2. Teacher's observed frequency of technology use:

Low (1, 2) No, or limited technology is used.

Mid (3, 4, 5) Teacher uses technology to facilitate learning in one way or for only a small portion of the lesson

High (6, 7) Teacher uses multiple digital technologies to facilitate learning.

3. Teacher's observed level of technology use:

Low (1, 2) Technology may be used to only support teacher productivity (e.g., attendance; i.e., use of technology by teacher will not impact on learning) Teacher uses no, or limited technology to facilitate learning.

Mid (3, 4, 5) Technology is used as a substitution for non-digital elements (e.g., a smart board as a projector instead of an overhead) or to augment non-digital elements (e.g., cut and paste elements in a word processor)

High (6, 7) Technology is used in a way that modifies or allows a redefinition of the tasks (i.e., by using technology the learning objectives are extended or modified) Multiple means to represent and to facilitate learning with technology are observed.

The teachers' examples of changes in practice and associated artifacts (student work, lesson plans) were included within each case. The individual teacher's use of technology was coded twice per year to detect any individual-level changes over time. Using this method provided supplemental evidence, to supplement teacher self-reported data, of any changes in the classrooms for the five participating teachers.

The same instrument and procedures were used for each cycle in order to develop a consistent and thorough case study database (Yin, 2009). The in-school data collected

for each cycle were supplemented with RCOP records to illuminate the RCOP activities and expand the five cases.

Capturing teacher experiences in the RCOP. The five participants were interviewed using semi-structured questions to focus their responses relating to their technology use and experiences in the RCOP. Having five participants provided richer data sets and strengthened the design as "multiple-case designs are stronger than single-case designs" (Yin, 2009, p. 24). Interview data were analyzed along with observation data in order to further explain the teacher's individual experiences and results. Finally, the use of interviews and focus groups was used to identify what RCOP experiences influenced the changes in teaching practice (Research Questions 1 and 3).

Semi-structured interviews were conducted to gather individual-level data in response to the following questions:

1. Tell me about your experience in the RCOP.
2. Please reflect on your participation in the RCOP.
3. Please describe whether and in what ways the RCOP influences your teaching practices.
4. This is a research COP, tell me about your experience with the research part of the COP.
5. What, if anything, is different about the RCOP in comparison to other professional learning experiences?

Validity and trustworthiness. To ensure interpretive validity, an interview protocol with questions and procedures was developed and followed and the interviews were audio recorded and transcribed. The protocol included semi-structured questions

designed to avoid the risk of "leading" the participants (Given, 2008). A copy of the transcripts and subsequent analysis was provided to the participants in order to "member check" the data and confirm the findings as they were being developed and at the conclusion of the study (Bazeley, 2013).

As the teachers implemented new practices, the changes were captured through teacher self-reporting in interviews and focus groups, as well as through researcher classroom observations and structured classroom observations (video-captured) by the research team from the University of Alberta. Corroborating self-reported changes with a direct observation protocol helped to address potential reflexivity concerns (respondent provides what they believe the interviewer wants to hear) related to self-reporting, and provided the study with a more solid foundation of evidence (that change occurred) for analysis (Yin, 2009). As highlighted by Yin (2009, p. 103), "the most important use of documents is to corroborate and augment evidence from other sources." During the study, teacher-reported changes in practice were compared against the direct observations collected by the research team. In the process of coding and analyzing the teacher data from interviews and focus group, emerging themes were corroborated and tested against other data sources (see Appendix 3) including field notes, classroom observations, feedback charts given to teachers from the research team and project documents.

Yin (2009) contends that case studies, as a form of empirical social research, should be subjected to four widely used tests to establish quality throughout the study: construct validity; internal validity; external validity; reliability. To increase the quality and level of confidence in the qualitative data, multiple tactics were used as outlined in Table 1 (Yin, 2009).

Table 1: Tactics used to establish quality within the qualitative research design

Test to establish quality	Tactics used	Phase of research in which tactic was used
Construct validity	• Multiple sources of evidence (interviews, focus group, documents, field notes and observation data) • Teachers reviewed drafts of their transcripts and the interpretations of their data to validate the data and the understanding of what the data is saying • Another researcher from outside the project as "peer review" to address possible preconceptions related to the researcher being part of the project	Data collection Data analysis
Internal validity	• Follow-up interviews and focus group used to address rival explanations (for example, changes in the use of technology could have happened for reasons not related to the RCOP) • Each site/case logic model used to explain activities and relationships • Guidelines for ensuring the trustworthiness of conclusions (Bazeley, 2013) followed for systematic development of themes and patterns	Data collection Data analysis
External validity	• Multiple cases (five cases) used for replication logic • Comparison against external sources (school authority reports, lead researcher's reports)	Research design
Reliability	• Interview protocol used • Procedures, field notes and evidence well documented (semi-structured interview protocol, recording and transcribing data, capturing structured classroom observations) • Multiple contexts compared (five different sites) • Case study database (NVivo) used • Another researcher and project leads used to validate and augment evidence (the project leads worked with the teachers to create logic models and reports that document challenges, activities and changes)	Data collection Data analysis

All five participants participated in the focus group in order to further understand the impact of the RCOP activities on practice and to test possible rival explanations (Yin, 2009).

The focus group discussion was guided by the following questions:

1. How would you describe the RCOP; what activities come to mind?
2. Reflect back on any changes in practice in your classroom. What things within Flexible Pathways (activities, supports, etc.) influenced your change in practice? List your top five influences below and rank them from one (most important) to five (least important). Share your list with the group.
3. Would those changes in practice have happened for other reasons (without the RCOP activities listed)? Why or why not?
4. Is it possible that your changes in practice were already happening or inevitable? Could you have done this alone?

Analysis and Interpretation of Findings

This research design represented the logic that links the data collected, and conclusions drawn, to the research questions. Articulating the "theory behind what was being studied and what has been learned helps to operationalize case study designs and make them more explicit" (Yin, 2009, p. 24). Analysis was focused on providing evidence that addressed the research questions. The study design included the mixing of multiple sources of evidence to create a more compelling set of cases for cross-case analysis (Creswell, 2009; Yin 2009). Drawing from the method described by Yin (2009),

the single teacher cases were analyzed and reported individually in Chapter 4 followed by the cross-case analysis using a describe-compare-relate method (Bazeley, 2009) in Chapter 5.

Individual case analysis (five cases). For each of the five participants, multiple sources of evidence, including interview and focus group responses, direct observations and documents, were collected over the four cycles of the project to develop themes and patterns and construct the five 'cases.' These five cases were described independently (rich description including context and voice) using a common template for collecting basic demographic and contextual data and using a common set of questions to guide each case study (Bazeley, 2013; Yin, 2009). The participants were asked to contribute responses to questions related to their experiences within the RCOP. The responses were recorded and thematically analyzed for processes and outcomes relating to their RCOP experiences.

The categories were generated inductively, approaching the analysis without a preset list of categories and analyzing the data to identify concepts that helped explain the teachers' experiences and results (Bazeley, & Jackson, 2013; Given, 2008). Review and coding of the data sources for the first teacher generated the first set of concepts which were expanded based on examination of each additional case. Over the course of data analysis, as categories were uncovered and refined, a coding frame was used to classify further data segments into already established or new conceptual categories. The categories were used to explain the teacher's experience. For example, a reported challenge with technology could be explained by categories including technology supports and technology access.

Data organization and thematic analysis were supported through the use of Excel and NVivo software. Data sources were separately coded using Excel and NVivo to produce, compare, contrast and confirm an initial set of concepts that were more abstract ideas rather than themes, emerging from the data. Using two independent coding processes protected against possible code and retrieve bias (coding discrete bits of data without seeing perspective and therefore misinterpreting meaning) and kept the researcher in control of the process and interpretation, thereby addressing critiques of qualitative software use (Bazeley & Jackson, 2013; Gilbert, 2002). Analysis of an initial list of 32 concepts produced 18 categories, from combining several related concepts, and three divergent views (Bazeley, 2009). Categories were refined into themes by comparing and analyzing patterns while also using divergent views to challenge generalizations. Fortunately, there were other researchers involved in the overall Flexible Pathways project (and familiar with much of the data) who provided reviews and feedback on the study design and categories. Using these 'skeptical colleagues' was a helpful way to avoid 'tunnel vision,' undetected bias, and to test whether different conclusions could be drawn from the data prior to drafting the cases (Miles & Huberman, 1994).

Creation of the five cases was a collaborative process between the participants and researcher thereby ensuring accuracy of the data and interpretations while also allowing the participants to expand on ideas. Participant responses to interim analysis were re-coded and used to refine categories, reorient interpretations, and collect more detailed data. This reflect-review-provide feedback process was facilitated via email and phone as well as at a final face-to-face focus group. Project leads (the district project manager) also created cases of the participating teachers which provided another

perspective useful for comparison against emerging themes in the study. Once all data sources were extensively coded into themes and categories, individual case synopses were developed based on what was essential to each participant's experience and using close approximations to the persons own words (Miles & Huberman, 1994). It should be noted that while the individual cases were thickly descriptive and data-rich, reduced versions of each case were reported in order to protect participant identity. In addition, the study took place over several years allowing for multiple check-ins with the participants during case development. One year after the Flexible Pathways project ended, participants were asked to review their cases again, make any changes and reflect on what practices, if any, they were still using. This cross-checking over time allowed for a deeper analysis of any RCOP factors and changes in practices that persevered over time (at least one year later). Once the individual cases were completed, cross-case analysis was conducted.

Cross-case analysis. Yin describes multiple-case studies as case studies that cover multiple cases and then draw a single set of cross-case conclusions (Yin, 2009). After completion of the five separate case reports, NVivo software was used to organize the data, code the data and compare findings across cases. Several rounds of coding revealed repeating ideas and a broad selection of quotes. The themes and patterns that emerged from the participant responses were used to create a single set of broader themes (Bazeley, 2013). Two independent coders reviewed the evidence and developed consensus on the final list of cross-case codes. These broader themes and quotes were then compiled to address each of the research questions guiding the project. The

emerging themes were described, compared and related (Bazeley, 2009) within the analysis in Chapters 5, 6 and 7.

Table 2: Multiple sources of evidence used to address the research questions

Research Question	Sources of Evidence	Analysis
1. How do teachers describe their experiences as participants in a research community of practice?	• Structured interviews • Focus group • RCOP event records that described activities and collaboration	Case Building (descriptive): • Attitude • Time • Collaboration • Activities • Support structures
2. How does teacher practice change, if at all, in terms of implementing technology to support student learning?	• In-school observation (Classroom Observations of the Use of Technology) • Field notes	Case Building (descriptive): • Nature of technology use • Change in technology use over time • Classroom-based examples
3. How do the elements of the RCOP impact any changes in teaching practice (adoption of technology)?	• Semi-structured interviews • Focus group • Document review (RCOP event documents, project wiki, reports)	Explanation Building: • Themes and patterns • Testing rival explanations • Describe, compare, relate
4. What is the role of Research within the RCOP?	• Semi-structured interviews • Focus group • Document review (project reports, RCOP event records, project logic models, project wiki)	Explanation Building: • Themes and patterns • Describe, compare, relate

Limitations

Many public policy objectives focus on the collective rather than the individual level and seek empirical evidence of impact on the community. This study focused on the

individual experiences of five participating teachers, each with unique contexts, within a provincially funded and locally supported RCOP. As with all studies that have a small group of participants, there is a concern that the findings may not transfer to broader contexts. In order to enable transferability of the findings, multiple-case analysis where "each case effectively acts as a replication of the study in a different person and setting," gives some "assurance that the results obtained are not completely idiosyncratic –that they will be more broadly applicable" (Bazeley, 2013, p. 411). In addition, the use of multiple sources and types of evidence and careful adherence to the tenets of proper research design (triangulation and rigorous examination of data, member checking, peer review, evidence database, testing rival explanations) served to ensure that the case study was of high quality.

The goal was to expand on the knowledge of *what works and why* to provide an analytic generalization, rather than *how much* something worked (statistical generalization) (Yin, 2009). This study provided careful evidence, situated within an innovative research-grounded PD approach that was teacher-centred, job embedded, on-going and outcome focused. As such, the study lends valuable information to the education and research fields.

The researcher's role (See page 178 in Creswell, 2009) may be seen as a limitation to the study and therefore further information is provided below.

The Researcher's Role and Perspectives

The researcher in this study was both university researcher and government project manager responsible for the research and overall RCOP creation and funding.

Therefore, careful consideration and extra steps (drawing from Yin, 2009) were taken to mitigate any investigator effect. The participants in the RCOP were clearly informed in writing via email and on consent forms, in person and at events, of the researcher's dual role. All of the research activities were conducted in close collaboration with another highly experienced senior university investigator on the project. The data were checked and validated by respondents and triangulated with direct observation by other university researchers. In addition, the project leads in each of the five participating school jurisdictions provided evidence that was used to triangulate (compared against) research data and inferences (Bazeley, 2013). Multiple sources and types of evidence, including data collected by other researchers, were used within a general analytic strategy to mitigate the potential for investigator effect and to test possible rival explanations. In addition, another researcher (external to the project) provided peer review of the data and inferences to assist in addressing potential preconceived bias of the researcher. Having both internal (to the project) researcher review and external review and utilizing member checking, provided a higher level of transparency and trustworthiness.

In any study, the researcher's philosophy and world-view lay the foundation for specific approaches and methods of data collection, analysis, and interpretation (Creswell, 2009). An understanding of the researcher's philosophy and theoretical orientations provides additional insight to the design of a qualitative study. In this study, the researcher's paradigmatic position was best described as pragmatic constructivist. Pragmatists believe all knowledge is tentative and needs to be tested against experience (Bazeley, 2013). Creswell (2009, p. 11) describes pragmatic researchers as having "freedom of choice" in methods and look to many data sources and approaches rather

than subscribing to only one way of understanding a research problem. Pragmatism was manifested in this study design that included multiple ways to capture the actions and experiences of each participant (for example: interview data supplemented with classroom observations). Bazeley (2013) states that pragmatism emphasizes the action-based nature of experiences, as this is affected by different conditions, as well as a need to observe, interpret and interact directly with participants to view actions from the point of view of the participant. Pragmatists are also interested in the application of research, finding 'what works' and possible solutions to problems (Creswell, 2013). Inherent in this study was an interest in finding what worked and what didn't work with the RCOP, from the perspective of the participants, which may inform future efforts.

Similar to the pragmatist, the constructivist researcher also seeks to understand the meaning of situations through the views of the participants and through the direct interaction with participants (Creswell, 2013). Constructivists, however, are focused on the social construction of meaning (knowledge arising from interaction within a community) and the research approach is largely inductive with data collected in more open-ended procedures in the field (Creswell, 2013). This study design fit well with constructivism in that the participants were attempting to strengthen their knowledge and skills through on-going interactions and collaboration within the RCOP. Furthermore, the researcher was situated within the community, gathering data in the field, which helped to deepen the researcher's understanding of participants' world and work (Creswell, 2013). Constructivists acknowledge multiple realities as they study 'how' participants construct meaning and 'why' participants act or change behaviour in specific situations (Bazeley, 2013). In this study, although the participants were interacting within the same provincial

RCOP, they reported very different realities and perceived the RCOP differently given their specific situations and contexts. The research questions were purposefully designed to be open-ended to capture these varying experiences.

Risk and Consent

There was minimal risk as participants were not required to participate if they were not completely comfortable doing so. Participants were invited to express their perceptions of the RCOP openly and honestly, without risk to their participation in the project or future projects, as part of a community where the failure of the RCOP, or any part thereof, would be a legitimate conversation. Participants were not required to answer all questions. Participants provided written consent for participation in the Flexible Pathways Research and the consent form included the exploration of the RCOP. The research was approved by the Research Ethics Board of the University of Alberta.

Privacy and Confidentially

Each teacher participated in semi-structured interviews and focus groups that were audio recorded, with their consent, for the purpose of transcription. Once the data were analyzed, the results were reported without identifying the actual participants or their location. Participant names have been replaced with pseudonyms and case descriptions have been reported without identifying content. All materials were kept in a locked cabinet and digital files encrypted and stored securely within a locked area. All materials with identifying information will be destroyed.

Chapter 3: The Study Setting: Flexible Pathways to Success

Historical Context

In 2009, an initiative called, Setting the Direction for Special Education (Alberta Education, 2009) outlined a vision of success for each student within an inclusive education system. The guiding principles that shaped this vision included a responsive, flexible approach and inclusive, equitable access to learning for all of Alberta's students. Setting the Direction resulted in proposed changes and recommendations to better accommodate children with special needs including:

- Create ways in which students with disabilities, or who are gifted and talented, can access the curriculum and demonstrate their knowledge.
- Provide provincial professional development opportunities for teachers, teaching assistants and learning coaches to develop instructional strategies for inclusive education in schools and school authorities.
- Increase access to technologies to support the learning of all students. (Setting the Direction Framework, 2009, pp. 8-9)

In 2012, Alberta Education added Priority Initiative 1.3 - to *"*continue the implementation of an inclusive education system in collaboration with partners and stakeholders" to Alberta Education's Business Plan for 2012-2015.

In 2011- 2012, Alberta Education worked with stakeholders to update the provincial policy document that set the direction for the use of technology in Alberta schools. The *Learning and Technology Policy Framework* (Alberta Education, 2013) provides five policy directions including the direction:

″Student-Centred Learning: Technology is used to support student-centred, personalized, authentic learning for all students″ (p. 18).

It is within this context that late in 2012, Alberta Education invited school authorities to participate in a multiple-year research and development initiative called Flexible Pathways to Success.

Flexible Pathways Project Description

Flexible Pathways goals. As identified in project documents, the intent of Flexible Pathways was to create, document and share the conditions to ensure that:

1. School leaders and educators are able to leverage technology to support engagement and learning in inclusive learning environments.
2. All students are engaged, participating and demonstrate success in learning.

The work of the participants was guided by the following research question: How can the implementation of educational technologies support individual student learning in inclusive Junior High settings where there are diverse cognitive abilities?

Alberta Education (government) managed and supported the program by providing funding (grants to participating organizations), access to professional development, research supports, and through facilitating a Research Community of Practice (RCOP).

Within the conditional grant agreement, each school authority agreed to:

- Participate in a provincial Research Community of Practice supported by Alberta Education to share merits, challenges and promising practices related to the Flexible Pathways project initiative. Participation included:

  a. Participation in six face-to-face provincial Research Community of Practice (RCOP) meetings and events over the two and half year course of the project (additional activities facilitated via videoconference),

  b. The administration of a needs assessment survey to project participants, and

  c. Implementation and participation in research activities including:

    i. Collaborating to develop research questions and research methodology;

    ii. Coordinating on-site research activities;

      • Data collection (surveys and other data collection tools);

      • Interviews;

      • Focus groups;

      • Observations; and

      • Collection of artifacts demonstrating student progress.

- Host site visits for Research Community of Practice members, researchers and Ministry staff.

- Contribute regularly to the Research Community of Practice project website and reports.

- Provide presentations at selected Ministry-sponsored events.

- Provide one interim and one final report to Alberta Education. Each including a short (maximum five minutes) video clip illustrating project progress.

There were five participating Alberta school authorities, three rural and two urban. The University of Alberta was the provincial research partner responsible for the overall research. The sections below are taken from project documents to further describe the purpose, principals and people involved in the Flexible Pathways program.

The Flexible Pathways participants worked together to:

- design, build and share expertise to deliver inclusive, innovative ′learning spaces′ at the junior high level where technology is leveraged to create flexible pathways to success.
- investigate the emerging results of implementing educational technology on learners′ increased participation, engagement and learning in inclusive environments where there is cognitive variability.

Guiding principles. The school authorities and partners involved in Flexible Pathways developed and shared an initial set of common guiding principles:

1. Every student brings a unique assortment of strengths, challenges and preferences to the learning environment.

2. Alberta schools embrace diversity and provide ways for each unique learner to develop their own pathway to success within inclusive environments.

3. Educational technologies provide the flexibility to customize learning for students. Technology can support student engagement and help students participate and learn.

RCOP Participants

There were over 50 professionals and 150 students from nine schools, within the five school authorities, directly involved in the Flexible Pathways project. The students were key stakeholders as they were the intended beneficiaries of the Flexible Pathways program. Within the nine schools, there was a special target group of approximately 30 students with unique learning needs (coded special needs) that were learning with their peers within 'regular' inclusive classrooms. The RCOP was designed to support the professionals in their efforts to provide inclusive learning environments that improve outcomes for all students.

The professionals were educators, leaders (principals, superintendents), Information Technology (IT) staff and learning support specialists from the five school authorities, researchers from the University of Alberta, as well as PD Providers and managers from Alberta Education. These groups of people learned and worked together to implement the project, support each other and uncover the emerging results within a Research Community of Practice (RCOP) approach.

The five diverse school authorities involved in Flexible Pathways were spread across the province and included both urban and rural schools. Three of the authorities served less than 5000 students and two served less than 20,000 students.

School Authority 1: Located in northern Alberta and covers a large geographical area where oil and gas, farming and logging carry the economy. The schools in this authority support mainly remote rural students consisting of significant First Nation, Metis and Inuit and Mennonite populations.

School Authority 2: Geographically large, encompassing the rural central-south region of the province. The region is sparsely populated and located a considerable distance from urban centers. The authority serves families tied to the oil/gas industry and farming. Most of the schools are small in size and population.

School Authority 3: Located in northern Alberta. The authority provides Catholic Education and French Immersion programs to the rural communities they serve.

School Authority 4: Located in central Alberta with mostly urban schools, as well as portions of the rural areas surrounding their communities. It is a Catholic school authority that provides French Immersion programs.

School Authority 5: Central Alberta public school authority in a rapidly growing region of mostly urban schools. The authority serves some rural communities as well.

Research Team: A team of graduate students led by Principal Investigator, Veronica Smith, PhD, Associate Professor, Department of Educational Psychology, University of Alberta. The team assisted with the planning and delivery of RCOP events, helped the school authorities with local research activities (developing local research questions, logic modeling, finding and sharing research-based models) and was responsible for the broader research project including a systematic exploration of the data collected, guided by the following research questions:

1. What are the processes (e.g., technology access and purposeful use, and pedagogy) and context factors (e.g., leadership characteristics, learning resources, student characteristics) that shape the successful implementation of technology in inclusive learning environments in Junior High settings

designed to facilitate the participation and achievement of learner outcomes for students who require significant accommodations to access the curriculum?

2. How do these processes and context factors shape the role that technology plays in supporting diverse student learners and enhancing their participation and achievement outcomes in inclusive Junior High settings? (Smith, 2016, p.5).

PD Provider: An Alberta PD provider, 2Learn.ca, provided professional development sessions at 2 RCOP events and locally within some school authorities, related to the use of technology (assistive technologies, educational 'Apps' and their application for learning).

Education Ministry: Managers from Alberta Education (a senior manager and a project manager) supported the overall project (planning, hosting events, monitoring progress) including the RCOP (events, site visits, reports).

The Activities of the Flexible Pathways Research Community of Practice

Over the two and a half years, RCOP members participated in a variety of professional learning, research and reporting activities. Spring and fall provincial face-to-face RCOP events were designed to facilitate all three types of activities -professional learning, research and reporting. These events and activities were planned and delivered in collaboration between ministry staff, the research team and school authority project leads. RCOP events were intended to augment the ongoing activities at the local (school and district) level, as well as the continuing research work.

Provincial RCOP learning events. There were six RCOP events (face-to-face meetings) hosted by the school authorities and held each spring and fall, over the two-and-a-half years of the project including two events in the spring of the first year. The one or two-day events each included activities to support project tracking (reviewed project goals and expectations in their project grants), research (project research activities as well as the research-basis for RCOP activities), collaboration and professional learning. In addition, most of the events were coupled with an opportunity for RCOPS members to visit a school and observe member teachers' classrooms. Specific details of the events are provided below.

Event 1: Getting started. The first event was a two-day meeting to start the project. The meeting was hosted by School Authority 4.

Day 1 Focused on understanding the project, getting to know RCOP members, setting goals, understanding the research component of the project, understanding communities of practice (Wenger, 1998). The agenda included:

- Understanding the Project (project origin, goals and expectations)
- Getting to Know Each Other
- Sharing Student Stories and our Visions of Success
- What is a Research Community of Practice?
- Setting our Goals for the RCOP
- Understanding the Research
- Next Steps: Preparation for the Fall

In the session on understanding the research, the research team introduced two theoretical models: Technological Pedagogical Content Knowledge (TPACK) for meaningful learning with information and communication technology (ICT) (Chai, Koh, Tsai, & Tan, 2011) and the SAMR model (Puentedura, 2013) as a foundation for some of the research activities related to capturing technology-related practices and results.

Day 2: The second day was a professional learning day to help the RCOP members develop their understanding of inclusion (supporting the unique learning needs of all students within the same classroom) and technologies and methods that support inclusion. The day was facilitated by an RCOP member with extensive background in inclusion and an Ontario researcher and inclusion specialist (Alex Dunn). RCOP members were introduced to the SETT Framework (Zabala, 2010) and associated research including Universal Design for Learning (UDL, Rose & Gravel, 2010). According to Zabala (2010), the SETT Framework is intended to enable collaborative decision-making focused on developing a deeper understanding of the Student, Environments, Tasks, and Tools in order to effectively design instruction for the student. The Tools part of the SETT included technologies and assistive technologies to support learning tasks appropriate for the student and their learning environment. RCOP members worked through a series of hands-on stations with a variety of educational and assistive technologies and methods to support inclusion.

Event 2: Logic modeling: Mapping our project. The second RCOP meeting was held three months after the initial start-up event. During the three months, the research team gathered participant data (schools, teachers, students), conducted a technology inventory (level of access for teachers and students, types of technology,

network provisions, tech support) and employed a survey to gauge members' level of experience, background and PD needs with regard to technology use and inclusion. The results of this baseline data collection were shared with the RCOP members in order to help make decisions and plan project activities according to the evidence uncovered. The three months also provided time for the school authority teams to identify the target class and students (for research purposes) and collaboratively draft their local project goals, including student learning goals, and research questions.

In addition to providing the results, the research team introduced 'logic modeling' to the group. Logic modeling was a way to assist the school-teams in identifying and connecting their project goals, inputs, activities, outputs and outcomes, while also uncovering any assumptions of how the activities will lead to change (Bazeley, 2013). As Yin (2009, p. 149) points out, "the process can help a group define more clearly its vision and goals, as well as how the sequence of programmatic actions will (in theory) accomplish the goals." Working with oversized poster paper, markers and post-it notes, the school-teams drafted their first logic models and then shared them with the other RCOP members for feedback. The process of logic modeling was new to RCOP members, and although some members struggled with the process, in the end all of the schools were able to share a draft model. The logic models returned home with the teams for further refinement and subsequent reporting (attached to their interim report). The research team and ministry managers held local logic modeling meetings for schools desiring additional supports.

Event 3: Exploring policy and practice: Student-centred learning with technology. The third RCOP event was focused on policy and practice for the use of

technology to support student learning and inclusion. The members discussed inclusion and technology implementation concepts from Todd Rose (2013) and Dave Edyburn (2013) (members received a digital copy of Edyburn's book) as well as revisiting the SAMR model (Puentedura, 2013). In addition, the RCOP members reviewed the draft Learning and Technology Policy Framework (Alberta Education, 2013) to see how it aligned with their experience/efforts and to make suggestions for improvement. The day prior to the RCOP event, the host school authority (School Authority 5) held school and classroom visitations for the RCOP members. The RCOP event had the following activities:

- Tracking our Project Outcomes
- Research Activities Update
- Logic Modeling Sharing and Feedback: Collaboration Time
- Practice: Designing to the Edges: Research-based Technology Implementation (Edyburn, 2013; Rose & Gravel, 2010; Rose, 2013)
- Policy: Shaping the draft Learning and Technology Policy Framework (Alberta Education, 2013)
- Planning: Learning Symposium and Next Steps

Event 4: Learning symposium. This 2-day learning symposium was facilitated by the PD provider (2Learn). Both days were focused on teacher-sharing of practical ideas for using technology and for supporting students with special needs. The first day involved more general activities while the second day was subject specific and teacher-led, as per the agenda items below.

Day 1: 2Learn-led activities.

- Through the Looking Glass: Transformative Learning and Teaching with Technology
- In the Hands of the Learner: Tools for Participation, Production and Personalization
- Meeting SLOs: When Students Choose Their Own Learning Tools
- Designing Engaging Learning Tasks: Sharing the Journey
- Designing Transformative Practice

Day 2: RCOP member-led sessions.

- CAFÉ-Style Subject-Specific Sharing Sessions
    - Part 1: How is technology supporting learning in: Math/Science/L.A./Social Studies/numeracy/literacy (table according to subject)
    - Part 2: How is technology supporting assessment in Math/Science/L.A./Social Studies/numeracy/literacy
- Using Learner Profiles to Tailor Technology Practice
- iPads and Inquiry-Based Learning (Grades 2-9)
- Leadership Strategies to Support Teachers (Research session)
- Game-Based Learning a Facilitated Conversation (Hayden)
- Learning in the Classroom with iPads (Kelly)
- Digital Storytelling

Event 5: A year in review and FlexCamp. This two-day event was held in a rural school (School Authority 3). The first day was the RCOP meeting and the second day was dedicated to classroom observations. Planned at the previous event, this RCOP format was designed to be highly interactive and participant-led. Our host school set up the gym so that there were ample collaborative work spaces on walls, tables and floor as well as a very large screen and projector. In addition to the usual tracking and updates, the first day had two major components:

- Looking back and Looking ahead (wall activity). After reviewing five-minute videos created by each school (demonstrating their progress from the past year) and the research results from year one (research team year one report, highlights in graphical form from authority interim reports and logic models), each member added "evidence of accomplishments cards" under "goals" on the wall. The project goals were written on large title cards at the top of the wall and the participants added specific items (on large green cards) that they deemed to be evidence of meeting, or an accomplishment toward meeting, that goal under each title. RCOP members walked along the wall and discussed the results, making notes and taking pictures with their devices then returning to their team tables to discuss further and start looking ahead. Next, the teams added large yellow cards indicating what key activities they would be focused on for the next year, and addressing any gaps. A second wall walk facilitated discussions of future activities and how they would align with the goals. Participants could visualize (lots of green cards) how far the RCOP has come, celebrate their accomplishments, in terms of reaching goals, and identify the focus areas for the next year (pink cards). In addition, a professional development organization (2Learn) was there to plan for future PD supports as needed by the schools.

- FlexCamp (an EdCamp style activity). RCOP members brainstormed ideas for participant-led sharing sessions and placed these on chart paper on the wall. Volunteers were recruited to facilitate the various topics. Topic tables were set up

and participants selected tables and participated in discussions according to interest. The topics included subject-specific (Science ideas for grades 7-9), technology related (iPads and troubleshooting), pedagogy (SAMR model and classroom management) and leadership (the 21st Century Principal) topics. The RCOP members enthusiastically contributed to the list of topics, however, there was a long period of silence when volunteers were requested. During a break, the support team (ministry managers and research team) were able to nudge enough members, mostly teachers, into taking on the role of facilitators. The table discussions were described as "high-energy" and participants appeared to be engaged.

Day 2: On the second day, staff from the host school provided RCOP members with a series of interactive classroom visitations. Members were divided up and sent to a series of four classrooms where they observed a technology-mediated lesson in progress and interacted with the students and teacher. RCOP members observed a variety of strategies and technologies that the teachers were using to support students with special learning needs. The students were very accommodating (answered questions, demonstrated how they use technology) and proud to show RCOP members their work. Members had an opportunity to talk to the teachers informally over lunch, discussing assessment, planning and classroom management, and were able to spend time in the office talking to the leadership team about their role in supporting change. The Principal and Assistant Principal shared strategies including having an on-site technology coach at least once per week and sharing their project work openly with all staff (e.g., holding their project team meetings in the staffroom so anyone could join the conversation, posting project materials on a staffroom Flexible Pathways bulletin board).

Event 6: A celebration of learning. This culminating event was focused on celebrating the accomplishments of RCOP members and their schools. School Authority

5 hosted the event and also provided a school visitation (viewing programs such as robotics, digital design, music and video production) the day prior to the RCOP event. At the RCOP event, teams from each school authority presented their final video demonstrating changes in school and classroom practice, gave an overview of their student case study (the impact on targeted students including a demonstration of pre-post student work), and each RCOP member shared their stories of challenge and success. The research team shared preliminary results ("What is the research telling us about Flexible Pathways?") and members shared their personal reflections on the changes they experienced and what they will sustain or grow going forward. As members were sharing, their stories, experiences and results were captured graphically by a professional graphic artist, on a wall-sized canvas at the front of the room. This collective visual record was reproduced (poster size) and sent to each member and school.

Local RCOP Activities: Supporting and reporting. In between the provincial events, each of the participating school authorities continued to work on the RCOP/project goals through a wide variety of local activities. There was variability across the schools in terms of the level and frequency of local activities. In general, the activities included:

- Supporting technology integration: Local project teams described spending "a lot" of time, especially at the start of the project, on technology acquisition, set-up, troubleshooting and training. The teachers collaborated with their peers on lesson design, trying new technologies with their students and discussing the results. Most of the schools held one or two additional PD sessions through a technology coach, central office consultant or an external PD provider (2Learn, U of A expert).

- Supporting the research activities: Throughout the project, the university research team collected, analyzed and shared data from student writing assessments (with and without technology), surveys, classroom observations with video capture, interviews, and focus group meetings. Local teams facilitated, planned the agenda and participated in the research activities. In addition, the research team met with RCOP members to review, explain and discuss their individual, school and authority results. The research team translated and summarized the data (observations, surveys), presenting coloured charts that demonstrated the degree of progress in terms of changing practice to use technology in support of student learning. RCOP members discussed the results at local meetings with the research team and at RCOP events. The results of the research activities were captured in a final research report (https://education.alberta.ca/media/3272631/uofa-flexible-pathways_finalreport_july26-2016_online.pdf).

- Tracking, reporting and sharing: RCOP members kept track of their progress through local project-tracking meetings, reviewing their logic models and by creating videos including in-classroom footage and interviews. In addition, each school produced three case studies describing the experience of a student, a teacher and the school. Progress was reported in interim and final reports to Alberta Education, during site visits by ministry staff and RCOP members, shared at RCOP events and also shared more broadly at staff meetings, board meetings and other provincial conferences.

Online RCOP portal. The RCOP was supported by an online project portal (http://flexiblepathways.wikispaces.com). According to the wiki home page for the project, the portal was designed to:

- Provide RCOP members with an online forum to collaborate, share and build understanding around the role technology can play in the design of inclusive Junior High learning environments.

- Capture success stories and lessons learned from technology-based initiatives designed to support the participation, engagement and learning of students with diverse cognitive abilities.

The portal included several “pages” where members could log-in to get information and post stories, materials, project documents and ideas related to a variety of topics including the RCOP, SETT framework, teaching resources, tutorials, research, digital citizenship, logic modeling, planning for diversity, iPad-agogy, and projects (Appendix 2 provides an image of the project wiki). General information about the Flexible Pathways project and members was also on the wiki, as well as a project calendar of events, research activities, deadlines and site visits. The project had a twitter feed (#flexpaths) that could be viewed on the wiki home page. Agendas, presentation materials, research and videos were posted for every RCOP event. There were discussion boxes on each page with discussion starters (questions like, “Do you have an example of moving from adaptation to accommodation then to accessibility (according to Dave Edyburn's A3 Model)?)

Chapter 4: Teachers' Individual Experiences as RCOP Participants: Five Cases

The following five cases are individual respondent-edited case reports, designed to show how and why changes in practice were or were not experienced, as well as to provide important teacher-level context and voice (Yin, 2009). Attention was given to any rival views or unique experiences and these have been included within each case and discussed in Chapter 6. The five teachers, representing the five cases, were all in junior high (middle school) settings and had between 10 and 18 years of teaching experience at the start of the project. Pseudonyms have been used for the teachers' names.

Case 1: Val

Number of years teaching as of Sept 2014: 16

Grade and subjects taught: Jr. High, Grade 8 Science

School context: Catholic public school within an urban region. Higher number of students with coded special needs. Teaches full classes (25-30 students) that include 2 students with special needs and a variety of different levels of academic abilities.

Technology: School participated in a previous provincial technology-related initiative where they acquired a mix of technologies (laptops, iPads, iPods) on carts available on a sign-out basis. At the start of the project, the technology was primarily being used by students with special needs (classroom observations). On occasion, approximately ⅓ to ½ of the class would take notes utilizing their own device - laptops, iPads, and iPods. However, Val indicated that technology use "may not have been truly 'robust' at this initial stage." In the first year of the project, the school/district addressed several technology barriers (restrictive filtering, wifi, bandwidth) and implemented a

bring-your-own-device program. Chromebooks were added in year 2 and by the end of the project, technology access was very close to 1:1 for staff and students.

Supports: School has a Technology Teacher on staff providing coaching and support. School principal was involved in PD and in the project (participated in the RCOP). School district has provided a project lead to support the teachers and manage the overall project (also participates in the RCOP). District administration is involved (also participates in the RCOP) and worked closely with the school to address barriers. Several teachers (also involved in the project) collaborate and support each other within a school-based team.

Release time: Project teachers had four half-days to collaborate plus they collaborated every Wednesday morning at 8:00 am (for 45 min before first class) and had release time to participate in RCOP events twice per year. As a lead teacher, Val had a 50-minute block of time every other day for project work in the second year.

Participation: Val participated in all provincial RCOP events and activities. Collaborated with other project schools from other districts (including site visits and classroom visitations). Hosted RCOP events. Held local RCOP events and activities for school and district staff.

Outlook at the beginning: High interest –had previous positive experience in a provincial project. Val had a strong desire to learn multiple new ways to support students with special needs that "need something different" – focused on inclusion. Appreciative of "fantastic" project lead and administrative support. Somewhat concerned about the impact of new technology-related methods on student attainment of outcomes and on

giving students more control regarding how they demonstrate the outcomes. A bit "overwhelming at first" with all the new ways to use technology ("where do we start?").

Challenges: At the beginning, technology access was limiting ("we really need to do something with our infrastructure"), iPods were not robust enough, wifi was weak, filtering and firewalls were a strong source of frustration (technology was "locked down").

Examples of new understandings and theories learned: Digital citizenship, Bloom's taxonomy with technology, understanding emotional supports, SAMR Model, 2Learn resources, UDL, Differentiated instruction, SETT framework.

Changes in practice: Technology use shifted from limited technology to facilitate learning (i.e., using it mostly with students with special needs and for teacher presenting/productivity) to using multiple technologies with all students and augmenting assistive technology use with new applications (text-to-speech software). Adopted new applications: Google Classroom, video clips, images, Patlet, Educreations, Popplet Lite, Simple Minds, Show Me, Shaddow Puppet, Socrative Student, Inspirations, etc. Using writing samples to better gauge progress of students with special needs. Doing more project work. Using peer assessment and "gallery walks" to have students demonstrate their learning. Assessment practices were modified to include three or four levels of the same type of assessment being used in class according to student needs.

Technology preferences: Val uses Chromebooks and Google docs,

> I like using chrome. It's with you wherever, and that's what we tell our kids too so there's no more 'oh I forgot it at home' because you can access it anywhere. You can access it at any arena, or Tim Horton's.

Teacher example of pedagogical shift:

In Science right now I'm doing a project-based learning assignment looking at hydraulics and pneumatics. So where we would read the textbook before, write some notes, I might have some examples I put up on the Smartboard. Now *they're* engaging in it where *they're* actually going through and finding different complex systems that are using hydraulics and then linking that to our energy transfer. So they're building their knowledge and they have the hands on. They can find different systems. And the videos that they've watched. It's amazing when you can have the web in front of you, the things you can find. Learning is immediate and at the students' finger tips.

And then the collaboration. We've introduced google classroom, 'so ok you're in a group of four, share a doc with each other and then they're adding information instantaneously. They're learning as they go. So maybe Partner A will find this, Partner B is in charge of that. But when they're all working on the same document, it's instantaneous, it's just there. And it's amazing to see them collaborate.

As well, they can share the document with me. So then I can quickly comment on it and send it back using google classroom. It's just eliminated all that kind of 'I forgot it at home, I didn't get a chance to start it'. I can even see who's worked on what. In google classroom I can see who's opened it, where they're at, what they're working on. As an educator it's eliminated a lot of problems or road blocks.

Getting Researcher Feedback: Use of technology (SAMR model) "moved from yellow to green, I had improved." Student writing samples showed improvement as did "the colored charts." Val appreciated having the research results from each site visit explained, translated and shared with them personally as well as seeing the research

results from all sites (at RCOP events): “It’s probably more feedback than most of us get in our whole teaching career.”

On the role of research and models shared at RCOP: Val indicated that it was important for teachers to understand “where research has shown how education has changed and where your teaching changes and how students learn.” A model that resonated with Val was the work that the RCOP did on understanding how to differentiate instruction (DI) to better meet the individual needs of students:

> We need to make sure we’re using DI and make sure we’re using UDL (universal design for learning). It’s just nice to know what they’re actually called and how they’re actually working and how they can really affect what students learn and how students learn. So it was good to get that information and to see why we were doing it and then get the results along the way.

Perspective on accountability/reporting activities: Val had a positive perspective regarding accountability and reporting activities within the RCOP:

> It kept us in check with all these RCOPs presentations, videos and having Veronica and her crew come in. Having the onsite visits forced us to take action, we had to jump in and do this. We were held accountable too. It motivated us to push through the unknown and learn. It kinda forced yourself to grow. You know if it was ‘hey we’ll see you in two-and-a-half years guys,’ it would have been a different story. We wouldn’t have tracked our progress. We wouldn’t have seen as much progress because it would have been another thing that we had to do and right now I have to make these tests instead. You stay within your comfort zone. So this forces you out of your comfort zone and to get involved in something that may be of more use than what you thought it was going to be, and not just for your practice but for the kids’ experience too.

Outlook at the end of the project: Val would "absolutely" participate in another RCOP: "I've gained a lot of knowledge, a lot of experience, it's been awesome. I've changed and transformed my teaching."

Things that made the most difference: Val emphasized the importance of having improved access to technology, applications and dependable infrastructure. At the start of the project Val and colleagues noticed a vast difference between their school and the others regarding the level and quality of technology access. They were unable to fully participate in the project until they were able to acquire additional technology and dramatically improve their infrastructure (wifi, network). The next key point was the collaboration:

> That time at the RCOPs to just share with your subject-based colleagues. Bringing back new ideas and sharing them with the rest of the teachers. Site visits too. Sharing of best practices, collaboration within our building, district and within the realms of the COP gatherings. It was amazing to see how education was evolving.

Other things that made a difference for Val included, "learning about new things and having time to try them," the tracking and reporting activities: "seeing your progress and the progress of others in videos" and "seeing the positive impact on students, they're more accountable, more critical thinking, more excited. The students taught me so much."

One year later, things (if any) still using from the RCOP:

> I have totally moved forward with GAFE in my teaching and instruction. Utilizing Google Classroom, Drive, Gmail, etc. I became Google Certified in the New Year and plan to continue my professional development and learning. I am the Pedagogy Lead Teacher for my school now, working on pedagogical design for differentiated learning with the other teachers. We are using the technology to

share stories, experiences and resources related to designing learning environments, lessons and activities that offer flexible pathways to success.

Representative quotes (Val):

You need to give teachers time, give them the information, and then give them time to play with it. And that's what I think is most beneficial out of all those things. The information that was presented was awesome and then having that time to sit at the table with other science teachers and go through the units and talk about awesome lessons and this is what I use. That's what's really helping me through the trenches.

So giving that time for collaboration, don't just say 'here you go, here's where we're at, this is the new thing we're jumping on where we're using technology, take it and run with it.' We have to make sure we're giving teachers and educators time to learn it and be comfortable with it. Even access to our students.

I have students who are totally more knowledgeable than me in different things and I use them all the time, 'can you show me how to do this?' or 'hey can you show Joey how to put that on there?' They love that, it gives them a chance to affirm their learning when they're teaching someone else.

Giving a teacher a computer or access to something is not going to necessarily make them a better teacher. You have to change how they teach. Change how they share, present, facilitate the information with students. So that's the whole mindset too when you get into technology.

I was blown away by all the things that are out there that I haven't even heard about. So that kind of just shows too that you could think you're doing some things that are utilizing great things and then there's so many more things out there to try.

> The knowledge that we've received at the COPs, all of the cool newest and latest apps and programs and things that people we're using, we then brought that back and then trained our staff. Our motto for the story we're going to be telling is from 5 to the 5000. That spillover effect.
>
> It's important we give all students the same opportunity to show us what they know. No matter how they get to their end point - it's a journey for all.

Case 2: Hayden

Number of years teaching as of Sept 2014: 10

Grade and subjects taught: Grade 7 Math and Science. Grade 9 Science.

School context: Public school within a remote rural region. Higher number of students with coded special needs. Teaches classes of 15-20 students that include 2-4 students with special needs.

Technology: Dell Latitude 10 Tablets and charging carts. One iPad cart and a laptop cart. School supports a BYOD program. Enough technology for every student and teacher. Reliable Wi-Fi. Smartboards in the classroom. Using Microsoft Office and Google applications.

Supports: School has access to district technical support personnel that come to the school periodically and upon request. Teachers also depend on each other for onsite support. High rate of staff change-over within the project (career changes). Project lead changed as did the school administrator, which resulted in varying degrees of involvement by school and district project members.

Release time: Very limited release time due to difficulty finding substitute teacher coverage. Had release time to participate in RCOP events twice per year.

Participation: Participated in all provincial RCOP events. Was not able to join sites visits. School did not have regular local RCOP events and activities for school and district staff (beyond preparation for reports and participation in field visits by the research team).

Outlook at the beginning: Was "not sure what it was about" and "felt out of the loop" but thought "why not?" Hayden had some previous experience with a district COP and was excited about being part of a larger community ("it's about the networking"). Hayden had a strong desire to learn new ways to increase students' engagement and improve behaviour, however, they were somewhat concerned about the impact of new technology-related methods on student attainment of outcomes and on finding out whether the students are actually learning ("technology can be gimmicky, but are they learning anything?").

Challenges: At the beginning the district chose new Dell tablets. Hayden noted technical challenges with the new tablets (difficulty with network access, not as user friendly as iPads). Another challenge was that as a smaller isolated school, it was hard to find substitute teachers. In addition, the higher staff turnover (both school and district) was a limiting factor in facilitating local collaboration and involvement.

Examples of new understandings/theories: SAMR Model: How to design lessons for higher order tasks. Emerge model of the different stages of technology use. How to move more toward having students create something new (movie, digital story) within their learning –increasing creativity in small ways.

Changes in practice: Technology use increased from teacher presenting and students using productivity tools, to the use of technology to facilitate higher-order learning (i.e., creating something new to demonstrate knowledge like creating a math story book). Using multiple technologies with all students. Adopted new applications: Google Classroom/Drive, video clips, more (and new) educational games, simulations, Google forms for quick assessments to better gauge progress of students. Technology is being used in a way that modifies or allows a redefinition of the tasks (i.e., by using technology the learning objectives are extended or modified).

Technology preferences: Would not have picked tablets ("things like flash player not working or Chrome's not loaded on to it or Internet Explorer's not working properly"). Uses iPads or Laptops when tablets are problematic.

Teacher example of pedagogical shift:

> Beforehand I would just naturally go with just a paper and pencil. And maybe it's less engaging or less interactive and less digital products. Because before, you just have a computer lab with under 30 computers. So once this project got under way and we had the resources, then I was free to really use those tablets as much as I could. Instead of just engaging in a simple math lesson on probability, and keeping to that simple lesson, now it's 'how is this used in the real world?' They're building critical thinking skills and research skills. I share anecdotes, I say 'hey look that up, bring up a picture and share with me and I can put that up on the smartboard'. I really that like that kind of learning in real time and sharing media. Once we get through the foundation then we start to explore simulations. There's lots of great simulators out there and I actually prefer those to strictly games. In terms of skills, I really want to work on the higher order stuff. And I know that's just going to take time. Slowly but surely those skills are kind of popping up, and not just math skills but 21st century skills like being able to go on the internet and have critical thinking and talking about real-life connections.

Like even today we were looking up probabilities and people have a lot of fear about lighting or fear about sharks and it turns out people are more likely to get killed by cows than they are sharks. These are sorts of things I do now, linking a video, creating a project, and that sort of thing. I think it's getting better in terms of the types of things that they're capable of doing.

Getting researcher feedback:

There was a change in that using technology increased –it was done as a graphic, I remember saying, ok well, that increased. But often times when Stephanie and Veronica were here I found that it was about a process, they had a certain process for collecting data. Or the particular lesson they saw, I didn't find that exciting or I was just kind of critical of myself for not really pushing the technology as far as it could go. I get now that I had lots of learning to do and I still do. So I can't expect it to run completely auto-pilot. It's something that takes time. In terms of the research part, there was the feedback but in terms of how much I used it, I probably didn't use it as much as I should have.

On the role of research/models shared at RCOP:

I liked when we had our meetings, to me that was engaging. Mostly the SAMR model, I liked that. And the five levels of EMERGE. Those I definitely use. I try to keep that in mind. That's why I always think maybe I'm at a two and a three some days. It varies depending on the course. Other than those things I found it difficult to put the other research into practice.

Things that made the most difference: For Hayden, having access to technology/applications and dependable infrastructure in the classroom (not having to book a lab) was important, as was the experience of being part of a community that shared lots of ideas.

I've learned tons about web based tools which is really what I wanted to do. Practical applications in the classroom and just more engaging games online for the kids to use. So a lot of that I probably wouldn't have been exposed to just in our district. Having on-going PD with expectations to produce a report and presentation was also significant.

Perspective on accountability/reporting activities:

I was fine with the expectations. I feel like if I had just done PD and it was a day long PD if it was something I didn't really have an obligation or the onus wasn't on me to produce something in the end I probably would have just let it go. I definitely feel accountable being on a team and we have to present something.

Outlook at the end of the project: Hayden would "love to" participate in another RCOP and get "more involved in the research side of things." Maybe developing programming skills, "I'd be more interested in trying to implement coding or computer programming or a robotics class or a technology class into schools. So that's something I would like to get involved in. More of hands-on technology and kids building projects."

One year later, things (if any) still using from the RCOP:

I have kept many of the online math games that I used in my grade 7/9 classes in my repertoire. While these were engaging; they were mostly meant to encourage students to become fluent in a particular math skill. This past year I used regular math drills from the text as the foundation for my grade 9 math class. The digital aspect was introduced shortly after I launched the google classroom. The online practice was meant to augment classwork and reinforce concepts.

I am still connected with the other teachers and we discuss the Google platform mostly. I will be part of a group of teachers in the fall to have the opportunity to become a Google Educator.

Currently I am researching an interdisciplinary master's program at the University of Calgary with a focus on designing technology-rich collaborative learning environments and design thinking for innovation.

Representative quotes (Hayden):

Often times with PD I've taken before it's like oh wow it's great once you're in the moment, you're all pumped about it and it's exciting and cool, etc. But then when you leave it kind of peters out. At the end of the day with most PD there's no accountability. It's like will you use this? Hopefully. More often than not I find that there's no accountability typically in PD.

When you see great results then you continue with it, it kind of prolongs your excitement and the motivation to use it.

When I was down at the COP I spoke to people about Google and my experience with it. Some of the stuff that we are doing people haven't done yet. So that was a pretty good discussion on Google and I was able to share how we were using it in the classroom.

So the Google experience just gets better and better for all. I've bought into it totally whereas at the beginning of the year I wasn't sure what I could do with it. And just having those conversations with people and sharing resources. Some of the stuff there I didn't know existed.

As much as I try to follow up from the COP meetings, I've only sent a handful of emails. I didn't put much, if anything into the Wiki. I really wanted to but there's so many things that you want to do, but you just don't have time to do every single one of them.

> Trying to give kids higher order tasks is my goal and trying to get them to create things that they could share with me. I know that the kids struggle with that for sure. Maybe that's just because it's new. Creating original content with students is a challenge. Especially original content that's meaningful.

Case 3: Kelly

Number of years teaching as of Sept 2014:12

Grade and subjects taught: Grade 7 and 8 English Language Arts.

Context: Catholic school offering English and French Immersion within a rural region. School offers in-class and small-group programs for students with special needs. Teaches classes of 20 - 25 students that include one or two students with coded special needs.

Technology: The school has a wide variety of technologies to support a Universal Design for Learning (UDL) instructional focus. Students and staff use iPads and MacBook laptops. The school supports special technology-related programs like robotics, 3D printing, video production, TV production. There is enough technology for every student and teacher (9 MacBook Carts and 1:1 iPads). The network includes reliable wifi. There are Smartboards in the classrooms. Teachers are using Google applications in addition to iBooks, video creation software and many applications.

Supports: The school has an in-school mentor teacher and a district-based ICT support teacher that work together to provide regular and ongoing training and support to classroom teachers. School staff also have access to district technical support personnel that come to the school periodically and upon request to work on IT solutions. Teachers also collaborate with each other and with school administrators (Principal and Vice-

Principal) for on-site support. There is a high level of direct involvement (in-classroom and participation at all RCOP events) by school and district administration who are also project members.

Release time: Kelly had release time to participate in RCOP events twice per year as well as four days per year for planning, reporting and collaboration that were approved based on the agenda (i.e., work on SETT framework, logic model, SAMR). Teachers met every Wednesday morning before class (8:00 – 8:45 am) to collaborate. In the second year, lead teacher had additional prep time (between 5-10 hours/week) to focus on mentoring teachers in technology and new pedagogy implementation.

Participation: Participated in most provincial RCOP events (missed 2). Led a site visit and participated in sites visits. School hosted an RCOP event and had regular local RCOP events and activities for school and district staff (met in the staffroom and invited other staff to be involved). The school team (teachers, coach and administrators) delivered presentations on their progress and experiences at provincial events (beyond the project events).

Outlook at the beginning: Skeptical - didn't know enough about the Flexible Pathways RCOP or what it was all about, “I wasn’t sure if I could do this.” Felt that, “I’m already a good teacher so I don't need this." Was also concerned about student behaviour: “I run a tight ship.” However, was “always interested in learning something new.” Had no previous experience in provincial COPs.

Challenges: Kelly indicated that challenges were mostly related to the technology. Some technical “glitches” with students not being able to access materials within applications. Had to troubleshoot and find “work-arounds.” In the beginning there

was a concern noted regarding students with challenging behaviours "causing trouble" in the classroom. By the end of the project these challenges were less prevalent and behaviour incidents were reported to have "significantly improved."

Examples of new understandings/theories: Kelly provided examples of new understandings including: assessing student progress using writing assessments (guided by the research team), understanding new teaching practices by observing the other school's videos, using Logic Models to create and track goals. Found SAMR to be a "really helpful model" for learning the levels of technology use as well as UDL and SETT were also "helpful" in designing inclusive lessons and in better understanding student needs ("I really got the know my kids as learners in the process").

Changes in practice: Practice changed "from the teacher presenting information to having students using multi-media technology to understand aspects of literature in multiple ways, for example, listening to stories and creating a story book." Using multiple technologies with all students. Technology is being used in a way that modifies or allows a redefinition of the tasks (i.e., by using technology the learning objectives are extended or modified): "I've really moved past the straight substitution into modification and redefinition." There was a shift in assessment practices from summative classroom quizzes to using Google docs to provide formative assessment, "giving them instant feedback using the comment tools in Google docs. Instantly, like right then and there."

Technology preferences: Kelly appreciates having both iPads and MacBooks to choose from according to the learning task. Prefers to use Google docs to collaborate with colleagues.

Teacher example of pedagogical shift:

> The hockey sweater lesson is a prime example of how my teaching changed. I've taught 7/8 LA for 10 years and the hockey sweater is a story that I've presented to my kids every year for the last 10 years. And until I joined the flexible pathways, they would have their books, I would read it out loud to them, I would usually give them some comprehension questions, I would write some things down, I would give them a quiz on what they read about and we'd move on. And it wasn't until learning this whole idea of UDL and multiple means of expressing learning that things changed for me. We have our objectives, Alberta Learning gives those to us, but at no point does it say that they have to write a quiz about it. And so when I had the kids start to remake the story themselves instead I was like, wow they actually get it. Up until that point I'm not sure if the last eight years prior to that, they actually got it. Because they did a quiz and then it was gone. If you talked to my kids now who had to remake their own hockey sweater using the theme and using the plot, they can still talk about it because it was theirs. They did it themselves using multimedia. Could I assess the ideas of theme in their own videos? Absolutely I could. Could I assess the idea of plot? Absolutely I could. Did it have a beginning a middle and end, did it have a climax? Yes. And so the idea of how I was assessing the student work using the principles of UDL completely changed how I did things. And you know what, on average their marks were better.

Getting researcher feedback: Was able to see and understand shifts in their use of technology: "I became a much more competent user of the technology within the project, and it wasn't until I started to reflect, I was like wait a minute, I really have changed a lot." Having the researchers observing and reporting their findings back to the teachers was reported by Kelly as instrumental in changing practice:

> Everything shifted to blue or green -the highest levels. I didn't realize how powerful that part was. Getting those sheets and going through them with you and

> 60% of your kids said this. Just getting that feedback was huge. Because as teachers, you don't get very much feedback, unless it's negative from the parents. You don't get very many people that come in and say look it you're doing a really good job in all these areas. That was powerful. We don't get feedback after you've got a contract, really. Yeah, principals are in and out of our classrooms and they say good things sometimes but when they call you in it's usually bad, so to get the positive was really important. I studied it a lot and I think a lot of the feedback, because we were at the top end of the rating scale in almost all of the categories, but it was really, when she broke it down into those specifics, I wouldn't have put myself as high on the rating scales. That's what shifted my teaching, the results from Veronica, the categories -I loved how she had them broken up. Reading those descriptors, oh I could do this. Even if I was in the blue at the top of the category, there was still room for improvement in my own head. So that's where it influenced what I really did. So those are the areas that I really looked at as I tried things. With the student results too I knew that what I was doing was making a difference and I was going to continue down that road. Not that I was ever going to go back, but had the research come back more negative, I could have easily been swayed to say this doesn't work. It would have been easy to go back had that been negative.

On the role of research/models shared at RCOP: Used the SETT framework and UDL principals to design lessons for more flexibility and to get to know students better. Emphasized the use of the SAMR model to support higher-level activities and thinking:

> We used a lot of SAMR and we talked at a staff level about the SAMR model and we talked lots in our Wednesday morning meetings about SAMR levels in designing lessons. We talked about how it's ok to do substitution when you're learning something new but you don't want to be here forever or all the time. Even when I'm planning now, I'm thinking more -so I don't just want them to be able to write the answers on this document, I want them to do something new with

> it and so it's a total shift in how I really plan because I want them to be able to go beyond in their thinking and I'm designing things much differently, which is really awesome.

Things that made the most difference: Sharing good practices and having meaningful collaboration and "intentional time" that was practical (same grade level, same subject level, focused on student learning outcomes). Having specific, intentional project goals for the professional learning and tracking them regularly. "The excitement of the kids and the willingness of the kids to learn it -they were serious sponges and they went beyond where I could have ever asked or expected them to be with their learning at this point." The support from a technology coach along the way. Getting regular feedback and evidence that allows teachers to "see the results that it's working for both teachers and students." Knowing that a new practice has been tested, research-based or at least tried by other teachers before moving ahead with changes in the classroom:

> I need to know that what I'm doing has potential to be successful because the research says this, that's what I need. I'm not just going to jump in for fun. I need to know that we're doing this for a purpose and there's a reason for this to happen.

For Kelly, having access to technology/applications and dependable infrastructure was important in addition to having enough time to implement change (over two years):

> I don't think a year is enough time to change what you do for life. Because the first year you're learning and doing it and you might see the results of it, but you're not going to continue because it's easier to go back. The second year gives you that continued support that it gives you a broader knowledge; there's been more trials and errors you've learned more as a professional and now you really understand how this is going to change what you do for good.

Perspective on accountability/reporting activities: Was fine with the expectations; "at no point did I feel like the expectation was beyond what I could reach." Although somewhat nervous about doing presentations at RCOP events. In the beginning, was anxious about the video capture in the classroom but that anxiety dissipated and became quite comfortable with RCOP members being in their classroom. Felt that the accountability was important to influencing change in practice:

> The RCOP was not personal, it was research, it gave us the information and then we had to apply it back to our own practices. And I think hands-down that's the biggest piece of any professional learning that needs to happen is you learn it but you should have to apply it back to what you do. If you just learn it and never apply it, well then it was useless. This was learning and applying and sharing and because there was four RCOPs, and they continually kept coming you always knew that you were going to be sharing what you were doing; there was always something to look forward to. And it gave us the voice to share what we do really well.

Outlook at the end of the project: Feels that they "really have changed a lot" in terms of teaching practice and instructional design: "I'm designing things much differently, which is really awesome." Has been instrumental in spreading the research models from the project to others in the school: "those research pieces that we could go back to; the logic model, the SETT framework, the SAMR model, and UDL and SAMR as a school we've bought into it across the board." Would "absolutely" participate in future RCOPs with the caveat that "it has to be research based and there has to be an objective."

One year later, things (if any) still using from the project:

Kelly is still using technology as well as "the SETT framework, SAMR and UDL in a my new [leadership] position. Sharing my knowledge of the 3."

Representative quotes:

> Time is such a big piece of the implementation of the adoption of the technology and has been so huge for us. The time that it takes to implement the stuff and the time to bounce ideas off each other. And so the RCOPs beyond the days but the befores and the afters and the time with my colleagues was probably the most valuable. And then, the site visits were important like the one that we had here at our school. When we got to watch the final videos from year 1 across the project that was valuable to reassure us that we're going in the right direction. We're doing great things at our school. We're on the cutting edge of where education is going so that was really valuable.

> The EdCamp day wasn't what I was looking for. We all go into those with our own agenda and they got way off on a tangent. I'm looking for more student-specific ideas, to my own kids, my own classroom -'if this is the issue then this is what we need to look at' or 'this is the technology that I have, how can I input the executive functioning piece into it?' We're an Apple school but they got talking about apps that are in a format that we couldn't access. It was good stuff it just wasn't very applicable to my practice.

> There was a really good session where we were able to share good collaborative pieces of writing assessments and that was directly applicable to my practice. I shared with them how I assessed writing how I am able to share the kids writing documents, and I can give them instant feedback using the comment tools in Google docs.

It was something that I was dabbling in but didn't have the real skills of how to do it. But after we went to Google and we really started to play in the Google world, it's something that I couldn't function without right now.

We went school wide with the project information. I was given some release time this year to really help teachers and walk them through so nobody kind of gets left out and we've worked a lot with our new teachers. Our new Grade 6 teacher has been doing all of her stuff right in Google classroom. All of her assignments. These are straight out of university teachers. No prior experience. And they've just come on board and we're all going in the right direction now.

We probably had more participation because we hosted and we had to do all that behind the stands and organizing kind of stuff. I was very involved with the organizing and the layout. So the second day when I opened the doors of my classroom and there was 16 different teachers from the project, it was a revolving door. My students are used to that, they didn't even really flinch. And that's just the way we are here. At any given time I can have 2 or 3 different teachers from my own building in my classroom and they're like wow you're doing this and that and then next thing you know I go to their room because now that they're on board, we're all doing unique stuff, which we can all learn from each other. It was eye opening for the other teachers from their schools to come in and see what we were actually doing and how our project was working and that it truly has effected everybody.

And it truly has affected every student. It truly has blurred the lines between those kids with moderate cognitive learning disability to our kids with severe learning disability and to the high functioning kids. Everyone's on an equal playing ground now because they can take things as far as they want or they can just do what's expected. But very few kids these days, if you give them that opportunity to really succeed, will not take that as far as they can. And the stuff that our kids are producing, it's beyond the expected, it's so good.

> Talking about my participation, I think I've invested fully in the idea of the RCOP. Some of the research part of things, you know the research presentations, and those kind of things. They're knowledgeable and it was good to see baseline, because we each had feedback she'd given us personally. So then we were able to see where we fit in to the whole province project, and the progress. So that was really good for us to see. And when she was showing us the continuums, all of a sudden it's like oh ok, this is where we need to look at things and this is where the province is. It was good to see where we fit. I'm glad it didn't take up any more time than it did though because that's not who most teachers are. We're not the researchers, I'm not that into research, numbers. I like to see the trends, that's about it. I don't want to delve in deeper.

Case 4: Tracy

Number of years teaching as of Sept 2014: 18

Grade and subjects taught: Jr. High, Grade 7, Math, Science and Language Arts

School context: Small public school in a rural community. Smaller classes of 15-20 students with mixed abilities (class includes 1-3 students with special needs coding).

Technology: Using iPad carts (enough for each student and teacher) for project classrooms. Also have a shared laptop cart when needed. Each classroom has Air Server that allows students and teachers to display their work on the large screen. IPads were implemented by November of the first year. Students and teachers also using Google docs and a wide variety of applications (i.e., Socrative, Puppet Pals, Book Creator, Speech journal) in addition to productivity software (spreadsheets, word documents, presentations). Wifi and network access were described as "good."

Supports: Teachers depend on each other and have access to central office technology support as needed. At the beginning of the project the school principal participated in the RCOP, hosted meetings and PD sessions and supported the team. The Superintendent also participated in the RCOP and supported the project schools. The principal was promoted to a central office position and the new principal was not involved in the project.

Release time: Had release time to participate in RCOP events and 2 days per year to work on project planning and reporting. Collaborated with other teachers for 45 minutes once per month on early dismissal days.

Participation: Participated in almost all RCOP events. Was not able to participate in any site visits. Participated in additional Technology-PD sessions with 2Learn (PD provider).

Outlook at the beginning: Not much interest, was "chosen by Superintendent so there was more fear than genuine interest but there was no point in resisting." No previous experience in COPS. Was concerned about the impact on student behaviour and achievement: "I run a pretty tight ship so don't really want to do something that could have a negative impact."

Challenges: Had difficulty configuring the iPads in September (year 1), described as "a technology nightmare." Resolved the problem with alternate software (called Meraki) and implemented the iPads in November. Not a lot of previous training or experience with technology use for student learning. Initial apprehension related to the use of technology and the research activities were described as a challenge: "At the start trying to use technology and the fear of we're being watched, we're under this

microscope." The apprehension was eventually "eliminated" once they got to know the other RCOP members and the researchers. Change in school and project leadership left them feeling "isolated" and lacking active administrative coordination and involvement that was evident in other project schools.

On the role of research/models shared at RCOP: Examples of new understandings/theories: The SETT framework: "SETT for sure will be something that we will be using from now on and sharing with others within our school." Understanding the different ways that technology can be used for learning through the SAMR model.

Changes in practice: Differentiating instruction; moving from every student using the same format to some students using speech to text, word prediction and a variety of applications. Incorporating technology (iPads, applications and assistive technologies) within various subject areas. Moving from summative (quizzes and tests) to including formative and instant feedback while the students are working. Using more student collaboration and peer reviewing.

Technology preferences: Prefers a range of applications on either the iPad (puppet pals, haiku deck) or the laptop (iMovie). Emphasized collaboration applications and sharing (Google docs/drive).

Teacher example of pedagogical shift:

> Before if I used technology, it was to do research on the internet. And yes we still do that, but now we're creating things with it, we're using iMovie, puppet movies and creating videos, we are using haiku deck to create these beautiful poetry booklets, that before I would have just had them type in word and print off at the computer. There are many different things that they're now able to create. Google docs & drive was huge for sharing and me in there editing it with them right there and having that collaboration process with the students, that's huge. I never would

have done that, I would have marked them all, then sent them back, have them re-do it, take them in again. This is now straight feedback. I've had kids share stuff and I'm correcting capitals or whatever as they're writing and it freaks them right out. Because I'm typing and they're typing. I say everybody share your stuff with me, and then I can see what they're doing, they love that. It's a way to relate with them too and help them without always being at their desk asking 'what are you doing?' It's just different, it's a different way of doing things.

Getting researcher feedback:

The research part has been good. I love the ladies, they're fabulous people. It's been a lot, collecting all those writing samples. But I'm excited to see the information that we've been given. We did get to sit down the last time the ladies were here and go over some of the stuff.

I think that teachers are alone on our little island. And unless you're in your first few years of teaching where you're under the evaluation process, we don't have a lot of people in our classrooms watching us teach. Your administration comes in once in a while to just kind of see what you're doing but we're just not used to it. I think it is kind of an isolating job. And so we're just not used to having people in. But the first time that you guys came, it was wonderful. Like you just came in and you were just this is what we're doing and it went very well. I felt after that ok this isn't a big deal and you guys were very good at making us feel like no we're not here to judge or make comments.

Things that made the most difference: Having 2Learn (PD Provider) lead professional learning activities at RCOP events and then having them come out and work with the teachers on follow-up activities at the school district: "I think that was fabulous having 2learn come in. I took those apps back and tried them out. We had some time for them to come to our district as well. And spending that time with them going through the

specific things that are online that we can use, and discussing the apps that worked and all of those things."

Having evidence of progress:

In the end it was nice to have the opportunity to just see where you've gone and the difference, where you started out to where you are now. To see that progress. So I found it to be excellent. That little bit of apprehension was there at the beginning of the project and it's completely dissolved now. If I was to tell somebody, who was thinking about doing the research project I would say that the fear part is not something that needs to be there, whereas I had that when we first started out.

Having to present was both stressful and motivating:

It made us stress but I would just worry about it because that's what I do, but I wouldn't say take out that piece because it motivated us to try some different, cool things because we knew we were going to have to present it to other people. At the end of the day you do want to be impressive to your colleagues so I think it was an important piece. As much I would say it was my least favorite thing, I think it's an important part of the process, to be able to share your learning.

Tracking and reporting:

I think also reporting is a necessary part of it. Consider it a pain, but it's something that has to be done, if nothing else, to keep everybody on task. And for our division specifically, because we lacked a little bit of the direction, if we hadn't had that reporting process in place, I think it would have been a complete wash. Because at least at those points, we would have to be motivated to get together and come up with something. I think that is important for divisions that maybe were lacking a little bit in direction to have that reporting step. It's important to do it, to keep track, otherwise I think for our division the project would not have been half as successful.

Outlook at the end of the project:

As far as participating in the actual RCOP, I loved going to those events, I got the most useful information, like when we had 2learn come in to teach us or people discussed exactly what was working well for them within the project, and talking about specific technologies to use. I learned about SETT, I didn't even know what SETT was until the RCOP to be honest.

One year later, things (if any) still using from the project:

I use my iPads every single day. We use them to do much more than research, we make movies, presentations, share and collaborate with each other in ways that were not available without the technology. My biggest take away is that I am no longer fearful of technology. I embrace the fact that the students will always know more than I do and that's ok.

Representative quotes:

The iPad's were purchased fairly early in the fall, but then it did take a while for us to figure out the configuration process. We did start out with apple configurator and that was a nightmare and we were trying to get the apple people out so it was a few months of trying to figure that in. And it's tricky too when you start out in the fall, you know it's a busy time for everyone just getting everything organized. But then it did take a few months to get that, you had to get the iPad's, unpackage them and put them in the cases, and label the cases, and just all of that was a process, but actually getting them on the Muraki system, which in the end turned out to be a breeze. Once we figured out that out. So much different than the apple configurator and we shared that at the RCOP too and I think other people were happy to hear that too who were having the same issues. But that part has been wonderful.

It was important, spending that time with 2Learn going through the specific things that are online that we can use, and people discussing the apps that worked. And

how we separated into our areas of study and we got to share things with those same subject teachers -that was very effective. I took those apps back and tried them out. It was one of the RCOPs where we found word prediction software. So those were the kinds of things that we would talk about. Whereas I never had that until this project, having students use speech to text. That's pretty amazing now that I've got a couple of kids using that for different projects.

Usually any of the PD that I have gone to is, you've gone to a session to learn about whatever it is that you're learning about, and that's it. This was the first time that I've had to go and present things rather than sit and learn.

The thing that I did enjoy was that it was very targeted. We were all junior high teachers and there were different strands. Because you had the math people and LA teachers, but you gave us opportunities to split into those areas. It wasn't like, 'ok this one we're going to talk about math' because then I would have been like 'oh, waste of a day.' Any of the time that we were able to work together as groups of teachers, able to split up into our areas, that would better affect our practice when we returned.

Case 5: Lynn

Number of years teaching as of Sept 2014: 11.5

Grade and subjects taught: Grade 8 Health, Math, Science, Drama, and Sewing.

School Context: Larger urban public school. Teaches classes of 28-30 students including 2-3 students with coded special needs (gifted students).

Technology: For most of year 1 the technology was limited to classes using tethered laptops in the library. Students with special needs sign out a device from the support office as needed. In June of the first year, project classrooms received a cart of 5 Macbooks, and 10 iPads (5 with keyboards) shared across classes. Teachers could also

sign out Chromebooks (102) from the division office. All students and staff access a district portal and Google applications. Students with special needs have access to assistive technology applications (i.e., Board Maker, Word Q). Wifi and network connectivity was upgraded and a new server installed to increase connectivity. Toward the end of year 2, the school supported a bring-your-own-device program to increase technology access for all students.

Supports: School had additional consultants (external specialists, university experts and district consultants) providing training and professional learning services to the project teams. Central office and school administration participated in RCOP events (and hosted events) and supported project teachers. Central office technical support team provided technology supports to the school. School has a special education support person to assist classroom teachers (was also part of the RCOP).

Release time: Had release time to participate in RCOP events as well as 2 hours every 2 weeks to collaborate with other project teachers (also had scheduled shared classes to support teaching partners). In addition, release time was provided as needed to work on project reporting (1-2 half days per year).

Participation: Attended all of the RCOP events and all of the site visits. Participated in additional PD with 2Learn (PD Provider). Participated in school and district (local) RCOP activities. Hosted classroom visits for other project members.

Outlook at the beginning: Worried that the project "was just another thing." School district is frequently "implementing something new." Was already "very busy and already had a lot of theory." Was "willing to see what it was about anyway as long as it

was within reason." Hoped that the project would build on their understanding of how to create different pathways for special needs students.

Challenges: Didn't have "a clear understanding of what the project was until well into the first year" which made it "difficult to get started and know where to go with it, or what you're looking for, or where to get information." Was frustrated with spending a year on theory before getting the technology:

> Maybe as a school we could have done a lot of the theory more quickly. It was frustrating because we wanted the technology and it was all exciting. And my last year students were angry, because they didn't get it until May. They only had a month with it. But I think it had to happen I just would have liked it quicker.

Examples of new understandings/theories: Developed new understanding in "designing difficult tasks and thought provoking tasks and then saying ok what technology could be used to supplement that." Using the SETT framework for students coded as gifted. Applies the SAMR Model for designing lessons with technology in ways that support higher order thinking skills.

Changes in practice: Implemented new ways of allowing students to demonstrate outcomes in multiple ways and assessed them based on the outcomes. Moved from whole-class to more differentiated instruction:

> Typically, how I planned was to design the end product, 'so you will all make a PowerPoint based on this'. And then all the kids got there in the same way. But if we are assessing their knowledge of content, why does it matter if they make a PowerPoint, or if they make a movie, or if they write it, or do different things? And so, it really made me think about my own practice of what am I actually assessing. For example, in Health class the students investigated a drug and created a public service announcement. Some students were using iMovie, and other apps on the laptop or ipads.

Technology preferences: Laptops or iPads with a variety of applications. Uses Google applications and Google Classroom.

Teacher example of pedagogical shift:

> So rather than paper and pencil or these totally theoretical not relevant problems that we usually come up with, we did a burn problem in Math. We designed open ended math problems that have a real life application and that takes skills that they learned in Science and take skills that they learned in LA and puts them all together.
>
> I find personalized tools to help kids. I feel more comfortable in discovering applications that will help kids. So I found read & write for google, which has a dictation feature, and a text to speech feature, and it has a dictionary and a thesaurus and all these different things in one app. Have a student with Irlen syndrome, which means she can't read black on white or white on black. So I went and found an app that puts a blue screen over top of it so now she can read the computer.

Getting researcher feedback: Found the classroom observation process somewhat stressful but also useful in terms of seeing progress:

> The filming that happened in our classroom was kind of stressful. I think anytime you bring visitors into the classroom, when it's not a typical occurrence, it's a little bit artificial.
>
> The report card that we got about the percentage of time that I was using technology compared to the percentage of time that the students were using technology - that was interesting to look at. The first results were that I used it quite a bit and the kids didn't -I think they got a passive use. And then the next time, my percentage was way less and the student's use of technology was much greater.

On the role of research/models shared at RCOP: Used the SAMR model:

> I used the model of the level of technology integration. The SAMR model. I reflect on it a lot. Ok so when I'm projecting this worksheet, this is just a replacement, it's not high level. But then today when they're creating new things, ok that's definitely a higher level of use. So I'm aware of it more than I used to be.

Also used the SETT Framework:

> The SETT came out of flexible pathways and that we found really useful and we've actually shared it with our whole staff at a staff meeting and we feel that we learned a lot about our students through this process that we wouldn't have otherwise known.

Things that made the most difference: Spending the time upfront with the research and theory about "getting to know the gifted learner and understanding instructional design to better meet their needs." Collaborating with colleagues:

> The project forced us to rely on each other. Talking with colleagues made a big difference. And figuring out ok so open ended questions are more challenging just in their design so actually having time to sit with the math team to design these open ended math problems that have a real life application and that takes skills that they learned in Science and it takes skills that they learned in LA and put them all together. So we've been focusing a lot more on designing these things.

Having student and teacher access to the technology and finding applications:

> In May we got our studio carts and that's when we really started to look at assistive tech and different products and different ways of getting there and instructional design. Having the technology and being able to find personalized tools to help our kids. So for example I found read & write for google, which has a dictation feature, and a text to speech feature, and it has a dictionary and a thesaurus and all these different things in one app.

Having professional learning facilitated by 2Learn (PD provider) and through collaboration with other teachers:

> With 2Learn we found personalized tools. I feel more comfortable in discovering applications that will help kids. And by the time the second classroom visits came around I had a very clear understanding of what the purpose of the project is. So I knew what to look for in practice. I went into those teacher's classrooms with the idea of 'ok so this is how they're doing it, they're focusing on executive functioning, now how can I swing this in my class to enhance things for my gifted kids?

Having on-going professional learning:

> With the RCOP meetings it was a bit rapid fire. So they'd say ok so this is this technology and here's how you use it and so we tried to take notes so we could refer back to it. But you learn about all these things really quickly and then you have to go back and you sort of forget about them. So then we had 2Learn come and actually work with us, they were physically in the building, and we focused on just a few of the assistive technologies and we actually got to use them. That was way more useful. Because then you have time to actually explore it in your classroom.

Outlook at the end of the project: Positive, found the models (SETT and SAMR) useful:

> The SETT and levels of technology use came out of flexible pathways and that we found that really useful and we've actually shared it with our whole staff at a staff meeting and we feel that we learned a lot about our students through this process that we wouldn't have otherwise known.

One year later, things (if any) still using from the project:

> One year after the project, technology use has become commonplace in my classroom. Students are consistently using assistive technology such as voice-to-

text, Read and Write for Google and online dictionaries. Google Classroom is used to house assignments, provide links for research or games, and for students to contribute to digital conversations. This year, students used Google Classroom to help each other find resources. Students who asked for help in the comments would receive help from classmates in the form of explanations, and links to support their research. This was exciting for me to watch, because the students did it without prompting from me!

As far as technology use to create products, I am still designing the task, and aiming to plan for the highest level of achievement and then asking what technology could be used to support that. Students are using programs such as Google applications that allow them to collaborate in real time. Students are given a choice of how they are going to demonstrate their understanding of objectives. Many students choose to use technology to do that, while others choose paper and pencil methods. This year, I am teaching grade 5. As a generalist I have focused even more on making cross-curricular connections. Being able to draw from the skills the students learn in different subjects helps to make the task more authentic.

Representative quotes:

I didn't fully understand what the project was, I'm not sure that a lot of us did at that [start of the project] point.

I knew that I wanted to be able to help my students find their own voice in sharing their understanding. I have a better idea of how to design things that are going to be more challenging and intriguing for our higher end kids.
The RCOP helped me think more about what you are actually assessing. So now I'm really aware of what I need to assess. Do I need to assess their writing skills? Do I need to assess their knowledge of a particular curricular objective? So rather than focusing on what the product is, I'm focusing on the learning objectives. You're all going to make a PowerPoint on the life cycle of a plant. But if I'm

focusing on do they understand the life cycle of a plant, why couldn't they do it in a dramatic reenactment? Or why couldn't they plant a seed and then film it and explain what's happening. So focusing more on what I want them to understand rather than what the product is.

Something we worked on is backward by design where start with the end goal and figure out how you're going to get there. So rather than looking at here's all my curricular objectives, I'm going to teach all of them and then I'm going to wrap `em all up in a project at the end. Now I think about ok what would I like the project to be and what curricular objectives can I pull in from different subjects? So that's what an inquiry is and that's how you get cross curricular. And we've done that through flexible pathways, and through a lot of the initiatives just from our school. Of looking at inquiry, looking at group planning or collaborative planning and cross curricular.

Chapter 5: Teachers' Collective Experiences in the RCOP

Cross-Case Analysis using Describe, Compare and Relate

Bazeley (2009, p. 6) argues that, "too often, qualitative researchers rely on the presentation of key themes supported by quotes as the primary form of analysis and reporting of their data…with no attempt to link those themes into a more comprehensive model." The cross-case analysis utilizes the Describe-Compare-Relate method suggested by Bazeley (2009). The data were reviewed many times for patterns and themes emerging from recurring words, ideas and emphasized concepts (Bazeley, 2013; Yin, 2009). The emerging themes were described and categorized and then examined comparatively as shown in Table 3 (Bazeley 2009). The individual results of each participant were compared to gauge agreement or disagreement with the individual results of the other participants. In addition, the results were examined to see if certain themes were only present under relating conditions. For example, the teachers that are 'related' by having the same rural school context demonstrated some differences in challenges and experiences as compared to their urban colleagues. The results are described, compared and related within key themes in this Chapter (similarities) and in Chapter 6 (differences).

New skills developed and changes in practice. All five teachers demonstrated (through classroom observations, video capture, interviews and project reports) changes in their teaching practice and the ability to implement new skills learned during RCOP activities. Specific examples of changes in practice were documented within individual case studies in Chapter 4. Although the changes in practice varied, there were some commonly reported changes including:

- Increasing the use of technology to provide more flexibility in how students access and demonstrate their learning (All five teachers)
- Applying the SAMR Model: Using technology in ways that support higher-order thinking (All)
- Applying the SETT Framework to improve the classroom environment and select appropriate technologies for students with special needs (All)
- Incorporating new applications ("Apps") for general student use (All)
- Incorporating new assistive technologies for students with special needs (All)
- Differentiating instruction: moving from all students using the same format to some students using different formats and modified tasks according to their needs (All)
- Applying Universal Design for Learning (UDL) principals: using technology to provide multiple means of representation of information (Val, Hayden, Kelly)
- Using writing samples to assess progress in students with complex needs (Kelly, Val, Tracy)
- Increasing student collaboration and peer review techniques (Tracy, Kelly, Val)
- Having a deeper understanding of students with special needs (Val, Lynn)

All five teachers made gains in the application of technology to better support the unique learning needs of their students. As one might expect, the changes in practice were more profound for the three teachers with the least amount of technology-related experience and training since they had the most to learn. As one teacher stated, "technology was quite frightening for me because I was really not that involved. I mean I booked the lab on occasion and that was about the extent of what I would use." The two

teachers with greater previous technology access and experience were able to hone their skills further and focus more on learning to apply technologies to support more complex tasks. For example, a teacher with previous experience said, "I was a bit of a techie already and I was looking for more efficient ways to do things, but I don't think my practice would have changed as much without this." Although their practices changed over the two and a half years, it wasn't a simple transition. The teachers all reported varying degrees of challenges along the way.

Glitches, firewalls and nightmares: **Technology-related experiences**. Having increased access to technology for teachers and students was emphasized by the teachers as vital to their changes in practice. And yet, the number one challenge for all five of the teachers was related to the technology. Val found technology and network access to be a source of frustration ("we really need to do something with our infrastructure"); the iPods were not robust enough, wifi was weak, filtering and firewalls caused the technology to be "locked down." Fortunately, these issues were addressed by the second year. Hayden noted technical challenges with the new tablets (difficulty with network access, not as user friendly as iPads). Kelly developed work-arounds due to technical "glitches" with students not being able to access materials within applications. Tracy described the first year as "a technology nightmare" due to difficulty configuring the iPads (eventually resolved the problem with alternate software). And finally, Lynn was disappointed that the technology didn't arrive until the end of the school year.

The teachers agreed that seeing different technology deployment strategies and troubleshooting with colleagues at RCOP events was an important feature of the RCOP. They were pleased to share any solutions that they discovered with their RCOP

colleagues. For example, Tracy had a big smile as she described how she shared the software solution that "made a huge difference" with the other members of the RCOP, adding that "other people were happy to hear that too, who were having the same issues, that part has been wonderful."

Sustained shifts in practice: A year later. A year after the completion of the Flexible Pathways project, the teachers were asked to describe any changes in practice, learned within the RCOP, that they were still using. A year later the teachers were all still applying technology in their classrooms and reflecting on the levels of use of technology. Tracy said, "I use my iPads every single day. We use them to do much more than research. We make movies, presentations, share and collaborate with each other in ways that were not available without the technology." In addition to using technology with students, Val became a Google Certified Educator and developed a district website "to share stories, experiences and resources related to designing learning environments, lessons and activities that offer flexible pathways to success. Hayden was still using Google Classroom (also working toward becoming a Google Educator) as well as pursuing graduate studies with a focus on designing technology-rich collaborative learning environments and design thinking for innovation. Lynn was also using Google Classroom but emphasized assistive technologies as well: "One year after the project, technology use has become commonplace in my classroom. Students are consistently using assistive technology such as voice-to-text, Read and Write for Google and online dictionaries." And lastly, within a new leadership role, Kelly was now mentoring other teachers in the application of the SETT framework, SAMR and UDL, in addition to continuing to use technology to support student learning in the classroom.

What Matters? RCOP Elements that Influenced Changes in Teaching Practice

There were numerous elements to the RCOP (activities, events, structures, processes, etc.) that all played a role in supporting teacher change in practice. And as Kelly pointed out, "I don't know if it was any one thing or if it was the collaboration with teachers, or the willingness of the kids to try, or the support from [principal], I can't pinpoint which specific thing. I think it was the collective." There were, however, some common key elements that all five teachers agreed were central in influencing change in teacher practice.

The hook: providing evidence that the practice is worth changing. According to the participants, the first step in facilitating change in practice is getting the teachers to "buy-in." In general, the teachers were willing to learn to use technology as long as it resulted in improved learning for their students, or as Hayden stated, "technology can be gimmicky" but if it "gets students hooked and involved in learning" then it's worth using. The teachers' willingness to learn new practices was predicated on those practices having a positive impact on student learning and engagement. At the start of the initiative, all five of the teachers expressed interest in wanting some assurance that the practices they would be learning and implementing were tested or at least grounded in theory. One teacher prefaced that, "first as a district, a little more research into whether or not you even need those tools" was required because they were concerned about the potential impact on their students (student behaviours, engagement, learning, attainment of outcomes). As Kelly pointed out,

> I need to know why I'm doing this, I need to see that piece. Do I need to see the end product of the project? No, but do I need to know that what I'm doing has potential to be successful because the research says this. That's what I need. I'm

> not just going to jump in for fun. I need to know that we're doing this for a purpose and there's a reason for this to happen.

This finding suggests that there may be an important link between teacher motivation to participate in professional learning and the necessity to demonstrate that what they learn could have a positive impact on their students. Therefore, demonstrating the research-based relation between new practices and student learning may be an important first step toward implementing a professional learning program.

Shared, student-centred vision and goals. When asked about their reasons for participating in Flexible Pathways, most common responses from the teachers included comments such as, "the goals were about helping students," "this vision of using better ways to include all students in the learning is something I can buy into," "our logic model has goals that are all about the kids and how we are going to do these activities together to improve our teaching." The teachers felt that the RCOP members were successful in developing a shared commitment and goals. Three of the teachers discussed this within the context of developing their local logic models while the other two teachers shared the original RCOP goals. Regardless of which set of goals they cited, the teachers bought-in to the changes required to meet the goals because the vision and goals were compelling.

On-going professional learning. The teachers each presented examples of new practices learned through the professional development activities, facilitated by PD providers and the research team, within the RCOP. Examples included; learning to use assistive technology applications and new educational software; learning to differentiate instruction and applying universal design for learning (UDL) principals; assessment strategies; new pedagogical methods of technology implementation and the use of

technology within subject areas or cross-curricular. In sharing their examples, the teachers emphasized the importance of on-going professional development. For example, three of the teachers talked about the follow-up PD activities that occurred after the initial RCOP professional learning sessions. Tracy shared that after 2Learn (PD Provider) led professional learning activities at RCOP events, they had them come out and work with the teachers on follow-up activities at the school district: "I think that was fabulous having 2learn come in [at the RCOP]. I took those apps back and tried them out. We had some time for them to come to our district as well." Likewise, Hayden felt that ongoing learning in the RCOP was important in terms of moving the learning into practice:

> Learning is ongoing [in the RCOP]. Often times with PD I've taken before, it's kind of like 'oh wow' it's great once you're in the moment, you're all pumped about it and it's exciting and cool. But then when you leave, it kind of peters out.

Involved and supportive leadership. Leadership was a dominant topic in conversations with the teachers. The teachers highlighted the vital role of leadership, particularly at the school level (mentioned by all five) and also at the central office level (three teachers) and provincial level (two teachers). Three teachers were highly appreciative of the active involvement of their school administration in the RCOP. Their principal, and often the assistant principal as well, attended RCOP events, learned alongside the teachers, and provided follow-up supports (tech support or tech coaching, release time, meeting facilitation, additional PD). Principals also played an important instructional leadership role by frequently coming into the classroom to help, observe and provide ongoing advice and encouragement. These schools also hosted site visits for the

other schools and meetings for RCOP members. Kelly described how these administrators were seen as partners in the process by the teachers:

> He came to everything and was visible to this whole process. He could see that we wanted to go whole-school but he didn't have the time or the expertise to be able to help all the teachers. And that's where he's given me the release time to be able to go in and work with a lot of the teachers. We could just ask for a half-day and show him our agenda and he would just approve it and move on. We work together, I would create my Google presentation and I'd just hit share and he would comment 'oh you need to add this or don't forget about this.' It was that way that we could share our stuff back and forth. And he's always opened it up to everybody, 'if you want to come in here, here's what the girls are talking about the iPads and UDL, come and take a quick peek'. We held our project meetings in the staff room on purpose.

In contrast, two of the teachers did not have actively involved school leaders and felt that it would have been more helpful if their leadership participated in the RCOP to "better understand what the teachers were trying to do" and provide support accordingly. They both noticed how directly involved the other administrators were both within their schools (observed during site visits) and at the RCOP events. As one of the teachers explained,

> I would think my administration has no idea about this project at all, what we've done, nothing. So that's probably part of the problem. He never came to a single RCOP or meeting or anything and wasn't involved at all. And we would see that [involvement] from other districts every time we went. There were lots of principals there that were celebrating the work of their teachers or were the leads and were involved in that stuff. If they're involved and they know the work involved, then they're kind of providing that support and that release time whereas we didn't necessarily experience that.

The active involvement of leadership may be related to the level of school participation in the RCOP since neither of these two schools hosted site visits for the other RCOP schools. In addition, there were limited local activities at these schools and both of these teachers expressed that they would have liked to use the RCOP as an opportunity to "do more as a school."

Another role of leadership witnessed by the teachers involved supportive pressure. Three of the teachers mentioned that, in addition to Alberta Education or the University researchers, either their school-based or central-office leaders would "check-in" occasionally to track their progress. These check-ins put supportive-pressure on the teachers to ensure that they were practicing what they were learning and documenting along the way:

> We had [central office manager] and she's amazing and she's totally a report lady. She knows her stuff, she knows how to track and put things in so she checked in quite a bit. She was awesome and she's what really kept us on track and told us what we needed to do and what was going on and how they're checking in. Just had to make sure you're spending that time to get those things done and document. She's an awesome project lead that's for sure. We definitely lucked out having her.

Leaders played an important role in developing a shared vision, tracking progress and in providing expectations.

Having expectations and tracking results. There was strong agreement across the five teachers regarding the motivational and instructional importance of having expectations for changes in practice coupled with 'check-ins.' As Tracy described,

> There was definitely days that I felt like, wow it would be so much easier if I just came up with six questions for them to do. But the expectation from the

> administrators, to be better at what we do, was definitely there. The expectation that you've been given this technology you better use it, was there. At no point did I feel like the expectation was beyond what I could reach. But once you started to use it, once you see what you could do with it, there was no turning back.

The teachers implemented new practices, developed through the RCOP, and were expected to share their lessons learned at RCOP events, in reports to Alberta Education, through research activities and through classroom observations (by RCOP members from Alberta Education, University of Alberta and other school districts). This learning-doing-sharing cycle was repeated four times (spring and fall each year) and therefore the tracking and sharing of changes in practice was ongoing. All five teachers noted that the expectations, classroom visits and reporting were instrumental in motivating them to implement new practices (use technology for learning) and advance their instructional strategies (support higher-order tasks). The teachers demonstrated a positive outlook toward the expectations and tracking activities. The teachers commented that it was important to 'check-in' with each other at RCOP events where they shared new ideas and strategies as well as their progress. They also felt it was important to showcase their changes in practice (to include the meaningful use of technology) for RCOP members, for the research team (Veronica) and for their administrators. In the focus group discussion, the teachers shared some illuminating insights:

> We wouldn't have been using technology as meaningfully without tracking. We would have maybe used it differently; it would have been just another add on. It wouldn't have been part of changing our teaching. And maybe try things once or twice, but probably stayed within what we were already doing because it seemed to be working.

If you refer back to the SAMR model that we were introduced to, you know that basic substitution, I mean that's where you have to start. But without regular check-ins, we would have been quite comfortable just to stay there. Because 'look we're using the technology'.

It always helps when you know someone is coming. When you know people are coming for dinner, you're going to clean your house. It kept us in check with all these COPs and having Veronica and her crew come in. Having the onsite visits, it forced us to take action, we had to jump in and do this. To be accountable.

It kinda forced yourself to grow. It's reviews and reporting, you're held accountable. You know if it was 'hey we'll see you in two-and-a-half years guys,' it would have been a different story.

As teachers, there's so many other things coming at us that without those regular check-ins, if we would have come back today, from Sept 2014 when we started, I think our pledges would look very different. If we wouldn't have tracked our progress, we wouldn't have seen as much progress because it would have been another thing that we had to do and right now I have to make these tests instead.

You stay within your comfort zone. So this forces you out of your comfort zone and to get involved in something that may be of more use than what you thought it was going to be and not just for your practice but for the kids' experience too. The expectation of sharing was good and without meeting regularly we wouldn't have had the cool things to share with each other either.

There was a progression of steps between all of the districts of how this went. I think maybe some of those very important steps might have been missed had we not been doing this regularly and sharing. Figuring out steps, figuring out all those things I think we might have jumped some really necessary hoops if we hadn't had been keeping in check.

> It's something that has to be done, if nothing else, to keep everybody on task. And for our division specifically, because we lacked a little bit of the direction, if we hadn't had that reporting process in place, I think it would have been a complete wash.

However, one teacher had a slightly different perspective. Tracy felt that having to present at RCOP events was more of a necessary evil,

> I would say having to present things gave me angst and motivated me to try things. Definitely both. It made us stress. But I would just worry about it because that's what I do. But also, I wouldn't say take out that piece because then it motivated us to try some different, cool things because we knew we were going to have to present it to other people. At the end of the day you do want to be impressive to your colleagues so I think it was an important piece. As much I would say it was my least favorite, I think it's an important part of the process, to be able to do that.

The teachers also related the tracking activities to a means of getting feedback.

Receiving feedback and getting positive results. The RCOP was designed to provide members with feedback in various ways including peer feedback at RCOP events, receiving feedback from the researcher (Veronica and team) and informal feedback during site visits from RCOP members. In the interviews and focus group, the five teachers shared their perspectives on getting feedback, specifically from the research team. The teachers felt that it was important to see that they were getting positive results in terms of student impact and changes in teaching practice. As Hayden said, "you see great results and then you continue with it." Likewise, Lynn, Val and Tracy added,

> It was great to see that the engagement has changed in our students. They loved the addition of the technology as far as being able to use it, it has been a positive

> thing. And I do believe it had changed in the writing samples as well. On all accounts where they were concerned it was a success that way for my classroom. I think our results all went up in every category.
>
> Getting those sheets from Veronica and going through them, 'so you and 60% of your kids said this,' I didn't realize how powerful that was. I didn't really know how it was going to work with my other kids and all of a sudden it was like wow it just unfolded before my eyes so it was the research part of it.
>
> The report card that we got about the percentage of time that I was using technology compared to the percentage of time that the students were using technology. That was interesting to look at. The first viewing I used it [technology] quite a bit and the kids didn't. I think they [the students] got a passive use or something. And then the next time it was my percentage was way less and the students was much greater.

In addition, Val and Kelly expressed their thoughts on the format of the feedback. There appeared to be a greater appreciation for the graphical reports (colour-coded progress charts) rather than numerical results. The graphical charts served to translate the numerical results into an easily understood spectrum that the teachers remembered.

> What was important? I think the feedback that we got from Veronica and her research team. Some of it was hard to understand because I'm not a math person, but I think where you could see yourself on the spectrum was really helpful. So the descriptors down the side. Ok, so I can do *this* really well and I do struggle with *that*. Just that kind of reassurance. Like oh, I'll focus on *that* for the next little while. It's probably more feedback than most of us get in our whole teaching career…I mean some of it is above my head. It was interesting to kind of read through. I went to the coloured graphs and things like that. To read through it, for sure I could see where they were going and what kind of things they were saying.

For the teachers, it was reassuring to see growth (from the starting baseline to the end results), to see areas of strength and areas for improvement and to have the provincial results (combined results from all of schools in the project) so that they could relate their individual feedback (given to them by the research team) to their school and to the other participating schools. As Tracy explains,

> It was good to see baseline, because we had what she'd given us personally. So then we were able to see kind of where we fit in to the whole provincial project. So that was really good for us to see. And she was showing us the continuums, where we are. All of a sudden it's like oh ok, this is where we need to look at, this is where the province is. It was good to see kind of where we fit.

The feedback was seen as helpful rather than judgmental. The non-judgmental approach was important in alleviating the initial apprehension toward the research activities as shared by both Lynn ("the filming that happened in our classroom was kind of stressful") and Tracy,

> I felt after that, [the first classroom observation] ok this isn't a big deal and you guys were very good at making us feel like, no we're not here to judge or make comments. In the end it was nice to have the opportunity to just see where you've gone and where you started out, to where we were now. So I found it to be excellent, but that little bit of apprehension was there at the beginning of the project. And it's completely dissolved now.

Getting feedback seemed to be a unique experience for all five teachers. Val noted that, "it's probably more feedback than most of us get in our whole teaching career" which was echoed by Tracy and Kelly,

> Teachers are alone on our little island. And unless you're in your first few years of teaching, where you're under the evaluation process, we don't have a lot of

people in our classrooms watching us teach. Your administration comes in once in a while to just kind of see what you're doing but we're just not used to it. And I think it is kind of an isolating job. And so we're just not used to having people in there doing it. But the first time that you guys came, it was wonderful. Like you just came in and you were just this is what we're doing and it went very well.

As teachers, you don't get very much feedback, unless it's negative from the parents. You don't get very many people that come in and say, 'look it you're doing a really good job in all these areas.' That was powerful.

Although it caused some initial stress for two of the teachers, getting feedback was seen as a non-judgmental, important support for improving teaching practices.

Time to develop new practices. There was a high degree of variability in the way that each school provided the teachers with time to participate, collaborate and implement new practices. Each of schools had their own model of participation in the project and therefore the five teachers had different time allocations. As shown in Table 3, time to attend RCOP events was the only consistent time-provision across the schools.

Table 3: Various ways that time was provisioned for teacher participation

Time provided (over 2.5 years)	Time for RCOP Events (5-7 days)	Scheduled release time (no substitute required)	Release time for local collaboration	Other time provisions
Val	yes	50 min every other day	4 half days	1 Friday per month (local PD days)
Hayden	yes	none	none	none
Kelly	yes	1st year none 2nd year 5hrs/week	4 days	Teachers met 45 min before school each Wed
Tracy	yes	none	4 days	Teachers met for 45 min via VC on early dismissal once/month
Lynn	yes	60 min per week	4 half days	Scheduled shared classes with teacher-partner

Regardless of the model, all five teachers emphasized the importance of having time to collaborate, adopt new practices, collect evidence and prepare reports or presentations. The five teachers agreed that having time get together at the face-to-face RCOP events was an important time to collaborate:

> For us, we're not given a whole lot of time to work together as a team to do this. So for us it was a chance for our team to get together and collaborate. Whether it was during the RCOP or after that when we would go for dinner. And the drive to and from. So for us that was our time to focus on this project.

> Time has been important. I think it needs to be on the top 5. Whether it be driving to the events, the time in the car to chat with our team. The time at lunch to talk to different schools. I think even time within your own building, time that was given to you as release time, it didn't all have to be on your own time.

> In our school we often got release time, about 2 hours per about 2 weeks. [Another teacher] and I were teaching partners, we share classes. And we could talk about our students: we could talk about goals for them and do some collaborative planning on what projects are coming up that we could do in Science and LA. And then we had release time. We recently had a half day release to work on our final report. So there's been a lot of support in getting time to do things through the day. That's been helpful.

The three rural teachers noted that it was difficult to get substitute teachers and therefore they were more likely to collaborate before school or during early dismissal days. Hayden provided an example of this challenge: "I guess I could have asked for it, but it's really challenging to get coverage here because we are short on subs. At the end of the day sometimes it's just easier to go through the whole teaching day."

Likewise, due to their remote locations, the rural teachers were more likely to facilitate local collaboration using videoconferencing (VC). Regardless of how time was provisioned, the teachers used the time they had to "do collaborative planning on projects," to work on reports and presentations, and to share new ideas, solutions and instructional strategies.

Two of the teachers provided an additional perspective on time -change itself takes time. Having two years to change practice was instrumental in helping the teachers learn, implement and refine their practice. As Kelly explained,

> If we had to do this even in one year, I don't think there would be enough time. Because by the time you get your feet wet, it takes you a year to learn it and all of a sudden you're done. I don't think a year is enough time to change what you do for life. Because the first year you're doing it and you see the results of it, but you're doing it because you're in the project. All of a sudden, you like the change, you like what it's doing but there's not support so you're not going to continue because it's easier to go back. The second year gives you that continued support that it gives you a broader knowledge. There's been more trials and errors, you've learned more as a professional and now you really understand how this is going to change what you do.

Collaboration. The time spent collaborating with RCOP members and other local educators was instrumental in changing teaching practices. As Kelly indicated, "it was the very intentional time with my colleagues that really affected my teaching. The collaboration in this project transferred to how I assessed my kids." Collaboration at the RCOP appeared to facilitate an increase in local collaboration or "spillover."

> The collaboration within your building and within our COPs and within the district is important. I would collaborate with my tech person because I'm not a

techie so I'd say 'look at this cool thing that we learned, how do I do this, how do I make it work, how can we get them on this?'

Some districts didn't have the Google platform, like we didn't have that until the second year, and that was right across our division. So that was a huge boost for us to have google, so now everything at the COPs just made more sense. So it was just nice to jump right in to using google and be able to say at the COPs 'ok we'll be talking about how to use these tools now, we're going to be using them in different ways but we're going to be collaborating together'. Then you've got to have that dialogue with your tech person and work through the logistics.

That spillover effect, it was awesome. So then we would come back from our COPs and say 'look at these new things that we learned'. For example, a teacher was sharing about Patlet. And how you can use Patlet a variety of different ways. So then you can use that in any curriculum. So to bring that back and say, 'hey look, just try this'. So the knowledge that we've received at our COPs, the latest apps and programs and things that people we're using, we then brought that back and then trained our staff.

Experiencing new models of teaching and learning. The use of research-based instructional models was a bridge between theory and practice. The teachers indicated that they needed the "mental models" ("I need the explanation, why, what it is and how it's supposed to work with kids first") in order to understand the new practices and implement them. All five teachers were able to describe new research-grounded models of instruction (i.e., SAMR Model, SETT Framework, Universal Design for Learning - UDL) learned within the RCOP activities. The teachers shared examples of how those models advanced their research knowledge and were instrumental in changing classroom practice.

Having the frameworks affected a lot. We had the time to learn, sit back and look at them, talk about them, work on them and come back and share; versus someone telling you, and then you trying to describe it on your own, is two totally different things.

We intentionally worked on moving up the SAMR model, plotting where some of our assignments and some of our projects were. And we really hovered between the middle two levels. I've really moved past the straight substitution into modification and redefinition. I think when you talk to our kids, they don't have that kind of language but they understand. And those kids are going to show you that redefinition has happened, it's there.

I really think the other piece of the research that really helped, was learning the SETT. We spent half days with each of the families of the kids and the kids themselves doing the SETT framework. And all of a sudden it gave them a voice of what they're good at, where we need to work on. I took a lot of the pieces of that SETT framework and talked to my kids, talked about them as learners.

I knew what the SETT was. But I didn't really know how it was going to work with my other kids and all of a sudden it was like wow it just unfolded before my eyes so it was the research part of it.

We need to make sure we're using UDL, universal design for learning. Teachers are doing it and it's just nice to know what they're actually called and how they're actually working and how they can really affect what students learn and how students learn. So it was good to get that information from the COP.

The SAMR model, I liked that. I definitely use it; I try to keep that in mind. I always think like maybe I'm at a two and a three some days. It varies I guess depending on the course. Trying to give kids higher order tasks as I go is a goal

> and trying to get them to create things that they could share with me. Other than that model, I find it difficult to kind of put research in to practice.
>
> I started off on the lower level of the [SAMR] ladder and I'm not at the top and I hope to get to the top, closer to the top, but I think I've done a fantastic job in the last two years from where I've started. So I'm going with it and the kids are loving it and I'm excited. Next year with my new teaching position I think I'm going to be able to do a lot more things, just because of the information that I've gained. I'm pretty excited.

Three of the teachers noted that they participated in classroom/school visitations within the RCOP and found it very helpful to see the models in action. Seeing how other project teachers were implementing the models, and being able to interact with the students and teacher, was an important aspect of professional development for the teachers. For example, Kelly felt that their teachers "were very fortunate because we had time to see how teachers were actually doing these things. We actually got to go to Val's school and spend half a day with them. And then we got to go to Lynn's school and then have them come to us. That, for us, was huge."

Chapter 6: Not Everyone Agrees: Differences in RCOP Experiences

Unlike Chapter 5, where respondents were in agreement regarding key themes, this chapter explores areas of difference. The cross-case analysis using the Describe-Compare-Relate method (Bazeley, 2009), uncovered some important (and possibly surprising) variances in the teachers' experiences and perceptions relating to the RCOP.

On joining the RCOP: Willing participant to 'voluntold.' The five teachers were asked to share their reasons for becoming a member of the RCOP. Only one teacher (Val) expressed a high level of interest in the project at the onset. Val's interest was explained by her previous positive experience in a provincial community of practice and her personal interest in the RCOP topic. The other teachers were leery of the RCOP and expressed concerns about the project potentially having a negative impact on student behaviour and achievement (Hayden, Kelly, Tracy), or the feeling that they were already good teachers with enough theory under their belts (Lynn, Kelly) or that this was "just another thing" coming from above (Kelly). One of the teachers was "chosen" by their Superintendent and the other three were selected by their school administration. Despite the circumstances around how they came to be in the RCOP, all five teachers indicated that they were willing to give the RCOP a chance or in Tracy's words, "I thought if it's going to be good for the kids then you know, it's something." As a teacher in a remote area, Hayden was interested in being part of a broader community and liked the idea of being able to do some "networking." The teachers had varying degrees of interest in changing their practice in ways that included technology to better support the unique needs of students (the RCOP focus). Val, Hayden and Lynn were generally interested in learning new ways to improve outcomes for students and especially for students with

special needs (students with autism, physical and behaviour challenges and gifted students) with or without technology. While Tracy and Kelly were anxious about increasing their use of technology in their teaching due to perceived challenges with their and their students' technological abilities: "I was so not involved with the technology beforehand, I was quite afraid."

Contrasts between rural and urban experiences. A useful feature of NVivo software is the ability to compare nodes (clustered data points within each theme) by respondent or source. NVivo produced a comparison which indicated that the three rural teachers had more similar results. Likewise, the two urban teachers were also more alike in their data. The differences between the two groups were related to time, collaboration and availability of additional professional development. The urban teachers provided more data related to additional training with local PD providers, collaboration with other near-by schools and flexibility in provisioning time to work on new skills. In contrast, the rural teachers felt a degree of professional isolation, reported difficulty getting substitute teachers and instructional supports and that they were more apt to participate in on-line or VC-enabled PD activities. Despite the differences in contexts, both urban and rural teachers were able to demonstrate changes in teaching practices and both agreed on things that were important within the RCOP (Chapter 5). In future RCOP research and development efforts, it may be worthwhile exploring additional flexible ways to facilitate local PD, teacher leaders (to provide instructional support and feedback) and broader collaboration for teachers with special attention on rural settings.

What Didn't Matter: Elements of the RCOP that Contributed the Least

According to at least three of the teachers, there were a few elements of the RCOP that did not seem to matter as much (as the items in Chapter 5) in terms of facilitating changes in teaching practice.

The online portal. The Flexible Pathways project was supported by an online project portal which included a Wikispace (for sharing project documents and collaborating online) and a designated twitter feed (see Appendix 2 for example). Even though there was an expectation to contribute to the project portal (stipulated within the conditional grants to the school districts), participation in the portal was intermittent. In the beginning of the project, RCOP members utilized the portal to access project documents and information and during RCOP events some members contributed to the twitter feed. Of the five teachers, two mentioned the project portal but only to say that they didn't access it. One of the teachers expressed regret that they were not able to use it more due to time constraints. Hayden's observations may help explain the lack of teacher on-line participation:

> The best thing for me is I like networking with people, in person. Just having those conversations with people and sharing resources. I try to follow up. I've only sent a handful of emails. And I didn't put much, if anything into the Wiki. I really wanted to but there's so many things that you want to do, but you just don't have time to do every single one of them.

The EdCamp format. In the second year of the project, RCOP members decided to try the EdCamp format (more loosely structured, participant-driven PD) for an RCOP event. The format received mixed reviews and was not repeated. Only one of the five teachers found the format "good because it was topics that the teachers came up with."

Two teachers were uncertain about the format ("I guess it was ok"), and two teachers reported that did not find the EdCamp format as effective as other more structured PD activities within the RCOP. Tracy and Kelly provided the following reflections:

> I loved going to those events. I found the most useful information when we had 2learn come in, or people had to discuss exactly what was working well for them within the project. I learned about SETT; I didn't even know what SETT was until the RCOP to be honest. The half day EdCamp idea, it was valuable to hear the knowledge of other teachers but was it effective practice? or what could we take back tomorrow? I'm not sure.

> It's very different between each of the participants in the EdCamp because of the different technologies that they used. And being all at different spots really made it difficult for us to find common ground. I thought I was going in to one talk about executive functioning and all of a sudden they got way off on a tangent. It wasn't what I wanted it to be and I think as teachers we often have that problem. We all go in with our own agendas. It was not as good as the focused days.

Participant Suggestions for Improvements

The teachers were asked if they would participate in another RCOP and what, if anything, they would change. All five teachers confirmed that they would participate in another RCOP and offered some suggestions for improvements based on their individual experiences.

Planning for staff changes and having a teacher leader. The Flexible Pathways RCOP was designed to have a team from each school (including teachers, school administrators, student support personnel) participate together. Each school district identified a lead staff member. This structure was stipulated within the conditional grants to each school district. However, staff changes in some of the schools impacted the

intended team structure. Hayden explained that, “over the two years that this project was going on, there was a lot of role shifting.” This role shifting included a new principal and a teacher moving into an administrative role, leaving Hayden as “basically the only teacher on the team” for their school. Like Hayden, Tracy also experienced a change in school leadership leaving the all-teacher team without school-based leadership involvement. Both Hayden and Tracy suggested that future RCOPs could benefit from having a designated lead teacher at each school to provide instructional leadership and support as well as involved school leadership and a plan for dealing with team-member changes (e.g., processes to ensure that new teachers and principals understood their role and were actively included in the RCOP). Four of the teachers felt that it was important for central-office leadership to be involved “at some level” but not necessarily as the lead. For example, Lynn reflected on the idea of having a school-based lead staff member,

> I’m not sure that our lead had a really great understanding of what the project was. I wonder if having a teacher as the lead would have made a difference. And to have that one person in the building. Or even if it is admin or learning support, to have them checking in with teachers to see, ‘how are you doing with this? Have you tried this?’

Theory coupled with practice. One of the five teachers did not have student access to technology at the onset of the project. By design, Lynn’s school spent almost a full year on learning “the theory” (UDL, understanding students with special needs, curriculum and assessment) prior to procuring and using technology. While understanding the need for planning and theory, Lynn felt “out-of-sync” with the rest of

the RCOP members and preferred to have been equipped (have access to technology for both her and her students) with the tools sooner.

> Although the process was painful, it was necessary. And maybe as a school we could have done a lot of the theory more quickly. Ok so we need to understand who the gifted learner is. Let's make some profiles and let's figure out some different theories and now what do we do with this? I do like how our school looked at looking at the curriculum design as the main focus and we weren't learning technology for the sake of learning technology. We were designing these difficult tasks and these thought-provoking tasks and now saying ok what technology could be used to supplement that. It was frustrating because we wanted the technology and when we got it was all exciting. And my last year students were angry, because they didn't get it until May. They only had a month with it. I just would have liked it quicker.

Lynn's experience suggests that it may be beneficial to implement theory and practice (using the technology) together. In contrast, during the first year, the other teachers were learning to implement and troubleshoot new technologies as they developed their understanding of theories behind their efforts. Tracy shared this example,

> The iPad's were purchased fairly early in the fall, but then it did take a while for us to figure out the configuration process. Once we figured that out. So much different than the apple configurator and we shared that at the RCOP too and I think other people were happy to hear that too, who were having the same issues. But that part has been wonderful…I found from every RCOP meeting that I attended that I could come back to my classroom and put into practice the things that I've learned.

Chapter 7: Linking it all Together: An Emerging Theory of Change

This chapter presents an emerging theory of change (teacher change in practice) based on linking the evidentiary base (individual cases, document review, observation, field notes) and cross-case analysis within the study (Yin, 2009). A theory of change emerges from synthesizing "relationships between the case studies, findings, and previous theory or research" (Yin, 2009, p167). In addition, models describing emerging theories are useful in illustrating the theoretical conclusions arising from analysis and linking the conclusions back to the research questions (Bazeley, 2013).

First, an emerging model, to explain the development of teacher change in practice within the RCOP, is discussed. The emerging theory of change draws on teacher experience as participants within a RCOP (research question 1) to respond to the research questions exploring how and why teacher change in practice occurred and the role of the RCOP in fostering change (research questions 2 and 3). The second part of this chapter describes an emerging model of the role of research (the "R") in the RCOP as related to teacher change in practice (research question 4).

A Model of Change: Critical Elements that Support Teacher Change in Practice

All five of the teachers in the study demonstrated changes in teaching practice during their participation as members in the RCOP. The teachers demonstrated shifts in their instructional practices, and provided their explanations as to how several key factors within the RCOP contributed to the changes (as described in Chapters 3 and 4). In creating a model of change, several interrelated key factors were combined to produce six critical elements that appear to have been instrumental in supporting change in practice.

The teachers' accounts of RCOP aspects that were most important to their learning, emulates the findings of current Canadian professional learning research in that the RCOP model provided a practical application of the effective principles of professional learning: research-based; focused on student learning; collaborative; embedded in practice; evidence-based and data-driven; ongoing and sustained; individual and collective responsibility (Campbell et al., 2016).

The teachers' experiences in changing practice began with an interest in improving student learning, progressed to learning and applying new practices (with the necessary supports) and resulted in assessing and sharing results with others. This change progression is described in Figure 3 and discussed in detail below. It is important to note that although Figure 3 depicts a linear sequence (based on the project progression within the RCOP), the teachers indicated that their learning and refinement of practice continued within and beyond the project and therefore the sequence is repeated.

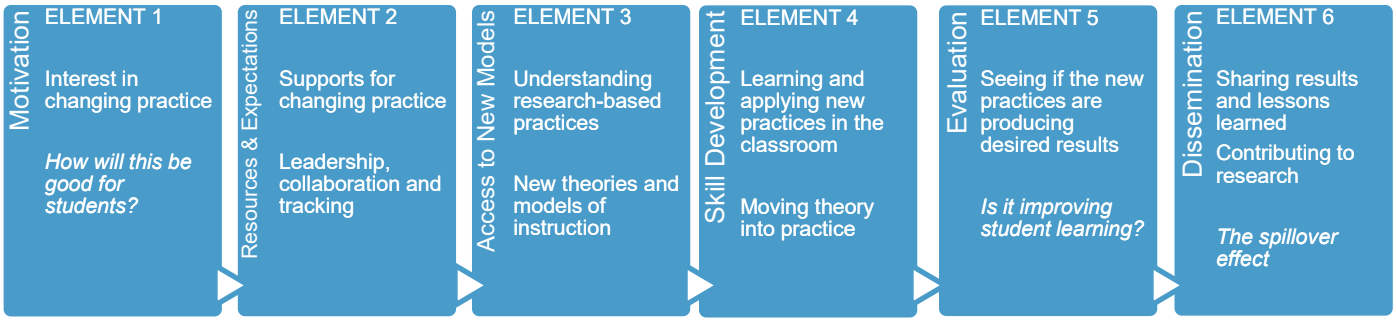

Figure 3. An Emerging Theory of Change: RCOP factors in moving from teacher interest in changing practice to changing practice and sharing lessons learned

Element 1: Interest in changing practice. Teachers elect to (or not to) participate in professional learning for various reasons. As Galbraith (2004) reminds us, adults, like most students, have varying degrees of interest and prior knowledge and

therefore may need motivation (behavior directed by an internal desire to learn) to learn new skills as a precursor to change. The RCOP used relevant learning models and collaboration to cultivate interest, develop positive attitudes, and attach value to the new content (providing the theoretical bases and research support for change), to enhance meaning (discuss models and their application), and to engender competence (collaborative instructional design, resource sharing)–these are strategies that can enhance teachers' internal desire to learn (Galbraith, 2004). Some teachers in the study volunteered to participate in the RCOP because they were motivated by a desire to improve instructional practice in ways that could improve learning for their students. Other teacher participants were reluctant to join the RCOP (even "voluntold") but willing to "give it a try" as long as the new practices they would be learning would benefit their students. Regardless of how they came to be in the RCOP, the teachers' interest and level of motivation for changing their instructional practices was based on a premise that the practices had to be good for students (the value associated with the new content). As two of the teachers indicated, they were already good teachers so why would they change? As well, there were concerns about the potential for the new practices to have a negative impact on students. For example, Tracy and Kelly were anxious about the impact of technology on student behaviour as well as their own technological abilities. The more reluctant the teachers were to participate, the more important it was to provide research-based evidence that the new practices would be worth it in terms of benefitting students. Likewise, there was a strong sentiment that for the RCOP to be taken seriously by teachers it must have a shared vision and goals, and those goals need to be connected to student learning. Participating in collaborative goal-setting activities (e.g., logic

modeling) that linked the RCOP activities to student learning outcomes demonstrated the value of changing practices and appeared to be an important precursor to change for the teachers. Logic modeling provided members with an opportunity to "agree that the staff development program was well conceived, logically planned and likely to produce the intended results" (Killion, 2008). However, goal-setting alone was not enough to motivate teachers to invest in new practices. Teachers also wanted to understand the need for change. In the RCOP, the teachers also spent time reviewing the policy, theory and literature-basis for adopting instructional practices that leverage technology to support student learning (particularly for students with unique learning needs). In addition to developing the teachers' knowledge base, exploring the theoretical evidence of researchers like Edyburn (2013), Rose and Gravel (2010), and Puentedura (2013) was important in demonstrating that the new practices were research-informed. The RCOP discussions of the research also gave members the opportunity to share any related practical experiences with each other. For example, Val, shared previous experiences (in a RCOP) implementing UDL principals, confirming the benefits of related instructional practices as observed with specific students.

Element 2: Supports for changing practice. The teachers shared an interesting mix of key change factors that included a combination of supports for change (supportive leadership, technology coach or lead teacher, resources, focused time) and "supportive pressure" to change (shared expectations, tracking). Involved and supportive leadership (including active participation in RCOP events and activities) were described as vital to addressing barriers and facilitating both classroom and school-level change. The teachers' observations that involved leadership (in professional learning) is central to

facilitating change in practice, is well supported in the literature (Andrews and Lewis, 2007; Fullan and Langworthy, 2014; Guskey, 2003; Hargreaves,1995). Louis and Marks (1998) describe the role of leadership in teacher professional development as providing a combination of supportive structural conditions (shared decision-making, time to meet) and facilitative leadership (feedback on performance, focused PD). In addition, Campbell et al. (2016, p. 13) indicate that effective leaders often co-learned with their staff, and that they "supported teachers' professional learning, took interest in what they were learning and celebrated their work." All of the teachers in the study provided examples of observed leadership behaviour (sometimes observed in another school) that demonstrated supportive involvement in the RCOP. The teachers noted that supportive leaders attended and participated in PD and RCOP events with the teachers, helped them plan and track progress, ensured that they (and their students) had access to technology and infrastructure, invited them to share their learning with other staff and parents ("cheered them on"), posted materials and results in the school (staff room, office, gym), visited their classrooms to see how things were going and arranged for additional resources when needed.

In terms of resources, the teachers found it crucial to have access to technology (teacher and student devices, applications, and a robust network) as well as on-site technical supports. There were technical challenges layered on top of the new pedagogy (learning to use technology within instruction). Working with the leadership at the school and district levels and technology coach, teacher-leader or technology support staff, the teachers were able to troubleshoot and overcome these challenges to changing classroom practices. Attending to time and resources is an important determination of successful

teacher professional development (Butler & Schnellert, 2012; Guskey, 2003; Joyce & Showers 2002). The need for supports (as well as interest) is also supported in a study (Azano et at., 2011) that investigated key influences on level of teacher fidelity of implementation of research-based interventions learned within a professional development program. The study found that, regardless of their professional expertise and comfort levels (with the content), teachers were less likely to implement research-based models of instruction for gifted learners, "if teachers are not personally committed to participating, lack the time and resources necessary to meaningfully implement an intervention with fidelity, or do not expect students to be capable of high-quality curriculum" (Azano et al., 2011, p. 714).

According to the teachers, one of the most important supports that the leadership (both school and district-based) facilitated in the RCOP was time to learn and to focus on implementing the learning within the classroom. The teachers were provided with time to participate in ongoing learning opportunities (both RCOP and local activities), time to plan and collaborate with colleagues, and time to learn and apply new practices over the 2.5 years. Each teacher/school had a different model for providing time. Regardless of how it was facilitated (release time or flexible scheduling), the teachers agreed that having time to participate in ongoing RCOP events, coupled with local time to collaborate on improving instruction, were important supports.

It was important to consider *how* the teachers used their time. For example, a quasi-experimental study of the impact of professional learning teams on student achievement across nine schools found that meeting time alone did not assure impact (even when administratively supported); however, student achievement gains were

achieved when teacher collaboration time was focused on "students' academic needs and how they might be instructionally addressed" (Saunders, Goldenberg, & Gallimore, 2009). Saunders and colleagues (2009, p. 1026) also noted that schools that depended on internal school staff alone for instructional professional development were less successful, leading them to conclude that "interventions that include external assistance typically produce better results than programs that do not." The teachers provided evidence (field notes and interviews) that in-school collaboration time was focused on implementing the instructional models learned within the RCOP and discussing the results of those implementations on student learning (often using their targeted student/s as a case study).

In addition to time and resource supports, the teachers noted the importance of having expectations and tracking results (documenting the changes in instruction and collecting student artifacts). The teachers indicated that they were keenly aware (from their leadership team and the project leads) that they were expected to try new practices (in using technology) in their classroom and report on the results so that all members contributed to evidence-based practices. Even though it was somewhat stressful, the teachers felt that it was important to track results and have regular "check-ins" to discuss progress. One of the teachers provided insight on the link between expectations to apply the learning and actual change in practice: "We wouldn't have been using technology as meaningfully without tracking…It wouldn't have been part of changing our teaching." As the teachers pointed out, an important element of the RCOP, and any professional learning program, involved setting expectations and "taking steps to ensure that the

talking, planning and training actually result in action" (DuFour, DuFour, Eaker, and Many, 2010, p. 207).

Element 3: Theory: New models of instruction. Through centuries of research we have learned, and continue to learn, a great deal about the drivers and mechanisms of learning (Bandura, 1977; Bruner, 1990; Vygotsky, 1978). Understanding how students learn should drive instructional practice (Tomlinson, 2001) and therefore we need to equip teachers with our best knowledge of what makes learning happen and how to provide learner experiences that are responsive to student variance. As part of the RCOP, the teachers spent time studying and discussing a variety of new theoretical models of instruction (Universal Design for Learning, SAMR, SETT Framework). As noted by all five teachers in the study, these models were relatively new to them; they "had heard the name but never really knew what it was before the RCOP." The teachers felt that the models facilitated change in practice by providing them with the theoretical perspective (e.g., exploring practices through the cognitive development and mind-brain-education lens) through exploring the work of Rose and Gravel (2010) and other cognitive theorists. For example, Kelly attributed changes in practice to learning new models, sharing that "it wasn't until learning this whole idea of UDL and multiple means of expressing learning that things changed for me." After a RCOP meeting, Val shared that "teachers are doing it and it's just nice to know what they're [SETT, UDL, SAMR] actually called and how they're actually working and how they can really affect what students learn and how students learn." Lynn, Kelly and Tracy pointed out that another important aspect of the models was helping RCOP members deepen their understanding of their own students. As Lynn shared, "we learned a lot about our students through this process [SETT

Framework] that we wouldn't have otherwise known." This notion is also supported by other research. In a program designed to assist teachers in differentiating their instruction to enhance learning in mixed-ability classrooms, Tomlinson (2001) indicated that learning theory helped practitioners better understand the population that they are dealing with as well as understanding the needs of individual students.

The RCOP meetings were designed to allow time for the teachers to clarify multifaceted models of instruction and relate theory to practice. RCOP members coalesced around a shared vision of how the models could be applied (situating lesson plans, instructional strategies and technological applications within the models) and situated within different contexts (students with special needs, students coded as gifted). The models themselves were accessible to the teachers; meaning that the theoretical information was translated and presented in language and formats (logical steps, graphics, videos) that were clearly understood (for example, see http://www.hippasus.com/rrpweblog/archives/2014/12/11/SAMRandTPCK_HandsOnApproachClassroomPractice.pdf.). This is important because as Kennedy (1997) explains, academic research is often complex and written in inaccessible language that makes it difficult for teachers to internalize and apply. Furthermore, Shonkoff and Bales (2011, p. 17) agree that "science doesn't speak for itself" and therefore "the translation of science into policy and practice is an important endeavor in its own right." These assertions from the literature were supported by Val's observation: "other than that model [SAMR], I find it difficult to kind of put research in to practice." The models used in the RCOP appear to have reduced the research-practice barrier through the use of visual models and ongoing meaning-building discussions focused on application.

There were a few cautions that emerged from the teachers with regard to exposing teachers to theoretical frameworks. Although the teachers agreed that the models were helpful (in giving them "mental models" for implementation), they also indicated that it was important to provide a balanced approach between theory and practice. The teachers shared that they didn't have time (or deep interest) in reviewing comprehensive, overly theoretical, research literature ("especially if it was quantitative") and they strongly favored the application of theory over a focus on the theory itself. For this reason, the teachers expressed their appreciation for the work of the research and RCOP support team in translating (summarizing and visually representing) the theoretical information and providing it to them in manageable amounts over multiple RCOP events. In addition, a lesson learned from Lynn's experience (of almost a year of theory prior to having access to technology) is that, to alleviate some frustration and to support collaboration, the teachers needed to have the resources at hand while they are learning, in order to more seamlessly move research into practice at the same time as their RCOP colleagues.

Element 4: Application: Theory into practice. Much of the theory was learned through the exploration of models (Element 3) during RCOP events. After the RCOP events, the teachers applied the theory, in collaboration with local team members, back in their classrooms. For example, Tracy shared the following anecdote, "I took those apps back and tried them out. It was one of the RCOPs where we found word prediction software… having students use speech to text. That's pretty amazing now that I've got a couple of kids using that." Grasping the learning and actually applying it in the classroom is an important step that is often missing (or unexpected) in teacher professional

development (DuFour et al., 2010; Hadar & Brody, 2010). The importance of classroom application was noted by Kelly,

> The RCOP was not personal, it was research. It gave us the information and then we had to apply it back to our own practices and I think hands down that's the biggest piece of any professional learning that needs to happen -you learn it but you should have to apply it back to what you do. If you just learn it and never apply it, well then it was useless.

The teachers' experiences with changing their teaching practices by applying new instructional models and strategies earned at RCOP events, is shared by (some) other teachers within professional learning communities. For example, in their professional learning community study of educators learning to apply higher-order thinking skills, Hadar and Brody (2010, p. 1647) reported that "teachers brought concrete documentation [videos and student artifacts] of teaching innovations based on new skill acquisition" as a result of convening several times to learn current theories, read research, explore implementation and then implement the changes within their instruction and document the results. Teachers in the Flexible Pathways RCOP came back from RCOP events armed with new ideas (curricular strategies and resources, project ideas, ways to implement new models) and solutions (document-sharing applications, technology fixes, assistive technologies). Back in their schools, the classroom application centred around creating and trying new lesson plans that reflected the instructional models (SAMR, UDL) and integrating new technology applications with all students as well as specialized applications for specific students. For example, Kelly applied the SAMR, UDL and SETT models to design inclusive lessons and to better understanding student learning needs ("I really got the know my kids as learners in the process"). For most of the

teachers (Hayden being the exception), the collaboration from the RCOP events continued within their schools, usually with other project teachers, school administration or a technology coach. This expanded collaboration was an additional source of professional learning that allowed RCOP teachers to share their learning with others as they implemented new practices.

Element 5: Getting feedback and tracking progress. In addition to collaborating around instructional design, local teams discussed their results (explored evidence and feedback from the research team) and worked on tracking and reporting activities (captured classroom video footage and student work, completed research surveys and developed their reports and presentations to share at RCOP events). The teachers' willingness to learn new practices and invest time for RCOP activities was predicated on those practices having a positive impact on student learning. Therefore, seeing if the new practices were producing desired results was important to all of the teachers and especially for the teachers that were most concerned about potential risks of negative student impact (e.g., disruptive student behaviour). Galbraith (2004) reminds us that motivating learning environments (for adults) stimulate the natural desire to achieve by addressing anxieties about learning and by encouraging accomplishments. The RCOP addressed the teacher's anxieties by facilitating teacher-sharing of successful implementation strategies (e.g., ways to engage students and monitor their work in real time) and results (reduced incidence of behavioural referrals). There were a number of strategies for tracking (and celebrating) results and providing feedback in the RCOP. The results (of implementation of technology to support inclusion) were captured and reported by the research team (classroom observation, student writing assessments,

survey instruments, field data) at RCOP events as well as through school team meetings and one-on-one feedback sessions with the teachers.

During research meetings at RCOP events, the members tracked and reflected on the impact of their efforts. Each teacher received evidence-based feedback through coloured charts that described the observations of the researchers and the perceptions of the students (see Appendix 4 for an example of the feedback charts). Research shows that providing teachers with meaningful feedback can lead to changes in practice to improve their teaching in ways that fostered improved learning experiences for students (OECDa, 2009). The teachers observed their progression (in terms of implementing technology and research-grounded practices) over time and monitored the impact on students (for more on the charts, see Smith, 2016). In the interviews, all of the teachers were able to verbalize their progress. Not only did Kelly remember the results ("everything shifted to blue or green -the highest levels") but also felt that getting feedback was a "powerful" influence in changing practice: "getting those sheets and going through them with you and 60% of your kids said *this*. Just getting that feedback was huge." Likewise, all five teachers indicated that they appreciated getting meaningful feedback on their efforts to change practice (although Tracy did find it somewhat stressful to have researchers in her classroom in the beginning). Apparently, getting feedback is a rare occurrence for the teachers as illustrated by Val's comment, "It's probably more feedback than most of us get in our whole teaching career."

Element 6: Sharing lessons learned: Joyce and Showers (2002) call for educators to function as a community of professionals who learn together, apply their learning and share the results. Sharing the results builds upon what is being learned and

supports capacity building for other educators (Guskey, 2003; Killion, 2008). The RCOP was designed to capture (through videos, images, presentations and reports) the lessons learned within each school/district/classroom as well as to capture the results within the formal research study (Smith, 2016). Those classroom-based lessons learned were shared and celebrated at RCOP events and the teachers emphasized that "seeing the practices (on video) actually happening" was "inspiring" and "motivating" (Kelly also alluded to some "peer pressure" motivating them to change practice).

Beyond the RCOP, the teachers provided examples of what they called "the spillover effect," meaning the transference of knowledge and lessons learned within the RCOP to others (outside the RCOP). By their own accord, each of the participating schools had various forms of outreach activities aimed at sharing their learning with others. Outreach came in many forms including presentations at board meetings, conferences and Alberta Education sponsored events. For example, Kelly and Tracy shared their learning through demonstrations (using the audience as their students) of technology-mediated lessons at education conferences. Three of the districts shared teacher experiences and newly acquired resources through newsletters. Locally, three of the teachers provided training to other educators. Val explained that "the knowledge that we've received at the COPs… we then brought that back and then trained our staff. Our motto for the story we're going to be telling is from five to the 5000. That spillover effect." The teachers enthusiastically reported these broader sharing activities as being professionally important. As Campbell and colleagues (2016, p. 8) found, as they are implementing new practices "it is important that teachers have opportunities to collaborate with peers and engage in teacher-led workshops and also have access to

opportunities to engage in and with external expertise and sources of professional development."

In addition to professional capacity building, the RCOP provided the teachers with opportunities to share their learning as teacher-leaders (Val, Kelly and Tracy) and helped reduce feelings of isolation especially for rural teachers (Hayden and Tracy). Addressing teacher isolation is an important step in helping teachers improve instruction (Hadar & Brody, 2010). Saunders, Goldenberg and Gallimore (2009, p. 1007) argue that "teachers left working in isolated classrooms with little opportunities for collaboration and learning are unlikely on their own to improve instruction." Furthermore, by connecting teachers across the province, the RCOP model may help alleviate concerns raised by Campbell et al. (2016) that rural teachers in Alberta have lower access (availability and supports) to the types of collaborative professional learning that meets their individual needs or allows them to share their knowledge with others.

Chapter 8: The Role of Research within the RCOP

The desire to ensure that educational practices produce positive results brings the need to incorporate research to the forefront of professional development (DuFour et al., 2010; Hargreaves, 1995). The RCOP model of professional development provided a unique opportunity to move research into practice (Element 3 and 4) and expand the knowledge base within and beyond educator communities of practice (Element 6). Research had a pervasive role in the RCOP, far beyond the general trend of collecting participant self-reported perception of professional learning activities (Vescio, Ross & Adams, 2008). In this study, teacher descriptions, examples and documents captured in cycles over the two-and-a-half years, provided a rich account of the role of research within the RCOP (research question 4). In describing their experiences in the RCOP, the teachers provided examples of how and when research was used and the impact of research-related activities on their learning and practice. The teachers also provided insight into their views and definitions of research. The teachers described research as, "learning the theory behind what we're doing" and "seeing evidence, because the research says so" as well as tracking, collecting and reporting on results. The teachers' broad definition of 'research activities' in the RCOP included the use of research (literature) to guide instructional design and planning, data collection, evidence-based feedback and knowledge dissemination. In their accounts at the beginning of the project, the teachers described how reviewing the literature (seen as a research activity) was part of planning activities, and how these activities were linked to their own student-learning goals. The teachers' descriptions of the role of research continued through implementation (using theoretical models to apply technology in the classroom) and

included their contributions to the formal research (publications). The teachers' accounts exemplified how the RCOP activities intertwined with classroom instructional practice cycles, bridging the research to practice gap. The instructional undertakings described by the teachers in this study are similar to an overview of teacher instructional cycles supported by Akdeniz (2016, p. 268),

> Teachers begin the instructional cycle by assessing individual student learning needs, interests and strengths through observation and consultation. They then determine the instructional approaches required, deliver instruction in a manner appropriate for the students and evaluate student growth and understanding. The cycle concludes with teacher self-reflection and further consultation. Effective instruction finds the best expression when educators collaborate to develop, implement and refine their professional practices.

In addition to assessing student learning needs, the teachers in this RCOP study also included research-grounded models of instruction in the determination, delivery and assessment of instructional approaches. This was the main difference between the Akdeniz (2016) model of instructional practice and the RCOP teachers' described experience.

An emerging model of the role of research (situated in classroom practice) surfaced as a result of the teachers' rich accounts coupled with additional evidence (event records, field notes, reports). As Figure 4 illustrates, a variety of research activities within the RCOP, were intermixed with teacher instructional activities within their school/classroom. The model is further explained by theme.

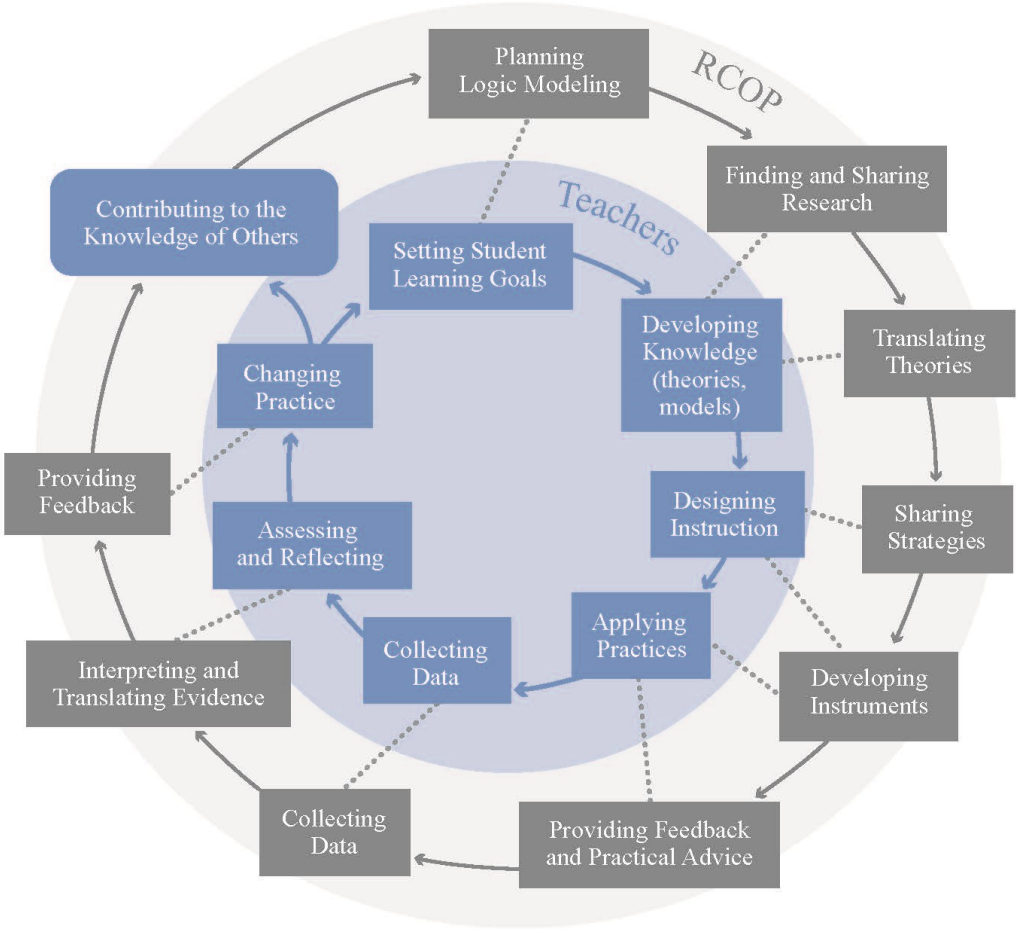

Figure 4. Teacher instructional change and research activities within the RCOP.

Evidence-informed planning. The teachers came to the Flexible Pathways project with specific student learning goals that they wanted to address. For example, Val wanted to help a student with complex needs increase their writing skills and increase their level of engagement in the class. Like Val, the other teachers had specific goals for their target students and also more general goals for all students including increasing engagement and supporting higher-order thinking skills. The planning and logic modeling activities in the RCOP provided teachers with the opportunity to develop a shared vision and goals (connected to their student learning goals), identify necessary resources and design their learning activities accordingly. This planning stage also

provided the RCOP members with an opportunity to give/receive feedback and ideas to inform plans. The RCOP support team (University research team and Alberta Education managers) used these initial plans (as well as baseline survey results) to inform the research plan and to gather research (literature, theoretical models, related studies) and resources (experts in the field, PD providers, books) to support the knowledge needs of the RCOP members.

Knowledge translation and instructional design. In the early months of the project, research-based resources were amassed and discussed in response to the goals identified in planning exercises, and to inform instructional design activities. For example, along with the resources that they found themselves, RCOP members were provided with books and articles proving theory synthesis on educational technology implementation and differentiated instruction (e.g., Chai, Koh, Tsai & Tan, 2011; Edyburn, 2013; Rose & Gravel, 2010). Members were also exposed to research-based ideas translated through presentations and videos (e.g., Kharbach, 2012; Rose, 2013, June 19) and graphical models (e.g., Zabala, 2010, October 15; Puentedura, 2013). For the collected knowledge within these resources to be useful, "it must be arranged in a coherent and systematic form that is easy to access" and "the format should be designed to best serve the audience it is aimed at" (Jessani & Bennett, 2011, p. 17). Given the teachers' appeal for practical strategies (and their time constraints), it is not surprising that theoretical models of instruction translated into clear, graphical forms were strongly preferred. Well-designed graphical "representations can enhance the interpretation of the data, provide an opportunity to understand how change has occurred, and make interpretation of the findings more accessible" in a way that is beneficial for teachers

(Francis, Jacobsen & Friesen, 2014). SETT, SAMR and UDL models were reportedly used by all five teachers to design instruction for their students. The teachers provided examples of how they shared implementation strategies with RCOP members and used the models within their practice. For example, Kelly worked with fellow teachers to apply "SAMR levels in designing lessons" and Tracy reflected on the SAMR model during instruction: "when I'm projecting this worksheet, this is just a replacement, it's not high level. But then today when they're creating new things, ok that's definitely a higher level of use." There was also a recognition that it was very unlikely that they would have found and integrated these research-based models of instruction without the research component of the RCOP. There is support in the literature of the unlikelihood that busy practicing teachers will find and integrate new research-based practices on their own (Hadar & Brody, 2010; Kennedy, 1997), indicating that this translation role of the RCOP may have been an important aspect of the application of research within teacher instructional design.

Applying practices and tracking results. Once the teachers developed an understanding of the new instructional theories, the models were used to design lessons that were implemented in the classroom. Prior to implementation, the research team worked with the RCOP members to refine data collection instruments to be responsive to their instructional change goals (i.e., capture the level of technology use as described in Chapter 2) and to capture evidence of the impact of change in practice on student learning (writing samples, classroom observations, surveys and interviews). Given the rarity of evidence connecting teacher learning efforts with student learning within communities of practice or professional learning programs (Joyce & Showers, 2002;

Killion, 2008; Louis & Marks, 1998; Saunders, Goldenberg & Gallimore, 2009; Vescio, Ross, & Adams, 2008), the scientific collection of evidence (by the research team) was a noteworthy part of the RCOP.

As teachers applied the new practices in the classroom, or with individual students, they captured data in the form of student work, video clips and student reactions to the intervention. Teachers received practical solutions (applications, strategies) and feedback as they shared their classroom-based experiences at each RCOP event. For example, assessing students' work on multiple iPads was shared by a teacher as a major source of frustration, and subsequently RCOP members provided an alternate software solution as well as related assessment strategies.

In addition to RCOP events, several teachers participated in classroom visits in other schools and other districts. This was an opportunity for RCOP members to experience implementation strategies first hand and to interview students, teachers and school administration. For example, Kelly worked with school colleagues to create a classroom visitation schedule that enabled RCOP members to visit several classrooms (in the subject areas of interest) as well as time to talk to the teachers in that school about their implementation experiences and results. After the visitations, Kelly observed that, "it was eye opening for the other teachers from their schools to come in and see what we were actually doing and how our project was working and that it truly has affected everybody [in their school]."

Reflecting and refining practice. Throughout the Flexible Pathways project, the research team collected data from multiple sources (classroom observations, principal, student and teacher questionnaires and interviews, field notes), translated the results into

graphics and then discussed the results with individual teachers. The teachers described the information they received from the researchers and the process used to review the results (often in collaboration with others) as important feedback. The teachers' description of feedback was aligned with Hattie and Timperley (2007, p. 81) in that "feedback is conceptualized as information provided by an agent" (e.g., a peer, school administrator, external consultant or expert) "regarding aspects of one's performance or undertaking" in order to improve performance. The information provided through feedback can include corrective information, alternative strategies, encouragement and clarification of ideas (Hattie & Timperley, 2007). Furthermore, when the feedback is specifically relating to instructional skills and process being learned, it has greater potential to impact changes in practice (Hattie & Timperley, 2007).

The teachers indicated that having evidence-informed feedback was a unique experience and, according to Val, a "powerful" facilitator of teacher self-reflection and change in practice. Hayden, provided an example of self-reflection after receiving feedback, "I was just kind of critical of myself for not really pushing the technology as far as it could go. I get now that I had lots of learning to do and I still do." Hayden also provided an example related to the motivational factor of getting feedback based on student results, "when you see great results then you continue with it, it kind of prolongs your excitement and the motivation to use it [technology]." Likewise, Kelly explained the impact of getting researcher feedback: "I become a much more competent user of the technology within the project, and it wasn't until I started to reflect, I was like 'wait a minute, I really have changed a lot'"

The literature surmises that meaningful feedback is important to changing practice because it can evoke further professional development and instructional refinements, while also reaffirming effective practices (Tuytens & Devos, 2017). Yet there is an absence of meaningful teacher feedback systems within the education field (Clark & Duggins, 2016; Danielson & McGreal, 2000; Tuytens & Devos, 2017). The idea that feedback is not common in the education system was echoed in this study as well. For example, in reflecting on the feedback charts (provided by the research team) and discussions in the RCOP, Val observed that "It's probably more feedback than most of us get in our whole teaching career." Meaningful teacher feedback can be instrumental in guiding good teachers to build on their strengths, supporting struggling and novice teachers to improve their practice and in building more effective (targeted to individual needs) professional learning programs (Clark & Duggins, 2016). In their reporting on the state of professional feedback and evaluation systems in education, Danielson and McGreal (2000, p. 3) found that the climate surrounding feedback can be quite negative and teacher feedback is often limited to the principal "documenting a small number of observable behaviours" so they can "check them off the list", and "though well intentioned, these systems are burdensome and not helpful to teachers who are looking to improve their practice." This was reflected in Kelly's observations:

> As teachers, you don't get very much feedback, unless it's negative from the parents. You don't get very many people that come in and say 'look it, you're doing a really good job in all these areas.' That was powerful.

> We don't get feedback after you've got a contract, really. Yeah, principals are in and out of our classrooms and they say good things sometimes but when they call you in its usually bad so to get the positive was really important.

Furthermore, even when the climate is positive toward feedback, "the teacher's role is essentially passive; thus the teachers don't *do* anything" to improve practice (Danielson and McGreal, 2000, p. 5). The feedback provided within the RCOP appeared to have played a role in facilitating change in practice as noted by Kelly:

> I studied it a lot and I think a lot of the feedback…That's what shifted my teaching, the results from Veronica -the categories- I loved how she had them broken up. Reading those descriptors, 'oh I could do this.' Even if I was in the blue at the top of the category, there was still room for improvement in my own head. So that's where it influenced what I really did. So those are the areas that I really looked at as I tried things. With the student results too, I knew that what I was doing was making a difference and I was going to continue down that road.

The teachers emphasized that they became open to refining practice based on feedback because the feedback process was seen to be collaborative, supportive ("not personal, it's research") and non-judgmental. Even a year later, the teachers reflected on their progress (referring to the feedback charts and graphics) and areas they continue to work on, which suggested that feedback may have been a factor (in addition to others) in sustaining changes in practice. Teacher professional feedback systems are not mainstream and therefore not well understood. This in an area warranting further research.

Contributing to the knowledge of others. The teachers in the RCOP contributed to the professional development of other members by sharing their expertise and lessons learned. In addition, the teachers presented their learning at conferences and events, sharing knowledge beyond the RCOP. These knowledge-sharing activities provided the

teachers with opportunities to develop as teacher-leaders (Bond, 2014). As Bond (2014) points out, teachers are powerful agents of change and their leadership can and should extend inside and outside their individual schools. The teachers in this study had a lot to share, directly through presentations and also by participating in research.

What makes the RCOP approach somewhat unique, is having a research team situated within the community capturing evidence and supporting change. The formal research activities within the RCOP provided the teachers with an opportunity to contribute to the professional knowledge base of the field. Having researchers in the community, working alongside teachers, provided important insights to both researcher and educator. As external researchers (not directly involved in group activities) investigating professional learning teams, Saunders and colleagues (2009, p. 1028) concluded that what teachers are actually "learning and doing" within professional development and "what instructional changes resulted from their collaborations, leaves another 'black box' challenge for the research community." Having members of the research community situated within the teacher professional development community (the RCOP) helped to uncover the learning, the doing and the resulting instructional changes. The results of the teacher, researcher, and other RCOP members' contributions have been shared through publications (Smith, 2013, September; Smith, 2016) and events (international and provincial conferences and meetings) to inform the work of other educators, researchers and policy makers.

Chapter 9: Conclusions and Implications

Teaching quality is a significant determinant of student achievement (Costa, Garmston & Zimmerman, 2014; Hattie, 2008; OECD, 2014) and teacher professional development can improve teaching quality in ways that improve student learning (Perry & Lewis, 2011; Sample McMeeking, Orsi & Cobb, 2012; Saunders, Goldenberg & Gallimore, 2009). Therefore,

> It is our collective responsibility to ensure that Canada's educators and students have access to, and engagement in, the highest quality learning opportunities and experiences (Campbell et al,. 2016, p. 15).

These aims compel significant investment in teacher PD (Loveless, 2014, OECD 2009b) by the funders, PD providers and by the 98% (OECD, 2014) of Alberta teachers that participate in a vast array of professional development opportunities. Yet there are gaps between supporting teacher PD and actually gauging its effectiveness (Gersten et al., 2014) or even expecting teachers to *do* anything differently in their practice as a result (DuFour et al., 2010).

Communities of Practice (Wenger, 1998) have gained popularity as a professional development strategy to improve the quality of PD and bridge the learning-doing gap (DuFour et. al, 2010; Lave, 1996). In theory, communities of practice are groups of people with a common concern or passion who are action oriented, working together to learn new and better ways to achieve goals, sharing ideas, implementing new strategies in an ongoing cycle of continuous improvement (Dufour et. al, 2010; Lave, 1996; Wenger, 1998). And there is evidence that some communities of practice are effective in working together to improve student learning (Cashman, Linehan & Rosser, 2007; Costa,

Garmston & Zimmerman, 2015; Lieberman & Miller, 2001; Waldron & McLeskey, 2010). In Alberta, COPs have been used to support a wide range of programs and practices including the implementation of technology to support student learning (Gray, Andrews & Schroeder, 2012). The literature supports that COPs can have a positive impact on teachers' ability to implement technology for student learning when the right conditions are in place, including, continuous learning, leadership support, collaboration focused on student learning goals, and feedback (Fullan & Langworthy, 2014; Slatter & France, 2008; Wubbles, 2007).

The literature also describes challenges and cautions as a result of studies involving COPs. Some concerns include; the potential to spread ineffective practices due to a lack of evidence-base (practices not based on theory) within the professional program (Waldron & McLeskey, 2010); difficulty collecting and reporting on the effectiveness of the COP in relation to student or teacher learning (Louis & Marks, 1998); a lack of knowledge base regarding how COPs work and factors that guide success conditions (Verburg & Andrissen, 2006); and that participation in the COP may not result in teachers actually changing their practice (Vescio, Ross and Adams, 2008).

Research Plays a Central Role in Meaningful Educator Professional Learning

The approach adopted in this study originated in response to critical questions regarding the effectiveness of teacher professional learning programs, including communities of practice, in impacting changes in instructional practice and student learning. Through the experience of teachers, this multiple-case study captured aspects of professional development within an RCOP that supported changes in instructional

practice. Drawing from the literature base (Chapter 1), the study was designed (Chapter 2) to capture evidence of practice change and elements that influenced changes in teacher practice, including the role of research (Chapter 4 and 5), based on teacher experience within a RCOP (Chapter 3). Building on individual and cross-cases, a describe-compare-relate (Bazeley, 2009) analytical approach surfaced divergent views that provided an opportunity to test and refine emerging themes (Chapter 5) and salient RCOP elements (Chapter 7) as well as to uncover RCOP features that participants considered problematic or less effective (Chapter 6). Synthesizing the relationships between the cases, findings and previous research (Yin, 2009) produced an emerging theory of change (Chapter 7) and a rich description of the role of research within the RCOP (Chapter 8). The findings of this study offer important insight into aspects of professional learning that are more likely to produce results, and opportunities for further development, as discussed in further detail below.

This study provides evidence, for policy-makers, post-secondary institutions, PD providers and school leaders, that certain characteristics and elements of collaborative professional learning provided teachers with the impetus, supports and skills that resulted in sustained and measurable changes in practice. More specifically, the following characteristics of the RCOP, identified by participants in this study as central to instructional change, could be used in the design of future professional learning programs:

- The hook: providing evidence that the practice is worth changing.
- Shared, student-centred vision and goals.
- On-going professional learning.

- Involved and supportive leadership.
- Having expectations and tracking results.
- Receiving feedback and getting positive results.
- Time to develop new practices.
- Collaboration.
- Experiencing new models of teaching and learning.

Applying cross-case analysis to explore these characteristics deeper (i.e., looking at 'how' and 'why' and 'when' change happened) surfaced an emerging theory of change (Figure 3) and a model that explained the role of research within the instructional change cycle (Figure 4).

The teachers in this study found the research aspect of the RCOP to be a novel experience. In general, the teachers had limited previous experiences with accessing, understanding and applying research or having the opportunity to be supported by research (evidence, feedback). The results indicate that research played an important role within a sequence of RCOP elements that facilitated teachers' changes in practice. Starting with motivational factors (Element 1), the teachers' interest in changing practice (and therefore their interest in participating in PD) was fueled by evidence that the practice was worth the effort because it had support within current research and it supported student-learning goals. This finding illuminates a need for research involvement in the onset of professional learning efforts. In addition, the use of research-grounded practices helped to address the concern that practices being spread within the professional community may not actually be effective practices (Waldron & McLeskey,

2010). Using the RCOP members' goals as a starting base, the related current literature base was explored to inform the design of learning activities within each school. This step provided teachers with research-based evidence (that it "was good for students") that helped them "buy-in" to the effort as well as giving them the opportunity to design learning activities based on student-learning goals (using logic modeling).

Teacher motivation and ability to change practice is strongly influenced by external factors such as the presence or absence of supports (Azano et al., 2011; Fullan & Langworthy, 2014). In the RCOP, supports for changing practice (Element 2) included a balance of resources and expectations. The role of "actively involved" leadership was central to facilitating successful changes in practice. The school-based and central office leaders removed barriers (e.g., infrastructure challenges), provided focus (shared goals), supports (release time, technology, PD, encouragement, sharing/collaboration opportunities, modeling), developed shared expectations including the meaningful use of resources (including collaboration time) and tracked the progress of the application of learning within practice (providing "supportive pressure" to change practice). Baseline data collected within the research activities were shared with RCOP members including leaders (principals and central office staff) in order to inform planning and provisioning and ensure that requisite supports were in place. For example, the PD needs analysis provided evidence to inform local PD activities and the technology inventory provided a current state analysis that led to infrastructure improvements. An additional role of research involved the collaborative development of ways to track progress. The research team used the members' identified goals to find and implement research-based

instruments that would assist RCOP members in tracking progress (e.g., SAMR Model, Technology Coding Rubric discussed in Chapter 2).

The findings of this study indicate that developing teacher understanding of new research-based models of instruction (Element 3) was one of the most important aspects of the RCOP that fostered changes in practice. The evidence suggests that the path from theory to practice is not direct and that teachers need clear mental models of new instructional practices that allow them to envision classroom application. For example, the SETT Framework, UDL, and SAMR are theory-based translated models of instruction that the teachers found constructive in their efforts to design instruction in ways that leverage technology to support specific needs of their students. Through synthesis, discussion and exchange of examples, the researchers and RCOP members were able to develop a fuller understanding of what these models would look like in the classroom. The teachers appreciated having access to, and deeper understanding of, these new models as a results of the research emphasis (and researchers) in the RCOP.

This study highlighted ways that RCOP activities intertwined with the instructional work that unfolded in the classroom. Applying theory into their practice (Element 4) was an expectation that was embraced by the teachers. The teachers enthusiastically provided evidence (videos, student work, descriptions) of the application of SAMR (also UDL and SETT) and shared examples of previous paper-and-pencil activities that were now modified and redefined using technology. As the teachers were applying the practices they captured their experiences (successes and challenges) and shared them, often seeking advice, within the RCOP. The RCOP model appears to have utility in moving research into practice (i.e., resulting in teachers actually changing

practice) which is a well-documented shortfall of many professional development activities (DuFour et al., 2010).

This study reiterated that although feedback is an important aspect of professional growth, teachers rarely receive feedback or have the opportunity to see evidence that what they are doing is positively impacting students (Clark & Duggins, 2016; Danielson & McGreal, 2000; Tuytens & Devos, 2017). The teachers in this study knew that they were good teachers before the RCOP, but didn't necessarily know why. Getting feedback and tracking progress (Element 5) were unique and important RCOP factors that shaped changes in practice. Twice per year, the research team collected evidence (observations, questionnaires, student work) and provided the teachers (and schools) with rubric-like charts and coloured graphics that guided reflective discussions of progress (see Appendix 4 for example). As noted in the literature, it is rare for professional learning programs to have processes that actually gauge effectiveness (Gersten et al., 2014). The evidence in this study demonstrated that the feedback provided in the RCOP was used by the teachers to refine their practice. Even a year after the end of the project, these teachers were still reflecting on their level of technology use according to the feedback provided which suggests that feedback may play a role in sustaining changes in practice. Given the teachers' positive response to feedback (and the lack of literature in this area), exploring the nature of feedback that supports professional growth and improvement is a topic worthy of further research and could be factored into future leadership development efforts.

Teachers, especially those in rural communities, expressed that prior to the RCOP they felt somewhat isolated from peers that could offer subject-specific ideas and support.

The teachers also proposed an adjustment to the RCOP model to support a teacher-leader in each school that could support instructional design in the classroom in addition to involved and supportive administrators. This study added to the understanding of professional collaboration as an important conduit for the development of expertise and instructional improvement. The RCOP provided the environment for teachers to improve their professional practice in the company of peers, leaders, learning support professionals and researchers resulting in collaboration that enhanced student and teacher learning as suggested by Brandon, Friesen, Gereluk, and Nickel (2016). The RCOP facilitated on-going professional collaboration and sharing of lessons learned (Element 6) through a variety of mechanisms including face-to-face learning events (highly regarded, well attended), classroom and school visitations (highly regarded, about half of the schools participated) and through an online portal (mentioned but not well used). This collaboration was instructive in helping teachers see multiple ways to integrate the learning in their classrooms and to gather ideas, inspiration and feedback from their colleagues. In addition, the formal research activities (data collection, reporting) provided teachers with an opportunity to share their experiences and results with the education community; they referred to this as the "spillover" effect of the RCOP. This study presents an emerging theory of change and the development of a RCOP model that explains the interconnection between research and practice; these are emerging ideas that require further research.

Opportunities for Researcher-Practitioner-Leader Collaboration

This study provides evidence that the RCOP model of professional learning helps to address the long-held concern regarding the research-to-practice gap (research not

influencing classroom practices) in education (Anwaruddin, 2015). By design, research plays a pivotal role in the RCOP, informing the professional learning activities and in the practices that become integrated in the classrooms and schools. This study demonstrates that researchers, teachers, and administrators all play an important collaborative role in supporting meaningful change and therefore their roles and responsibilities warrant careful consideration in the design of professional learning activities.

Educators have a lot to offer to the research community and the research community has a lot to offer education. Yet direct involvement with research/researchers was a new experience for many of the teachers and leaders in this RCOP. As reflected in the literature, there is a compelling opportunity for universities/researchers to play a key role in fostering meaningful, continued teacher growth that can significantly improve practice (Anwaruddin, 2015; Clarke & Clarke, 2009; Darling-Hammond & Baratz-Snowden, 2005). This study presents an opportunity to strengthen collaboration between researchers, practitioners (teachers, learning support personnel, etc.) and administrators (school, central office, government) by providing a community-learning model (the RCOP) in which educators and researchers contribute to each other's understandings and improvement of practice. The findings indicate that research-grounded ideas were successfully infused within teaching practice through a learning community model that provided members with opportunities to interact with relevant, accessible research that was responsive to their needs and goals. Researchers within the RCOP provided a research-to-practice bridge (i.e., addressing research-to-practice barriers suggested by Kennedy, 1997) by providing access to compelling research/evidence, collecting and translating data (into accessible formats), demonstrating relevance (utility) and providing

stimulus to change practice (feedback, evidence). The findings of this study provide important evidence to leaders of professional learning communities in that professional learning-community models may be strengthened through a RCOP approach that includes researchers (and/or educators with a strong research background) working in collaborative partnership with practitioners and leaders to address research-practice barriers and to foster continuous improvement. Building on this study, further research is needed to explore the structures and impetus for collaborative relationships between universities and school authorities for the purpose of advancing professional learning and applied research. Furthermore, special attention could be given to research focused on developing teacher-leadership capacity and reducing professional isolation through an RCOP model for rural educators.

Education systems depend on the quality of their teachers to support successful learning for their students (Hattie, 2008; OECD, 2009a). It is broadly accepted that professional learning is a key driver of teacher change in practice resulting in improved quality of teaching. As part of a dynamic and responsive system, teachers are willing and able to adopt new approaches to meeting the needs of all students. Yet current models of professional learning may not produce the desired results or meet the needs of the teachers they were designed to serve. It is the challenge for system leaders to support meaningful professional learning opportunities that enable teachers to make changes in practice that positively impact their students' learning. As professional communities continue to evolve there is a growing impetus for universities, school authorities (superintendents, principals and teachers) and policy makers to work together in

designing programs that bridge the research-practice gap and demonstrate effectiveness in fostering sustainable improvements in practice.

As a study based on the experiences of teachers, it is fitting to conclude with their own words:

> Giving a teacher a computer or access to something is not going to necessarily make them a better teacher. You have to change how they teach (Val).

> When you see great results then you continue with it, it kind of prolongs your excitement and the motivation…I've bought into it totally whereas at the beginning of the year I wasn't sure what I could do with it. And just having those conversations with people and sharing resources. Some of the stuff there I didn't know existed (Hayden).

> Just getting that feedback was huge. Because as teachers, you don't get very much feedback, unless it's negative from the parents. You don't get very many people that come in and say, 'look it you're doing a really good job in all these areas.' That was powerful…I studied it a lot and I think a lot of the feedback…That's what shifted my teaching, the results…Even if I was in the blue at the top of the category, there was still room for improvement in my own head. So that's where it influenced what I really did. So those are the areas that I really looked at as I tried things. With the student results too I knew that what I was doing was making a difference and I was going to continue down that road (Kelly).

> As far as participating in the actual RCOP, I loved going to those events. I got the most useful information, like when we had 2learn come in to teach us or people discussed exactly what was working well for them within the project, and talking about specific technologies to use. I learned about SETT, I didn't even know what SETT was until the RCOP to be honest…My biggest take away is that I am no longer fearful of technology. I embrace the fact that the students will always know more than I do and that's ok (Tracy).

I used the model of the level of technology integration. The SAMR model. I reflect on it a lot. Ok so when I'm projecting this worksheet, this is just a replacement, it's not high level. But then today when they're creating new things, ok that's definitely a higher level of use. So I'm aware of it more than I used to be. The SETT came out of flexible pathways and that we found really useful and we've actually shared it with our whole staff at a staff meeting and we feel that we learned a lot about our students through this process that we wouldn't have otherwise known (Lynn).

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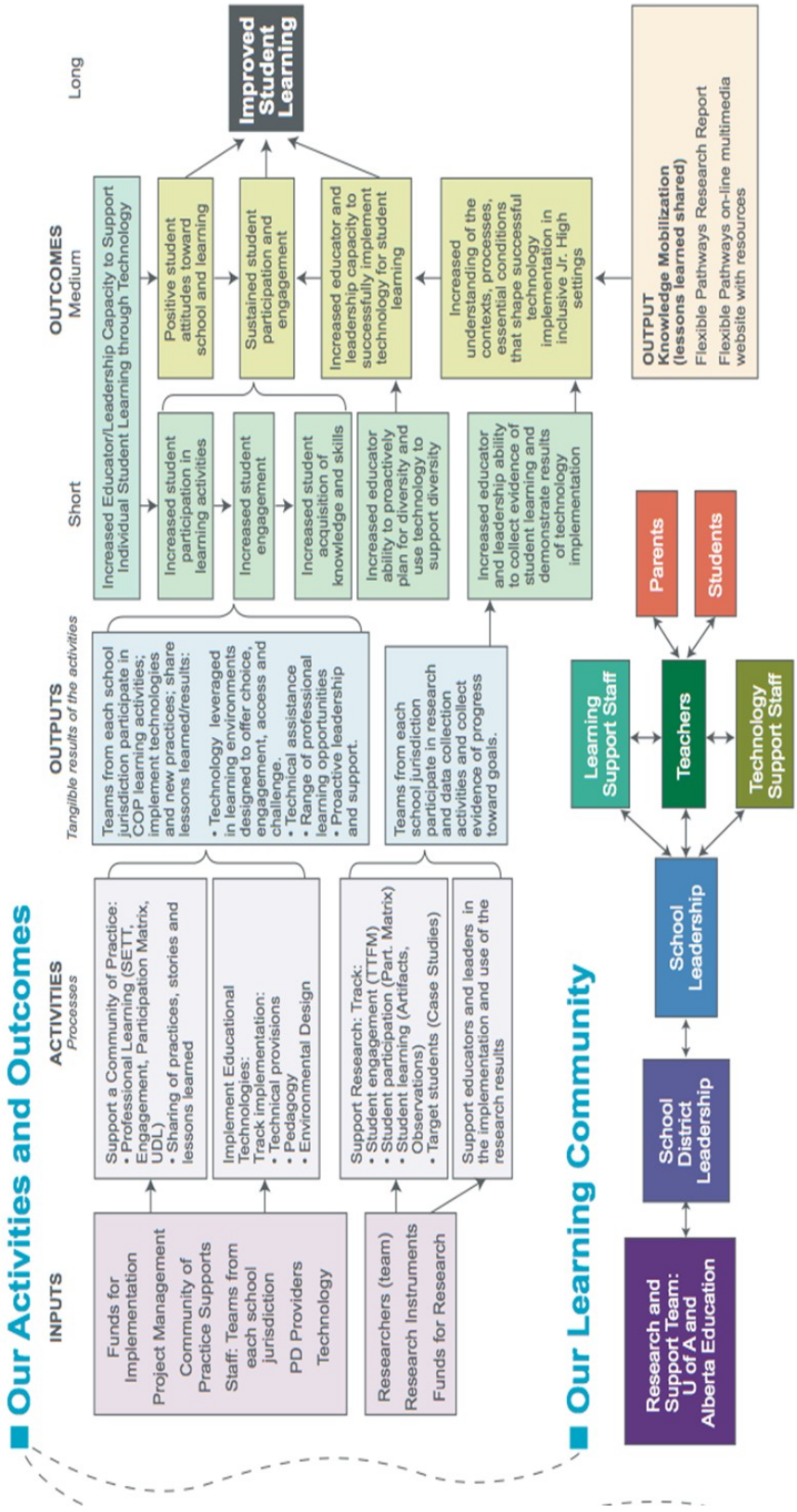
Appendix 1: Flexible Pathways Project Logic Model



Appendix 2: Image of the Flexible Pathways Project Portal (Wikispace)

Appendix 3: NVivo Node List: Frequency of sources and references by theme

- 6 Possible Teacher Sources: 5 Teachers plus Focus Group Interview
- Interview References: Number of Teacher responses on topic
- Corroborating Data Sources: (1) feedback charts, (2) project reports, (3) observations and field notes, (4) RCOP event documents.

Name	Teacher Sources	Interview References	Corroborating Data Sources
Attitude toward RCOP	6	32	2, 3, 4
Attitude toward research	6	21	2, 3, 4
Attitude toward technology	5	11	1, 2, 3, 4
Challenges with technology, project	4	16	1, 2, 3, 4
Challenges with PD	6	64	2, 3
Technical changes made, devices, infrastructure	4	8	2, 3
Collaboration	6	43	2, 4
Difference between PD and RCOP	5	13	4
Differences, unique, dissimilar responses	5	16	2, 3
Examples of things learned from RCOP	6	23	1, 2, 3, 4
Feedback, evaluation, accountability and reporting	6	23	1, 2, 3, 4
Interest in changing practice	5	18	3
Involvement with research activities	5	7	2, 3, 4
Leadership support	6	9	3, 4
Length of time in RCOP and ongoing PD	2	2	2
Level of participation	5	14	2, 3, 4
Local RCOP activities	5	15	2, 3, 4
RCOP activities, provincial	6	27	2, 4
References to theories (research) learned and used	5	12	3, 4
Release time	6	14	2
Spillover effect	3	8	2, 3
Student results and classroom activities	6	28	1, 2, 3, 4
Project results, summarizing Quotes	5	23	1, 2, 3, 4
Teacher results, impact examples	6	25	1, 2, 3, 4
Technology preferences	5	5	3
Technology-related supports (Access and help)	6	16	2, 3
Use of Research Results	6	26	1, 4

Appendix 4: Data Artifacts

This Appendix contains examples of data sources used within the study and described in Chapter 2. The artifacts have been modified for length and confidentiality. Data artifacts include examples of field notes, teacher feedback charts, RCOP participant survey results, and meeting agendas.

Example of Field Notes
Field Notes from Classroom Observations

Date: x School: x Teacher: x Class: x Observers: two: x, y

Description: Observed 2 classes of English Language Arts. Second year in the project for teacher x.

Teacher x shared lesson plan:
Lesson is focused on curriculum outcomes related to having students view and respond critically to print and other media texts. Specific objectives: that students write and represent narratives from other points of view; that students view and discuss more than one interpretation; students make connections between own interpretation and others.

Teacher x indicates the desk of "target" student (moderate learning needs).
Students arrive and take their seats.

Students have been reading a novel. The purpose of the lesson is to begin to review the novel both individually and in groups in order to meet the curricular outcomes. Each student will take on a role within the group (e.g., reviewer, interpreter) and respond to prompts that teacher x provided in the group assignment. Used Google Classroom to create lesson, stored the lesson in the class portal and loaded it into a group collaboration App. Will have students work on assignment via an App (already loaded before class). "No paper used."

Environment: Full class of 24 students, students in groups of 4 (desks grouped, facing each other in a square) no empty seats. Teacher desk has computer which is connected to a smartboard at the front of room. Room has student work (hand-written and printed) on side walls, students have annotated items on the wall with multi-shaped/coloured post-it notes (e.g., in marker: "I like this because it helps me"). Back of room has technology cart with iPads and laptops (charging station).

Class begins. Teacher x introduces the lesson (first 10 min), "we have been reading the novel and now it's time to review and interpret and talk about the different perspectives that we have…" Shows examples on the smartboard, projects the assignment and shows how to enter responses and see the responses from others.

Gives instructions: Students are to find their role and begin to draft the group document within the collaboration App. Students come to the back and get their iPads. Teacher x makes sure every student has a device, gets a laptop for target student.

Students discussing roles in their groups (~10 min).
Students start connecting to App. App not working (?), student, "I can't get into it" students asking each other, "are you in?" 5 students managed to get into the lesson without the App (used a web-based connection to Google Classroom). They start helping others.

Principal enters classroom (smiling, appears to be a normal occurrence), walks around, gets iPad and joins. Teacher x, "who's in the lesson? put up your hand" about half the class, and principal, put up hands. Asks student, "Ok, Jesse, can you please tell us how you got in?" Jesse tells class to stop using the App and log in via the web portal. Students log in and continue to work on their group document, each taking an independent role (adding their perspectives) while seeing what others are adding. Student reacts to something in the Google Doc, "wait, what you said is a review thing and that's what I'm doing" students discuss differences, teacher provides clarification.

Half way: Most students are in the lesson. 1 or 2 students in each group are typing into the device; the rest are watching on another student's device and some are contributing orally (and quietly).

Walk around: Talk to a few students, ask their thoughts: Student 1, "I like Inspiration better" why is that? "there's things that you can do, like add pictures and move things around" Student 2, "Google Docs doesn't work as well on the iPad." What about the iPads? Both students like the iPads (enthusiastic responses) "the teachers mark our work right away," "I like the games." Target student," "with paper you can write and that's about it, with the iPad you can do anything. It's better than a binder with sheets everywhere."

Teacher x: "a year ago I would have given up and ran to the copier. You need perseverance. You saw how they know how to do things that I don't and they help each other which is great."

Class wrap up, most groups are not quite finished. More time will be given next class. iPads are put away.

Technology observations (in Classroom)

Observer 1: 4: 5: 5
Observer 2: 3: 5: 4

Combined Observations (Observer 1 and 2)

1. Observed opportunities of technology use by students:

Mid (3, 4) Students have some opportunities to use technology. Students use iPads to enter text within an assignment created by their teacher in a Google Doc. Not all students enter information but they all have iPads and can follow along and review the information provided by others in real time. Some students (5) were able to troubleshoot and find a new way to access the assignment and help others.

2. Teacher's observed frequency of technology use:

Mid (5) Teacher uses technology to facilitate learning in one way or for a small portion of the lesson. Teacher used technology at the start of class to demonstrate the assignment (projected the Google Doc). Teacher monitored group entries/progress from an iPad while walking around the classroom.

3. Teacher's observed level of technology use:

Mid (4, 5) Technology is used as a substitution for non-digital elements or to augment non-digital elements. Teacher used technology (Google Doc) to augment collaboration. Teacher created a totally paper-less lesson, placing the students' roles and discussion prompts in a Google Doc and having students view/respond using iPads.

Technology Inventory (Teacher x)

Technologies available "as needed" in the classroom:	**Technologies available in school (shared resources):**	**Technology supports:**	**Other information provided:**
- Teacher laptop and iPad - Student Laptops - Student iPads - BYOD Option for students - SmartBoard - Document Camera	- Cameras - Video Cameras - Projector on a cart - Green Screen Room - Portable Green Screen	- Tech Support as needed inc. curricular support (booked thru central office) plus peers - Wifi is robust - BYOD – More and more students are accessing it - Digital Responsibility – the students are beginning to get it.	- Access to technology is at a 1 to 1 ratio (laptops and iPads). - BYOD policy is being continued this year, with the focus on "educational use" - A Digital Citizenship Policy is being drafted by the school. - Admin gives excellent support to all teachers. - Hands-on admin, collaborative teachers, tech support.

Example Teacher Feedback Charts provided from Research Team

Flexible Pathways:

Technology in Inclusive Classrooms from

Flexible Pathways to Success

Technology to Design for Diversity

Summary of Teacher Feedback

Prepared for: Teacher G

June 2015

Dear colleague,

The Flexible Pathways research team has collected data over the past two years from many sources. This is a summary prepared for your consideration. Our intention was to capture the story of how you are implementing technology in your classroom to support students with diverse learning needs. Please look for patterns as you review this summary; we hope that you find it valuable when reflecting on your contributions within the Flexible Pathways project.

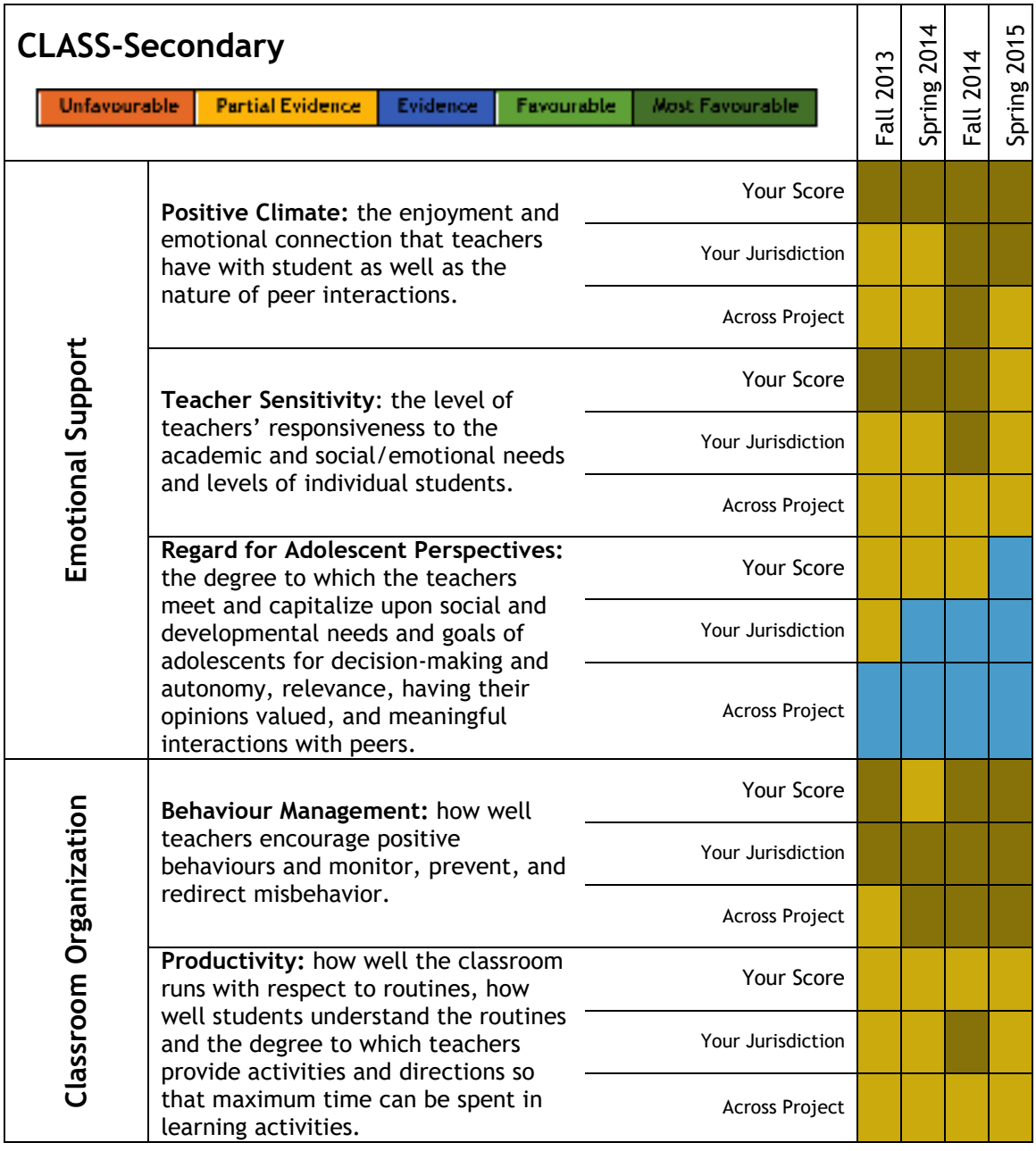
Thank you again for your participation, you have helped us better understand what it takes to implement technology in inclusive junior high classrooms. Best of luck for the future!

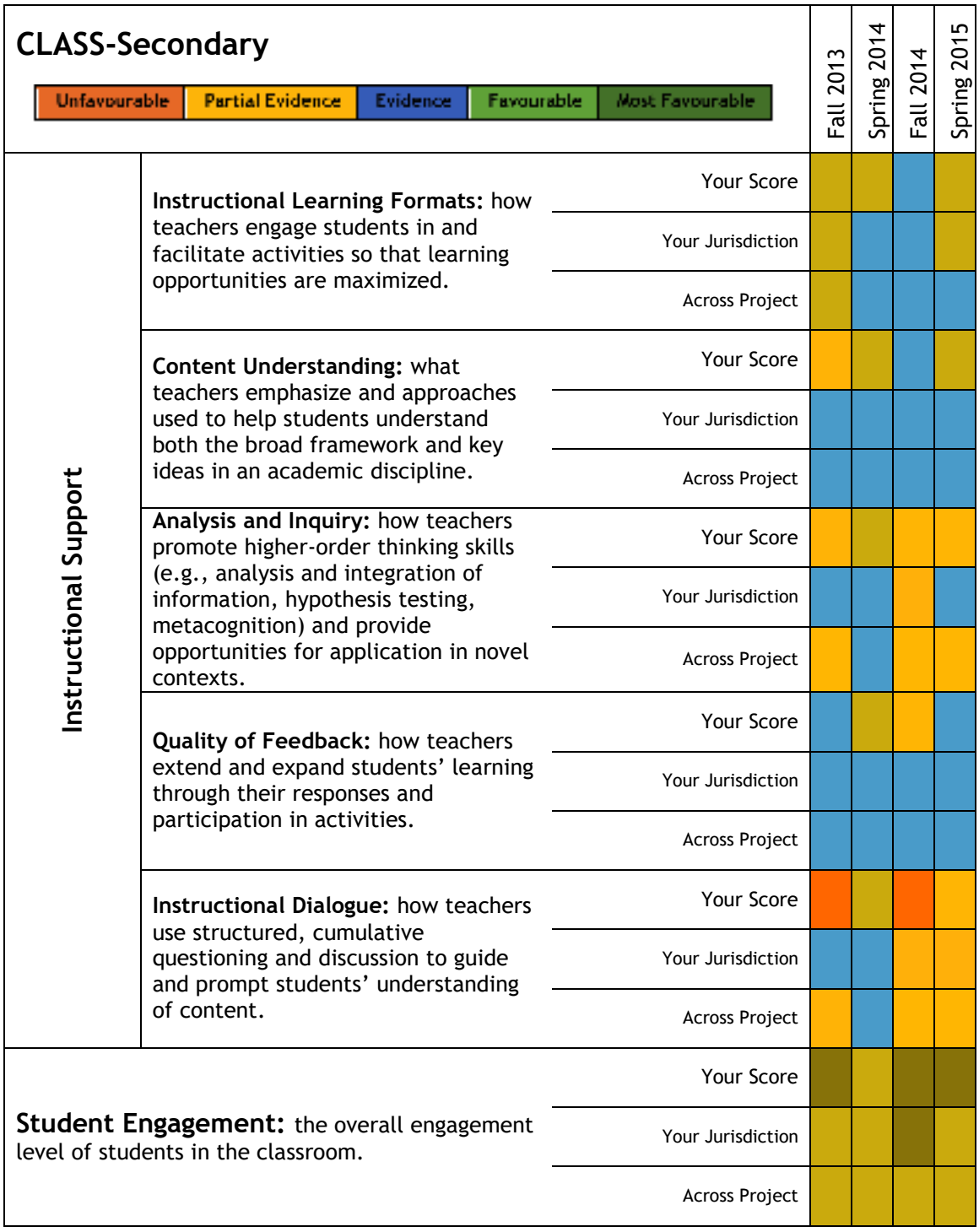
Sincerely,

Veronica and the Flexible Pathways Research Team

Evidence-Based Pedagogical Practices

We used the Classroom Assessment Scoring System (CLASS-S: Pianta, Hamre, & Mintz, 2012), to better understand the pedagogical practices in each of the participating classrooms. The CLASS dimensions are based on developmental theory and evidence that interaction between students and teachers is the primary mechanism of student development and learning.




CLASS-Secondary
Unfavourable
Partial Evidence
Evidence
Favourable
Most Favourable
Fall 2013
Spring 2014
Fall 2014
Spring 2015
Instructional Support
Instructional Learning Formats: how teachers engage students in and facilitate activities so that learning opportunities are maximized.
Content Understanding: what teachers emphasize and approaches used to help students understand both the broad framework and key ideas in an academic discipline.
Analysis and Inquiry: how teachers promote higher-order thinking skills (e.g., analysis and integration of information, hypothesis testing, metacognition) and provide opportunities for application in novel contexts.
Quality of Feedback: how teachers extend and expand students' learning through their responses and participation in activities.
Instructional Dialogue: how teachers use structured, cumulative questioning and discussion to guide and prompt students' understanding of content.
Your Score
Your Jurisdiction
Across Project
Student Engagement: the overall engagement level of students in the classroom.

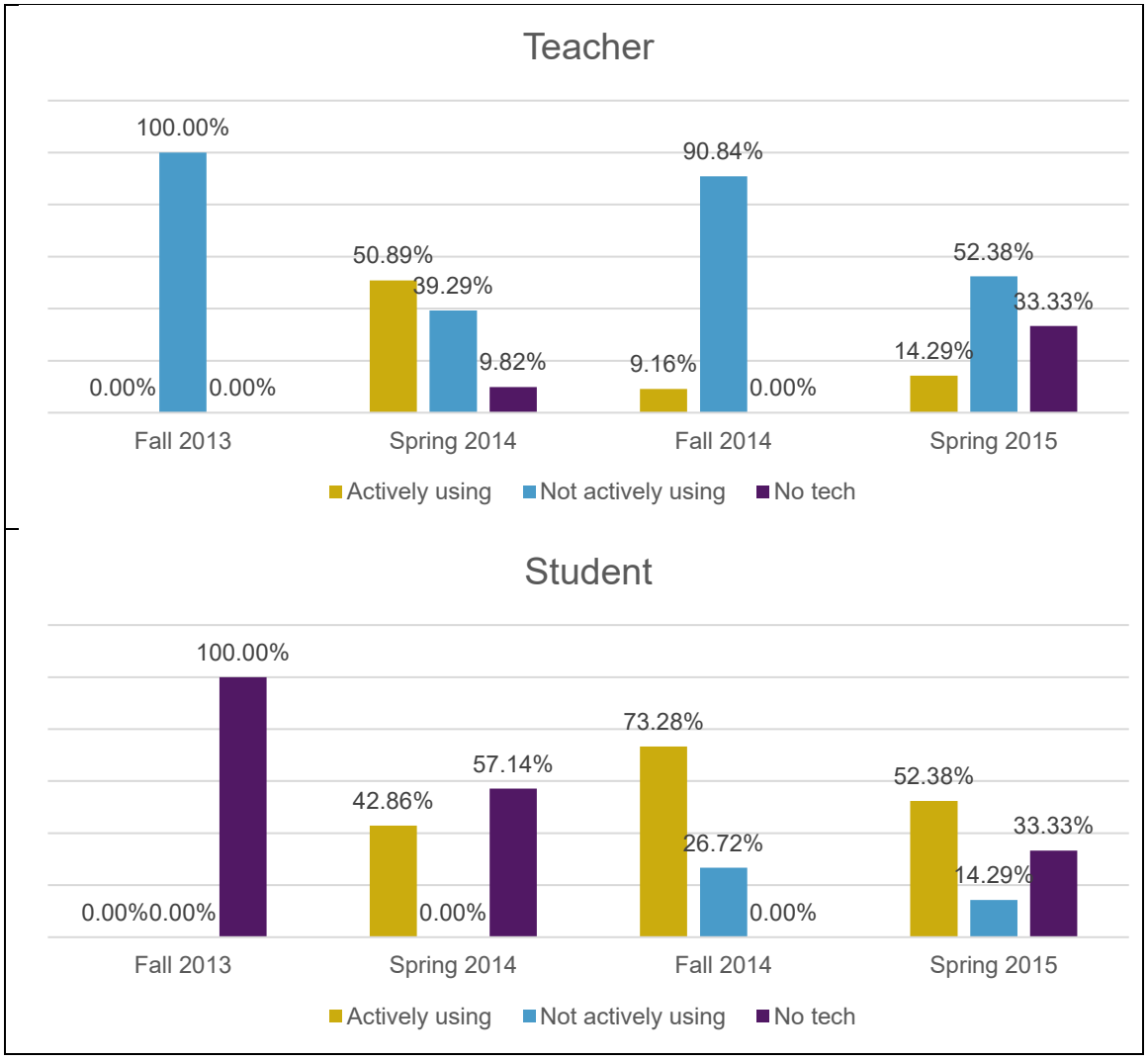
Pedagogical Use of Digital Technologies in the Classroom

Several resources were used to better understand the way digital technologies are used in the participating classrooms. These rubrics helped us to understand both the activities and the potential of digital technologies in inclusive junior high classrooms.

		Fall 2013	Spring 2014	Fall 2014	Spring 2015
Opportunities	Students have ongoing opportunities to learn with or use technology.				
	Students have some opportunities to learn with or use technology.				
	Students have no or limited opportunities to learn with or use technology.				
Tasks (SAMR Model)	Technology is used in a way that modifies or allows a redefinition of the tasks (i.e., by using technology the learning objectives are extended or modified).				
	Technology is used as a substitution for non-digital elements (e.g., a smart board as a projector instead of an overhead) or to augment non-digital elements (e.g., cut and paste elements in a word processor).				
	No, or limited technology is used. Technology may be used to only support teacher productivity (e.g., attendance; i.e., use of tech by teacher will not impact on learning).				
Multiple Means to Represent and to Facilitate Learning	Teacher uses multiple digital technologies to facilitate learning.				
	Teacher uses technology to facilitate learning in one way or for only a small portion of the lesson.				
	Teacher uses no, or limited technology to facilitate learning.				
Personalization of Student Expression of Learning	Students have choice in the digital technology they use to express their learning (e.g., some laptops, some iPads, some pen and paper).				
	All students are expected to use the same digital technologies to express their learning (e.g., all laptops; all same software, all paper).				
	No or off task use of technology (e.g., texting and gaming not related to the lesson).				

General Technology Use in the Classroom

The following charts summarize our video observations as they related to both you and your students' technology use in your classroom.



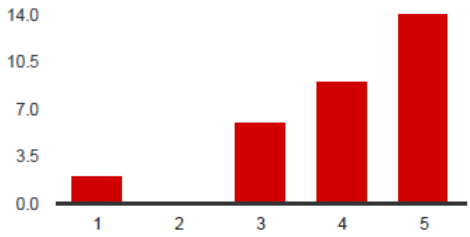
Digital Cognitive Complexity

We used Bloom's Digital Taxonomy (Church, 2007) as a model to categorize the cognitive complexity of the digital tasks that students were engaged in during our observations. The figure on the left illustrates the cognitive complexity of activities observed in the Fall and the figure on the right illustrates the cognitive complexity of activities observed in the Spring.

	Fall 2013	Spring 2014	Fall 2014	Spring 2015
Create: Application allows students to plan; invent; compose; design; construct; imagine				
Evaluate: Application allows students to present and defend opinions by making judgments about information, validity of ideas or quality of work based on a set of criteria to justify; assess; prioritize; recommend; rate; decide; and choose.				
Analyze: Application allows students to examine and break information into parts by identifying motives or causes; make inferences and find evidence to support generalizations; and compare; examine; explain; identify; categorize; contrast; and investigate.		■	■	
Apply: Application allows students to use new knowledge and solve problems to new situations by applying acquired knowledge, facts, techniques and rules in a different way to show; complete; use; examine; illustrate; classify; and solve.				■
Understand: Application allows students to demonstrate understanding of facts and ideas and explain; compare; discuss, predict, translate, outline, and restate.		■		
Remember: Application allows students to exhibit memory of previously learned materials by recalling facts, terms, basic concepts and answers to describe; name; find; list; tell.	■			

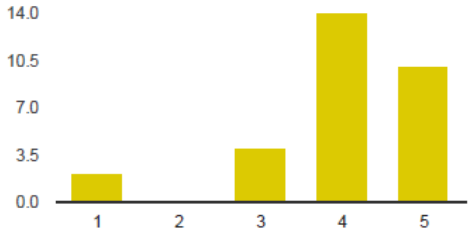
Project Document Examples
Project Closure RCOP Survey Results (31 RCOP Members -teachers and principals)

I had the opportunity to participate in research through the Flexible Pathways RCoP.



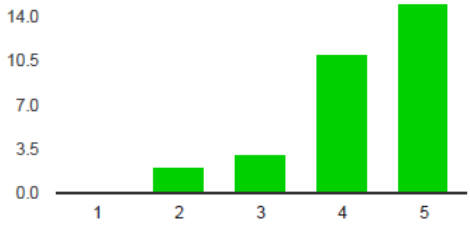
strongly disagree:	1	**2**	6.5%
	2	**0**	0%
	3	**6**	19.4%
	4	**9**	29%
strongly agree:	5	**14**	45.2%

I put research into practice (applied research to teaching and/or learning) during the Flexible Pathways to Success Project.



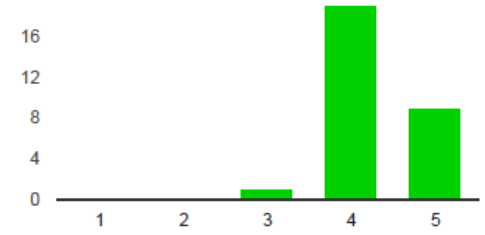
strongly disagree:	1	**2**	6.7%
	2	**0**	0%
	3	**4**	13.3%
	4	**14**	46.7%
strongly agree:	5	**10**	33.3%

The Flexible Pathways RCoP provided me meaningful opportunities to engage in professional growth.



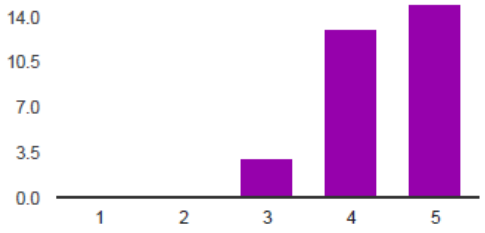
strongly disagree:	1	**0**	0%
	2	**2**	6.5%
	3	**3**	9.7%
	4	**11**	35.5%
strongly agree:	5	**15**	48.4%

I changed my practice to use technology to support higher-order thinking.



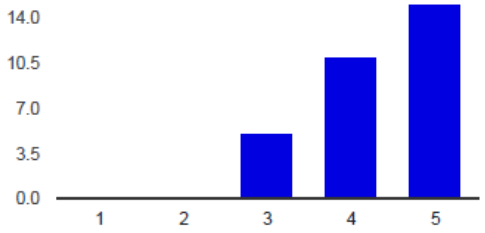
strongly disagree: 1	**0**	0%
2	**0**	0%
3	**1**	3.4%
4	**19**	65.5%
strongly agree: 5	**9**	31%

The Flexible Pathways RCoP helped me build teacher capacity to include all students.



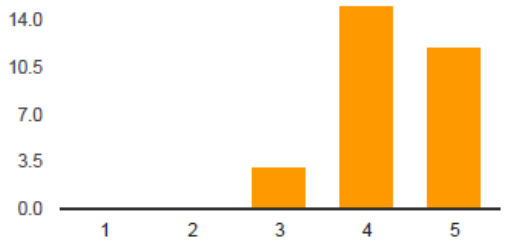
strongly disagree: 1	**0**	0%
2	**0**	0%
3	**3**	9.7%
4	**13**	41.9%
strongly agree: 5	**15**	48.4%

Through the Flexible Pathways RCoP I learned new practices to support inclusion.



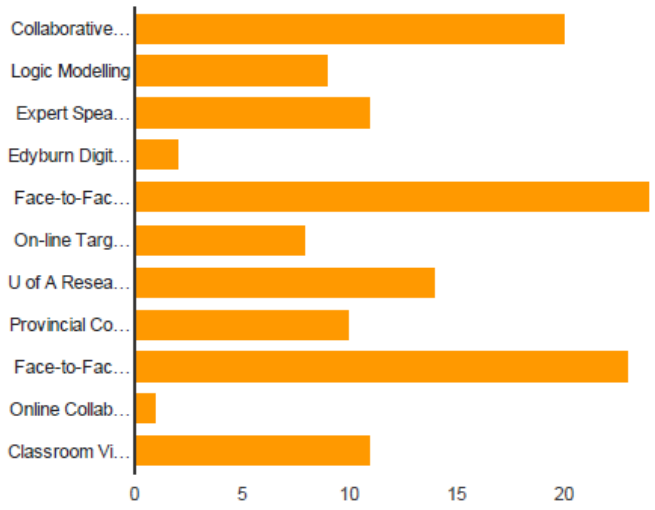
strongly disagree: 1	**0**	0%
2	**0**	0%
3	**5**	16.1%
4	**11**	35.5%
strongly agree: 5	**15**	48.4%

I changed my practice to better meet the needs of students with learning challenges.



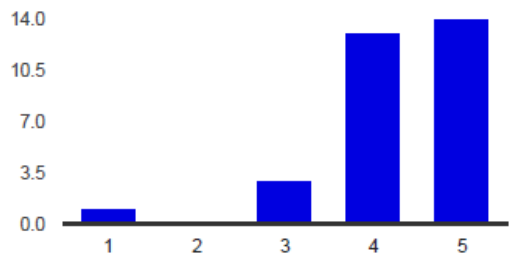
strongly disagree: 1	**0**	0%
2	**0**	0%
3	**3**	10%
4	**15**	50%
strongly agree: 5	**12**	40%

Which elements of the Flexible Pathways RCoP do you feel were key to contributing to its success?



Collaborative Goal Setting	**20**	66.7%
Logic Modelling	**9**	30%
Expert Speakers (i.e. Alex Dunn)	**11**	36.7%
Edyburn Digital Resource	**2**	6.7%
Face-to-Face Targeted Professional Learning Support (i.e. 2Learn)	**24**	80%
On-line Targeted Professional Learning Support (i.e. 2Learn webinars)	**8**	26.7%
U of A Research of the Project	**14**	46.7%
Provincial Coordination of the RCoP	**10**	33.3%
Face-to-Face Events	**23**	76.7%
Online Collaborative Digital Archive (Wikispace)	**1**	3.3%
Classroom Visitations	**11**	36.7%

Based on my experiences, I think the Flexible Pathways RCoP was successful.



strongly disagree:	1	**1**	3.2%
	2	**0**	0%
	3	**3**	9.7%
	4	**13**	41.9%
strongly agree:	5	**14**	45.2%

Example RCOP Event Agendas

LEARNING SYMPOSIUM

Flexible Pathways to Success
Technology to Design for Diversity

AGENDA

DAY 1 – Thursday, March 6

8:00 a.m.	Registration and Refreshments	
8:30 a.m.	**Welcome and Ice-breaker**	
8:45 a.m.	**Through the Looking Glass: Transformative Learning and Teaching with Technology**	
10:15 a.m.	Networking Break and Project Leads Meeting	
10:30 a.m.	**In the Hands of the Learner: Tools for Participation, Production and Personalization**	
12:30 pm	Lunch	
Breakout Sessions 1:15 p.m.	**Meeting SLO's: When Students Choose Their Own Learning Tools**	**Designing Engaging Learning Tasks Sharing the Journey**
2:45 p.m.	Break	
3:00 p.m. – 4:00 p.m.	**Designing Transformative Practice Sharing Activity**	

DAY 2 – Friday, March 7

8:00 a.m.	Networking Breakfast		
8:30 a.m.	**CAFÉ-Style Subject-Specific** Sharing Sessions (participants choose) **1. How is technology supporting learning in Math?/Science?/L.A.?/Social Studies?/numeracy?/literacy?** **2. How is technology supporting assessment in Math?/Science?/L.A.?/Social Studies?/numeracy?/literacy?**		
10:00 a.m.	Break		
Research Breakout Sessions 10:15 a.m.	**Using Learner Profiles to Tailor Technology Practice**	**iPads and Inquiry-Based Learning (Grades 2-9)**	**Leadership Strategies to Support Teachers**
11:45 a.m.	Lunch		
Practice Sharing Sessions 12:30 p.m. – 2:00 p.m.	***Game-Based Learning and Learning in the Classroom with iPads***	**Digital Storytelling in the Classroom**	
2:15 p.m.- 2:30 p.m.	***CLOSING REMARKS***		

AGENDA

November 3rd, 2014

8:45 a.m. – 9:15 a.m.	**Networking and Coffee**
9:15 a.m. – 9:30 a.m.	Welcome and logistics Introductions
9:30 a.m. – 10:45 a.m.	Flexible Pathways for Success: Looking Back & Looking Ahead - Tracking Our Progress
10:45 a.m.– 11:00 a.m.	**Health & Networking Break**
11:00 a.m. – 11:30 p.m.	Wall Walk & Logic Model Update
11:30 a.m. – 12:15 p.m.	Research Update
12:15 p.m. – 12:45 p.m.	*Classroom Teachers:* Surveys
	Project Leads: FlexPaths Final Report
12:45 p.m. – 1:30 p.m.	**Lunch**
1:30 p.m. -1:40 p.m.	Intro to Flex Camp
1:40 p.m. – 3:15 p.m.	Flex Camp (2 rounds @ 45 min. each)
3:15 p.m. – 3:30 p.m.	**Health & Networking Break**
3:30 p.m. – 3:45 p.m.	Professional Development Support
3:45 p.m. – 4:00 p.m.	Closing Remarks and Next Steps
4:00 p.m. – 5:00 p.m.	**Nov. 4th Participants' Meet and Greet** (OPTIONAL)