Teachers' Mo(u)rning Stories: A Living Narrative Inquiry Into Teachers' Identities on Emergent High School Inquiry Landscapes

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DISCLAIMER

THE COLLECTION OF EXPERIENCES AND THE INTERPRETATIONS OF THOSE EXPERIENCES IN THIS THESIS ARE WRITTEN FROM A COLLECTION OF IDENTITIES WHICH ARE DECIDEDLY NOT "MODERN" (DOLL, 1993) AND HAVE FORMED THROUGH THE INTERACTION WITH CONSTRUCTIVIST, POST-MODERN (DOLL, 1993), COMPLEXIVIST AND EXPERIENTIAL THEORIES. IN ORDER TO MOVE SIDEWAYS WITH A PROVINCIAL AND LIVED CURRICULUM FOUNDED ON A MORE HOLISTIC AND HUMANISTIC SET OF OUTCOMES ENABLED THROUGH CONSTRUCTIVISM AND INQUIRY, IT IS CRITICAL THAT THE EARLY EXPERIENCES OF THE STRUGGLES AND SUCCESSES BE MADE AVAILABLE TO TEACHERS AS THEY EXPLORE THEIR SHIFTING IDENTITIES. AIKENHEAD (2003), IN A VERY THOROUGH REVIEW OF RESEARCH ON TEACHER ORIENTATION, OR TEACHER IDENTITIES IN SCIENCE, IN RELATION TO MORE HOLISTIC AND HUMANISTIC CURRICULUM, NOTED THREE TYPES OF SCIENCE TEACHERS: A SMALL PORTION WHO HAVE IDENTITIES SUPPORTIVE OF HUMANISTIC SCIENCE EDUCATION, HUMANISTIC SCIENCE TEACHERS, A NUCLEUS OF "PIPELINE" ENTHUSIASTS, CLEARLY MODERNISTS AT HEART WHO VIEW SCIENCE EDUCATION AS SOLELY FOR THE PRODUCTION OF FUTURE SCIENTISTS, AND A THIRD GROUP OF PERSUADABLE TEACHERS OR MIDDLE-OF-THE-ROAD TEACHERS. THIS THESIS IS WRITTEN USING A LENS FOCUSED ON EXPERIENCE (DEWEY, 1938) AND INTERPRETED USING CLANDININ AND CONNELLY'S (2000) THREE DIMENSIONAL NARRATIVE INQUIRY SPACE SPECIFICALLY FOR THE AUDIENCE OF HUMANISTIC AND MIDDLE-OF-THE-ROAD SCIENCE TEACHERS. IF YOU HAVE A **CONSIDERED** "MODERN" IDENTITY, INTENTIONALLY "STEEPED IN POSITIVISM AND REALISM" (AIKENHEAD, 2003, P. 37) AND YOU CURRENTLY ALIGN YOURSELF WITH THE PIPELINE ENTHUSIASTS, PLEASE RESPECT THE NEED FOR PROFESSIONALS NOT SOLELY OF THIS "MODERN" IDENTITY TO EXPLORE THEIR SHIFTING IDENTITIES, PRACTICES, AND VALUES AS THEY EXPERIENCE THEIR LIVES ALONGSIDE YOUR IDENTITY, THE DOMINANT IDENTITY IN HIGH SCHOOL SCIENCE.

ABSTRACT

This particular telling and retelling from a living narrative inquiry (Clandinin & Connelly, 2000) into the early experiences of three high school science teachers – Beth, Joel, and Christina – explores the emergent inquiry landscapes constructed as we implemented a renewed, decolonizing, science curriculum in Saskatchewan founded on a philosophy of inquiry and on a broader, more holistic definition of scientific literacy, both Western and Indigenous. This inquiry draws on an ontology of lived experience (Dewey, 1938) and, more subtly, on the borderland of narrative inquiry and complexity science in order to illustrate the emergence and coming to knowing (Delandshire, 2002; Ermine, as cited in Aikenhead, 2002) of our identities in a way that avoids the reduction in complexity of our experiences. While my initial wonders persisted throughout the research as I lived alongside Beth, Joel, and Christina for two years, they diffracted into the contextualized wonder: how do we share a philosophy of inquiry with each other and with our students?

As such, this inquiry is a sharing about our own identities, about our own agency, about identity work, and about which experiences we choose to (re)engage with as we attempt to (re)find the narrative diversity, both individual and collective, necessary to shift from enacted identities to wished-we-could-enact identities. This exploration of our *mo(u)rning stories*, early experiences from our shifting identities after stepping through the liminal and onto emergent inquiry landscapes, or our *stories to relive with* provides a language and context to our shifting identities and hence, to science education, as we move towards a more holistic and humanistic form of scientific literacy for all our students. What emerged through the enmeshing of our landscapes and through the construction of voids in existing practices, followed by deformalizations in assessment and planning, was the development of a way of sharing our philosophy of inquiry and hence, our shifting identities. The artifacting and sharing of our *contextualized inquiry experiences* highlighted the rich assessment making, and curriculum making experiences (Huber, Murphy & Clandinin, 2011) we shared with our students and highlighted a view of assessment as a relationship. As we told and retold our stories to relive with, our identities shifted towards those more akin to facilitator and anthropologist and away from sage and engineer/architect.

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Dr. Shaun Murphy, for introducing me to narrative inquiry, to an ontology of experience, and to wondering in a way that did not reduce the complexity of the experiences of the identities involved, including my own.

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My committee as a collective, Dr. Shaun Murphy, Dr. Glen Aikenhead, and Dr. Janet McVittie, for the rich assessment making experiences we shared throughout my education, including the defence of this thesis. These experiences drove me to wonder further than I would have if left to my own devices and in directions that I would not have if more reductionistic forms of assessment had dominated our paths.

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My parents, for their continued support and my father for all of the English help received to date, inclusive of the time spent in high school. I think I have finally found an identity supportive of the creativity that was very much absent when I was younger.

My children Tehalen and Evan, for their constant interjections into my life without which I would not have fully recognized the need to embrace play, choice, and uncertainty in my classroom and my life. I also which to thank them for the time we spent in the morning, a time for morning stories, and a time to story the day and our lives anew.

My division and The Dr. Stirling McDowell Foundation for Research Into Teaching Inc., for the financial support without which I would not have been able to live alongside the teachers in this study in the depth necessary to explore the complexity of the emergence of our identities.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

NARRATIVE BEGINNINGS, RECONSTRUCTED EXPERIENCE AND THE SEARCH FOR MORNING STORIES: RETROSPECTIVELY FINDING THE MEANINGS AND WONDERS FROM THE EXISTING LANDSCAPE

Chapter Pre-Assessment

1. **Check Your Understanding - Fill in the Blanks (18 marks). One bonus mark for finding spelling or grammar errors. 1 mark each, ½ marks off for incorrect answers.**

   Word Bank: **wondered, experiences, assessment, wonder, teacher, affect, effect, inquiry, liminal spaces, curriculum, highlight**

   This introductory chapter will _____ my narrative beginnings into an ongoing narrative _____ (Clandinin & Connelly, 2000) of the _____ of teachers as they construct renewed high school science landscapes (Clandinin & Connelly, 2000) in response to_____ renewal. Being immersed in changing _____ practices and _____ writ large, I began to _____ if other _____s' _____ as they stepped through _____and into emergent inquiry landscapes, their *morning stories*, were similar to my own. Furthermore, I more formally _____**: How does a _____'s understanding of his or her own set of identities _____ the emergence of a _____ -based _____? What emergent _____ such as changes in classroom-based _____ for, as, and of learning are supportive of an _____ -based _____?**

Hint: If you put your cursor over a blank and hold it still you should get a hint. For each hint you use, ½ a mark will be deducted from your score. Good luck.

CYU Answers in Appendix **Total: _____/18 Percent: _____**

Have you ever wondered about where you are and why you are there? That is, have you ever been in a place, a unique place, not really sure how or why you are there, and really not sure where to start telling the story of how and why you got there and why it was an important place to be? If so, then you know where I am. It has taken me a long time to find my entry point back into my

lived stories (Clandinin & Connelly, 2000), my experiences that led me into this particular telling, that is, my narrative beginnings (Clandinin & Connelly, 2000), the experiences that span the dimensions of time, place, and the personal/social that help to locate me as an inquirer, a researcher within the existing landscapes of this inquiry. I am not who I once was. I have shifted both in terms of my identities as a teacher and as a learner and in terms of my practices in the classroom. I do, however, have a problem. As I have shifted, I have been so focused on the experience of learning to shift that I did not pay particular enough attention to the landscape I had wandered through or the reasons why I took certain paths over others. As such, many of the experiences I have had are not as educative as they could have been, often leading to further wonders or blank spaces about how I got to where I am now and where I could step next.

I do hope you did well on the pre-assessment, realizing of course that this particular assessment, like many other assessments I have been exposed to as a student and as a teacher, was likely not overly educative for you. In fact, it might have even been mis-educative (Dewey, 1938). As such, what follows is a retelling of a few of my *stories to live by* (Clandinin & Connelly, 2000), stories of experiences that represent my identities as narrative constructs. This retelling of my stories that I have built my lived identities from are presented in the hopes of filling in the blanks, for you and for me, in a more contextualized and hence educative way in order to elaborate on the research wonders that I, and the teachers I worked closely with, have come to.

Textbooks, Sacred Stories and the Department Meeting: Recursing Back onto the Landscape

I have had much passion along my journey as a teacher; however, it has waxed and waned over the years and prior to starting my master's in education it had been waning. I have taught, facilitated, and coached since I was 14 years old. That is 27 years now. I remember being 18 years old and preparing at night after work to teach swimming lessons the next morning – Bronze Medallion – which was part theory and part practical. Looking back it was a wonderful mix of the cerebral and hands on learning. I remember trying to facilitate the learning of the circulatory and respiratory systems with diagrams of the heart and lungs and having students trace a blood cell and a molecule of oxygen and carbon dioxide through the various systems. At the same time, we were practicing skills related to life saving and swimming. I was also instructing swimming to kids aged 1 to 18. I remember swimming with a one and a half year old boy on my back. He loved jumping off the diving board so I would take him at the end of the lesson on my back to the deep end for a few flips off the board. I wonder if he remembers that experience as memorably as I do. From swimming lessons to hockey camps to more formal settings, lab assistant, teacher, instructor, coach,

I have worked with countless individuals varying in age from 1 to 72, including my own children. It is a set of identities I have always had, and have always enjoyed. I was, however, recently reminded why I was so passionate about what has been happening on the landscape I have existed within for the last seven years, a landscape bounded by the dimensions of time, place, and the personal/social (Clandinin & Connelly, 2000), a landscape I specifically chose to step into, high school science.

The new Science 9 textbooks had arrived only a few weeks ago, several years after the new provincial curriculum for Science 9 had been released and today a department meeting was called. One did not need to be told what the meeting was going to be about. I was sent back nearly four years to images of meetings and discussions with other teachers from across the province who were working at piloting our new science 9 provincial curriculum founded on a philosophy of constructivism and inquiry in its broadest sense. That is, our curriculum demands inquiry in its broadest sense and not only scientific inquiry. It demands inquiry that encompasses not only the context of scientific inquiry but also the contexts of cultural perspectives; science, technology, society, and environmental decision making; and technological problem solving. I knew what was to be presented – the textbook, nice and shiny, a collection of new content. It was not the mundane, issues of budget, information from advisory council, and the like that was concerning me. It was the textbook and the discussion about the new curriculum that I was not looking forward to. I had tried to have this discussion, about new high school science curriculum, in many different ways over the past three years, focusing on engaging others in conversations on philosophy, on inquiry and on assessment; however, it did not go as far as I think was necessary. I wonder why my requests last year, under a different department head, for 20 minutes at a department meeting to discuss inquiry and the new Science 10 curriculum, founded on the same philosophy as Science 9, never materialized? I sent the PowerPoint I wanted to present to my department by email to my department head. I received only one response with a comment that it was "interesting" but it was simply too busy at that time of year. While I did get a response, it was not a welcomed one. I did present about my ideas for curriculum renewal to other science departments which hence resulted in a group of teachers who decided to collectively work on inquiry in Science 10, the how of our curriculum – the provincial and enacted curriculum – as opposed to the what.

A Selective Recount of a Grand Narrative: The High School Science Department Meeting

> "the work our children do might be memorisable (a version of control, prediction, and manipulation) but it is rarely especially *memorable*"
> (Jardine, Clifford, & Friesen, 2002, p. 87)

I reluctantly entered the department head's room where the department meeting was to be held. The lights were dim and the digital projector's LED was green but the display was muted, a very good indication that a formal presentation was imminent. We were not formally told the purpose of the meeting or given an agenda, but that was typical of our department meetings. A science 9 teacher and the department head were already there – I was late as I had been talking about an inquiry into wave motion using springs with a new science teacher, right out of university, who was covering my afternoon Physics 20 class for a few months so I could utilize release time to work on my research and to work with a division wide Science 10 inquiry group I had created and volunteered to coordinate. That in itself, having all of the afternoon off due to the release and my prep, created a tension as others had hinted at the fact that I now had all of this "free time" that I could use to help out the science department – clean, organize materials, that kind of thing. They knew what I was trying to do with inquiry and new provincial curriculum. I thought what I was trying to do *was* helping out the science department. I once again wondered why none of them were interested in working with the forthcoming Science 10 curriculum and exploring inquiry. I knew they were busy, we are all busy, but I am unsure if they felt it was important as I did. I had to remind them that I had paid for much of the release time with money I had received from a Stirling McDowell grant to do part of my research.

There are only four full time science teachers in our department. There are two other teachers who teach one class of science, one teaches science 9, the other teaches the Physics 20 I was provided release for, but they did not attend. The desks were still in rows from the class before lunch. I pulled three desks into a semi-circle, all facing the projector. I sat down in the middle desk knowing full well that my identities as a teacher and learner, considered identities – identities most recently informed from post-modern (Doll, 1993), complexivist (Doll, Fleener, Trueit, & St. Julien, 2005; Stanley, 2005; Sumara & Davis, 2005), narrative (Clandinin & Connelly, 2000), and experiential (Dewey, 1938) paradigms – that I think fit well with our new science 9 curriculum, did not fit well anymore with the dominant narratives of *"modern"* (Doll, 1993) high school science.

Nobody sat down beside me; in fact one teacher grabbed another desk, thus creating a separate row solely for themself. We are unfortunately not on good terms anymore – I wish that was different. I wonder if it is time for me to transfer. Meetings like these, and there have been many, usually place me at odds with the stories of experience shared. I often leave the meeting feeling as if I should have said something, like I should have challenged the taken for granted, the assumed; the grand narratives of "modern" high school science.

We were all in attendance for a change, our lunch hours often occupied with attending to the relationships necessary for teaching and learning. We have a very committed science department who deeply cares for their students and the learning that is to occur. We want our students to achieve, to go on to see success in science careers if they choose, to be able to use science in their everyday lives. I know this to be true. I have had discussions with all in our department and we share many common goals and often share resources; however, our philosophies about how to achieve this with our students varied considerably.

Most of our meetings started with a discussion about budget and information transmitted down from advisory council – a meeting of department heads in the school. Today, this portion of the meeting was rather brief. I noticed that we were not all sitting down. One of our teachers, a teacher near retirement, an import from another teaching area who regularly teaches science 9 and science 10, was eager to present the work he had been involved in producing to help himself and another science 9 teacher work through the new textbook. He was not a science specialist but is quite knowledgeable about the material he is teaching, and engaged in science and science education. He is certainly more than competent from a content perspective to step into ubject specific sciences like chemistry and physics. He was quite passionate about physics in his own schooling and very much enjoyed building, experimenting and tinkering.

I unfortunately knew much about the work he had been doing, work that he announced to me was being done in concert with two other teachers, work that I thought contradicted what he had engaged with as a youth. I knew much about this type work, a task I suspect performed in a majority of high school science departments – one can easily find this type of work available on a plethora of school web pages. He was intent on informing us that he was managing the process of development in a way such that the time and people resources he was using would be used to create something that was useful to science teachers – student notes and teacher PowerPoints from our new science 9 textbook focused on content. I wondered if the generation of "notes" was not a process that students should be engaging in; students focused on interacting with content in a context, as

opposed to the idea of content being transmitted in a decontextualized format into the brains of students. This "resource" was touted to be more useful in science than the content enhancement and literacy strategies being promoted in the division. This was seconded by another senior science teacher and I countered with the fact that I had found the strategies useful as I have shifted my teaching and assessment practices over the years. People stared at the floor, away from me and then after an awkward pause, the discussion quickly moved back to our textbook, to a focus on what content was there and what content was not there – science content that is – to discussions about the level of detail present, to a critique of the level of depth and the concerns that the new provincial curriculum does not repeat concepts frequently enough as students need the repetition in order to retain the content. It was at this point that I wondered why the curriculum documents – available via the internet – were not part of this discussion. How is it that we were talking about content and its fit with the provincial curriculum when there was not a single curriculum document to be seen? Where was the discussion about constructivism, inquiry, learning contexts, First Nations and Métis perspectives? Furthermore, I suspect, with good reason, that the science 9 curriculum had not even been seen, let alone read, by a few of the teachers in our department. It was at this point that I knew the curriculum we were referring to was not from the Ministry but rather from the hierarchy, that content expected as prerequisite knowledge for the 20 and 30 level sciences which of course was expected as prerequisite knowledge at the university level – the pipeline curriculum. It was the content that has always been taught, that which came before, that which serves as "appropriate" knowledge to be taught in science class.

The discussion then switched to a detailed look at a web page of resources, PowerPoints, notes, worksheets, textbook "activities" and the like. I am assuming that the fill in the blank notes, check your understanding (CYU) questions, demonstrations, tightly structured labs, and the matching, fill in the blank, and multiple choice exams…oh, and I forgot about the careful selection of black line masters (BLM), will follow on at a later date. We were told that the other teachers involved in producing the resources had been invited but they were noticeably absent. I wonder if they were concerned the work would be questioned? Maybe they did not come because they had some of the same concerns that I had, wondering why it was not being challenged. Maybe they were just busy. Maybe they were not all that proud of it. Why was nobody questioning if it fit with the ideas of constructivism and inquiry in its broadest sense in the new provincial curriculum? It would appear, however, that from this brief presentation and the resulting discussion around me, a discussion centred on the textbook, that *the new curriculum* was finally here. When I commented

that this collection of resources on a website or in a binder was something that I likely would not use going forward, the process and the resulting resource was defended by several teachers. They argued that this was a necessary step, a common and historic practice, to make Science 9 approachable for the non-science teachers who needed something to go by when they were teaching Science 9 for a semester. The binder I am afraid, has become a sacred story (Crites as cited in Olson, 1995) of our culture, a story authorized by the community of science teachers and as such is so engrained that its justification no longer needs to be shared as it is implicitly understood as a way to be in the classroom, as a shared and common story to live by, a collective identity of sorts. The binder or website in its "modern" day form has become the teacher resource utilized to deliver *the* science curriculum, the hidden curriculum of the pipeline. I wondered if the binder was just for the non-science teachers. It seemed to me that I was handed binders for all the levels when I started teaching. I wondered if there was something that might be more engaging for students and for teachers than the sacred story.

Concerns were raised, however, about the availability to students of all of these resources now that they were posted on a student accessible website – so they could print out the notes and such. One teacher questioned: What reason would they, the students, have for attending class other than for "the show", the teacher's performance? I wondered silently, and sarcastically: Right…it is "the show" that they come for…that is what creates the complete engagement we seem to have with all students. As I quickly reviewed the resources produced by the science 9 teacher and his two assistants, there were several noticeable omissions from that which was redacted from the textbook, itself redacted from the provincial curriculum, a reduction in the complexity of what was a very rich curriculum. Contextualized and complex concepts like holistic learning, outcomes and indicators, learning contexts, First Nations and Métis ways of knowing, and inquiry appeared to be absent or not be writ large, in these resources, or at least not as large as I remember them from the pilot. Maybe they are forthcoming? The locally developed teacher resources, our "binder", certainly does not represent these concepts as large as that intended by the Saskatchewan produced curriculum and textbook; a first for us, a first for inquiry in its broadest sense, and a first for our First Nations and Métis peoples who's Elders are credited on the back of the page with Donna Harpauer's picture – the Minister of Education at the time of publication of the textbook.

I left the meeting quite despondent, stunned at how this was largely foreseeable four years ago, and guilty for not having pushed back harder over the last four years and during the meeting. I was tired I guess of pushing back. This was not the only experience I had with the reduction of our

renewed curricula. I had become disengaged from this "modern" process, no longer interested in the focus on content consumption that so regularly occurs in science. It is not that I do not feel content is important but rather it is no longer the first piece I would share with students, with cooperating teachers or with teachers new to science who ask me for help. I must, however, admit to being somewhat two-faced on this issue. I recently received the "math binder" and it has made my entry into teaching math, my minor, with its new inquiry-based provincial curriculum, for the first time much easier. I am unsure, however, if easier is necessarily what is best for me, my students or the learning. I am also unsure if we are doing much inquiry-based learning based on the binder. I once again feel the comfortable pull of the tendrils of a more "modern" identity, with its focus on efficiency and exactness. It is a hard temptation to resist. I often wonder if I would be better off simply closing my door to all of this "help". I also wonder if the delay in the Science 9 textbook production and acquisition was intentional on behalf of the science consultant from the Ministry of Education. That is, the lack of a definite resource in some ways I hoped would encourage us, high school science teachers, collectively to focus on what was really new about this provincial curriculum – the how, a philosophy of inquiry founded on constructivism divided into four learning contexts: cultural perspectives, scientific inquiry, technological problem solving and science, technology, society, and environment decision making. I was wrong. When did that discussion, the one focused on shifting philosophy, happen? We have a *renewed* textbook, but despite many well laid intentions and philosophies on the part of the Ministry, we do not have a renewed curriculum. Rather we have an enacted curriculum that is much different, founded on a more "modern" (Doll, 1993) philosophy, than that which was intended in our renewed curriculum documents. There is hope I think, as when I left the meeting a colleague commented quietly to me that the "inquiry" in the textbook was not the type of inquiry the consultant from the Ministry envisioned as part of the Science 9 philosophy, a type of inquiry that this colleague and I had discussed at length for the course of about a year. I did not have to ask what type of inquiry he was referring to, it was inquiry in its broadest sense where there is less teacher direction and more student independence and choice, guided and self-directed inquiry (Llewellyn, 2011) which spans a diversity of learning contexts. My colleague and I had agreed that this type of inquiry was challenging and he even felt it was more rigourous than what was being done currently in our classrooms. I agreed that even the text was a weak representation of the intended provincial curriculum and wondered how we might move to inquiry in its broadest sense when our first inclination is to focus on knowledge level content – arguably a focus which derives from a different identity than the identities I have formed over the

years, identities I think which are necessary to implement a more holistic and humanistic (Aikenhead, 2003) curriculum founded on constructivism and inquiry. I wish that conversation would have happened in the department meeting. I wondered why my colleague did not express this part of his identity publically.

Finding the Meanings and Wonders From The Existing Landscape

The department meeting is but one place where science teachers often encounter and engage in the sacred stories (Crites, as cited in Olson, 1995) of their landscape. Olson (1995) defined sacred stories as those "anonymous and communal stories [that] are the implicit underlying cultural structures that form our consciousness, our taken-for-granted attitude that we bring to our experience because of the ways in which our world is presented to us by our social context" (p. 125). I am not only part of that culture, that landscape, but am also complicit with and partially responsible for constructing these sacred stories – after all, I did use the math binder and the science binder, both department constructions from the textbook, upon my entry to those subjects. The teacher binder or the website in this case, very much is the expression of the dominant grand narrative of our "modern" high school science identity. It is a symbol and a tool of not only efficiency but of control and I contend of internalized oppression (Friere, 1989) that forms part of the deprofessionalization or proletarianization (Apple, 1986) of teachers. It ensures a uniformity of experience for teachers and students, which on the face of it would appear to be an acceptable and desired outcome; however, that uniformity has come at the price of a hierarchical system focused on content consumption, often devoid of contextual, critical and creative thinking. This system of uniformity and content consumption is supported in Saskatchewan by a focus almost solely on assessment of learning or summative assessments with largely selected response items (Duncan & Noonan, 2007) which often narrows student thinking to strictly knowledge level outcomes – a collection of facts. This system of an aversion to formative assessments and restrictive set of constructed response type summative assessments exists in our universities as well (Goubeaud, 2009) which further reinforces these modernistic practices in our high schools. Bryce (2010) argued that this highly change resistant knowledge focus in the field of science education impedes not only the pipeline students ("science-for-scientists") but also the non-pipeline students ("science-for-citizenry"). This uniformity was born on the ideals of Skinnerian behaviourism, the Tyler rationale (1949), Cubberly's factory model (as cited in Doll, 1993), and the Age of Enlightenment (Doll, 1993) and exemplified metaphorically as the "banking model" of education (Friere, 1989). Modernity, as exemplified in my and other's practice, regardless of our efforts, continually pulls us

back into its comfortable tendrils and has taken a "powerful hold on our minds" in that "we have the greatest difficulty in freeing ourselves from its compulsion…unconsciously we fall back on it at every turn" (Bronowski, as cited in Doll, 1993, p. 55). I wonder what it will take to free ourselves from our collective *"modern"* identity?

However, as my identities have also been experientially woven further into the ideas of constructivism and inquiry, I have found more often than not that I am dissonant, bumping up against the sacred story of "modern" high school science. I suspect – hope – that there are other science teachers who are secretly disenfranchised or are in the process of becoming dissonant; however, it is often not their voices which are heard in the process of creating the stories to live by (Clandinin, Huber, Huber, Murphy, Murray Orr, Pearce & Steeves, 2006) in our schools, in the process of constructing *curriculum making experiences*[1] (Huber, Murphy & Clandinin, 2011) with our students. Rather, our practices, our teacher knowledge, and our philosophies, are put together through a process where "certain authorized versions of what counts as knowledge are constructed as consensus [which] is reached among individual voices" (Olson, 1995, p. 127) and then transmitted as teacher resources – a binder or website. This appeared to be the case in our department meeting where a *story to live by* (Clandinin et al, 2006) shared by science teachers that supported a sacred story of high school science was presented and accepted as the Truth, as a grand narrative of how teachers should be mentored into a subject – efficiently, devoid of context and devoid of a teacher's own personal practical knowledge (Clandinin & Connelly, 1996). This personal practical knowledge represents the embodied practices of teachers founded in their personal and social experiences both in and out of the classroom. It may seem trivial but this story, a dwelling-place or context (Olson, 1995) from which we structure our own stories to live by, from

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[1]The foundation of the term curriculum making experiences resides with Clandinin and Connelly's (1995) work on teachers' personal practical knowledge and their understanding that curriculum can be interpreted broadly as a curriculum of lives (Clandinin et al., 2006). As such, they contended that "curriculum might be viewed as an account of teachers' and childrens' lives together in schools and classrooms" (Clandinin & Connelly, 1992, p. 392). Clandinin and Connelly (1992) founded this contention and the idea of curriculum making on Dewey's (1938) ideas of continuity, situation, and experience and on Schwab's (1969) curricular commonplaces – learner, teacher, subject matter, and milieu. As such, curriculum making and assessment making experiences occur in interaction between students and teachers and hence, within the landscapes and associated tensions students and teachers are engaged with which includes, but is not restricted to, school, family, and community landscapes and the identities on those landscapes (Huber, Murphy, & Clandinin, 2011).

which we weave and have woven our identities, influences how learning appears in our classrooms with our students.

It is this type of managerial discourse (Sachs, 2001), that which is focused on efficiency and entrepreneurialism, detailed organization, a binder to be consumed, and a top-down hierarchy of knowledge of teaching practice, that continues to support *a "modern"* (Doll, 1993) identity that exists within high school science. This type of discourse creates and maintains hierarchical and competitive identities which see the teacher as a transmitter of knowledge, as "the show", and the student as a receiver of content. Modernistic identity as exemplified largely in Western cultures and Western science, maintains a closed system view of reality where cause and effect works in all areas of life, and where value free, objective Truth exists (Lather, 2007). That the binder *is* science 9 is an example of this proposed reality – a binder of the "Truth" to be transmitted from teacher to teacher and from teacher to student, the curriculum of the pipeline as implemented. I am unsurprised by this focus on a "modern" identity: it is attractive as it appears deterministic and easy to work from as it helps educational institutions achieve predictable but often simplistic outcomes both with teachers and their students; it controls the "quality" of the product which is then easily measurable. This modernistic identity that is woven throughout high school science, and regrettably through myself and other teachers, views the mind as a "blank slate", "black box", "immaterial thing", or "information processor" ready to have knowledge transmitted into it. An educational system composed of individuals with modernistic identities, our educational system, is founded on linear cause and effect transmissional teaching strategies which supposedly lead to changes in behaviour and hence the accomplishment of learning objectives (Doll, 1993). Unfortunately, modernism and associated "modern" identities are often reflected in our high school science classrooms as scientism (Aikenhead, 2002) where science is "authoritarian, non-humanistic, objective, purely rational and empirical, universal, impersonal, socially sterile, and unencumbered by the vulgarity of human bias, dogma, judgements, or cultural values" (p. 151); decontextualized content consumption.

While teachers often argue for the utility of "modern" high school science there is no denying that historically our science classrooms have shown a preference for decontextualized pure science that tends to "marginalize student-centered perspectives and utilitarian issues related to everyday life" (Aikenhead, 2003, p. 36). It is not surprising given this tendency towards decontextualized science that the concepts of holism, outcomes and indicators, learning contexts, First Nations and Métis ways of knowing, and inquiry – concepts requiring contextualized science, analogy and story, a foundation of good science education (Tytler & Prain, 2010) – were not part of

our discourse. This decontextualized pure science is often and best shared in a binder, in a PowerPoint, in a set of detailed notes and assessed with a multiple choice and other selected response type assessments. Of course, we must not forget that after the content is in place the process of content enhancement can happen, adding activities and context that help with the transmission of content. Certainly, this is not the process, constructivism and inquiry in its broadest sense, that I envisioned when I reflect back on my inquiry into teaching science in my undergraduate education courses or during the provincial curriculum pilot which focused on renewed aims and goals, and renewed teaching philosophies of our new science 9 curriculum.

These types of conversations, those about textbooks and binders, were comfortable conversations for many science teachers, conversations that reinforced the experiences we all had from the grand narrative of science which was a significant thread of the "modern" identity that ran through most of us. These were not the conversations that I wanted or needed. I was working at shifting my identities and these conversations only served to pull me back towards a more "modern" set of identities. At about the same time, I was struggling with my identities as a father and spouse. Mornings were not going well in our household. I was also looking to shift my identities at home, specifically around the morning. As this was happening, I noticed the parallels to the shifts in identities that I was striving towards in my teaching life. What follows are the experiences of my mornings as a father and spouse, a metaphor which I have used throughout the remainder of this thesis to elaborate on the experiences on our emergent inquiry landscape, a metaphor about the stories we tell and about the experiences we have, a story about change and changing identities.

The Roots of Stories of Mo(u)rning and Morning Stories

There is something unique about the morning, a time just after coming out of the slumber of sleep, a rather fuzzy place where the subconscious works to make sense of the experiences of the past, an in-between space that we walk through to start experiencing the next day, the present and the future, in different ways. I am not a morning person. I often lie in bed in an early morning dream state, a kind of pleasant stupor that feels impossible to remove myself from. Sometimes it is easier to just stay in this state of stupor. I remember being carried out of my bed, over my dad's shoulder for many years, so that I could eat breakfast with the family. I obtained this morning trait from my mother. The unwritten rule was that we were not to be talked to until we had eaten and moved around a bit as talking to us prior to that would usually receive simply a grunt or no response at all. This was my story to live by about mornings. I now share my mornings with my spouse and two children and three of us have this *apparently* heritable trait.

Our morning is one filled with negative tension where we all bump up against each other (Clandinin et al, 2006) and the apparent outcomes of a typical "modern" morning. My spouse, Pamela, the alert manager of the morning, covets efficiency and timeliness as we move through the tasks of the morning. Often there is grumbling, lingering, rebellion, disengagement, stress, and occasionally there is even crying and screaming…and the kids do their fair share of this as well. We are not a happy bunch on most mornings and we are occasionally later than we would like to be for work and for school. After we would drop off the kids, my wife and I would often console each other about the morning. We would both arrive at our respective workplaces and tell stories to our peers about our challenging morning experiences looking for consolation and support in the community of parent identities that we were intertwined with. For the most part our stories were not unique and we found support in our peers claiming to have very similar issues in the morning. It would appear to be a dominant story about the morning and is part of what appears to be a dominant parent identity, a stable negative identity (Day, Kington, Stobart & Sammons, 2006) from our vantage point, taken for granted narratives that were somehow not possible to challenge. If we did discuss challenging this dominant narrative, we would quickly delve into what we and our children would also lose out on if we did attempt to change how we were in the morning. Increased chaos and a loss of time were also themes of the discussion but were not grounded in the experiences of attempted change. In fact, these stories about the morning were protective stories which served to reinforce our existing identities. These were stories that ironically seemed to celebrate the fact that there was no other alternative other than our current identities. They were seductive stories as they were built from and intricately woven with a larger social narrative. Furthermore, these stories about the morning were often othering stories (Lugones, 1987) about our children or our spouses, stories about their faults or lack of ability or character. These stories about the morning, which lacked an experiential basis, were really not stories about the morning but rather ***stories of mourning***, stories designed to protect one's identities in the face of potential change, a serendipitously found expression as part of my attempt to shift my identities in the morning.

In the early attempts at starting to write about my experiences in high school science, I bemoaned the fact that modernity is difficult to subvert given the dominant stories that exist. In fact, I think that the modernity within high school science acts as a comfort, much like that early morning dream state, one that creates identities that are comfortably numb, anaesthetic for the mind so to speak. I have often wondered in regard to high school science, what will it take for us to wake from our stupor? After writing this line my mind slipped back to my *stories of mourning* as a parent and

realized that there may be a way to wake from the stupor, other possibilities capable of storying the morning differently. In fact, I wondered where the positive stories about morning were and wondered if it were possible to turn morning on its head, to remove the existing practices hence constructing a void and then provide a different reason other than time and efficiency for myself, Pamela, and my children to hang their motivation and engagement on. I wondered if I could read books about the morning to our children in order to story the morning differently and distance us from the *stories of mourning* that supported the existing dominant narrative. I was in the early stages of forming an activist identity (Sachs, 2001), engaging with the structures and tensions of morning, moving away from a morning that focused on managerial discourse to one that focused on a more dialogical, equitable, and respectful discourse. At this point my idea to change how I was and tell my children stories in the morning was mostly a ***story of morning***, a fictionalized story (Clandinin et al., 2006) – a self-constructed story or account designed to sustain or even possibly write anew our stories to live by, our identities – thought of in the shower after waking from my subconscious slumber, a construction untested against the throes of reality, the throes of experience. *Stories of morning* were possibilities about how to change and about how to shift one's identities. *Stories of morning* were the very early narrative beginnings (Clandinin & Connelly, 2000) of what Nelson (as cited in Clandinin et al., 2006) refers to as *counterstories*, stories that were narratives "designed to subvert, to shift, and to change" (Clandinin et al., 2006, p. 171). Stories of morning were "what if" stories, possibilities and emerging ideas about how things could and might be, about how to possibly construct a new landscape. Stories of morning might lead to an affective counterstory, but they might not if they are deemed not possible in experience.

I quickly searched online bookstores for "morning stories" and "morning time stories". I found very few. Consequently, I headed down to a local bookstore, approached the help desk in the kid's section and cheerfully asked if they had any morning stories. The attendant seemed puzzled and proceeded to lead me to a section in the back of the store. She said that they did not really label them morning stories but rather they had labelled their section "grief stories". I chuckled and said that no, I was looking for stories about the morning, stories of morning, possible stories to start the day with, stories that would breed creativity and courage, stories to enable us as we attempt to restory (Clandinin et al., 2006) ourselves and provide fresh narratives for the construction of our identities through the day. Apologetically, she chuckled and said that she thought I was "a bit nuts" when I came in *gleefully* asking for what she thought were *mourning stories*, stories about grieving and the experience of loss. Surprisingly there are few morning stories for children ages 5 to 7 and I

suspect one could fill a niche market with morning story books that enable us through the day. I wondered why we were only telling stories at bedtime and not at morning time. Was it not efficient? It would seem to be the best time to tell enabling stories and possible counterstories now that I truly thought about it.

With the intent of implementing this story of morning, a new way of being in the morning, I gave notice to my children that they would have to get up ten or fifteen minutes earlier the next morning as Dad would be doing something with them. They were excited to say the least but regretting the fact that it would mean less sleep. The morning came, I dragged myself out of bed fifteen minutes early and grabbed one of the new books I had purchased and headed to the bedrooms of my children and with each of them I said: "Two minutes until the story starts. Today we will be reading *Good Morning Sam* (Figure 1-1) by Marie-Louise Gay (2003); a book about getting ready in the morning." I headed down to the couch and opened the blinds to let the morning rays in. "One minute until our morning-time story starts." About ten seconds later, one ruffle headed male child with creases in his face came slumping down the stairs mumbling something incomprehensible about his bunny that he was carrying. He then sat down beside me. Five seconds after that, my daughter slithered out of bed and dragged her limp body to the couch while making guttural sounds. She then proceeded to cover the three of us with a blanket her grandmother had made. I started our first morning story. We spent time talking about the images and about the words after which we all parted ways and more gleefully went about the very tasks that Sam had just gone through.
We have read countless morning stories and our deliberate inefficiency inadvertently has resulted in our wake time shifting back to a normal time and a renewed relational engagement with my children. Pam and I have shifted away from participating in the sharing of *stories of mourning* to telling ***morning stories***, rich and enabling experiences about the implementation of a *story of morning*, our experience of shifting our identities in the light of a grand narrative in our attempts to create a new morning landscape. I believe we have awoken from our stupor, our identities shifted in the process of engaging with the tensions and the process of storying (Clandinin et al., 2006) our lives differently.

My Early Mo(u)rning Stories: First Steps on the Path to the Nexus of Inquiry and Assessment

My experience at the department meeting was disheartening. I lost something again. I lost some perceived hope and support, hope and support that I thought I had gained four years earlier as part of the pilot for our Science 9 curriculum renewal. From my viewpoint, the stories shared at the

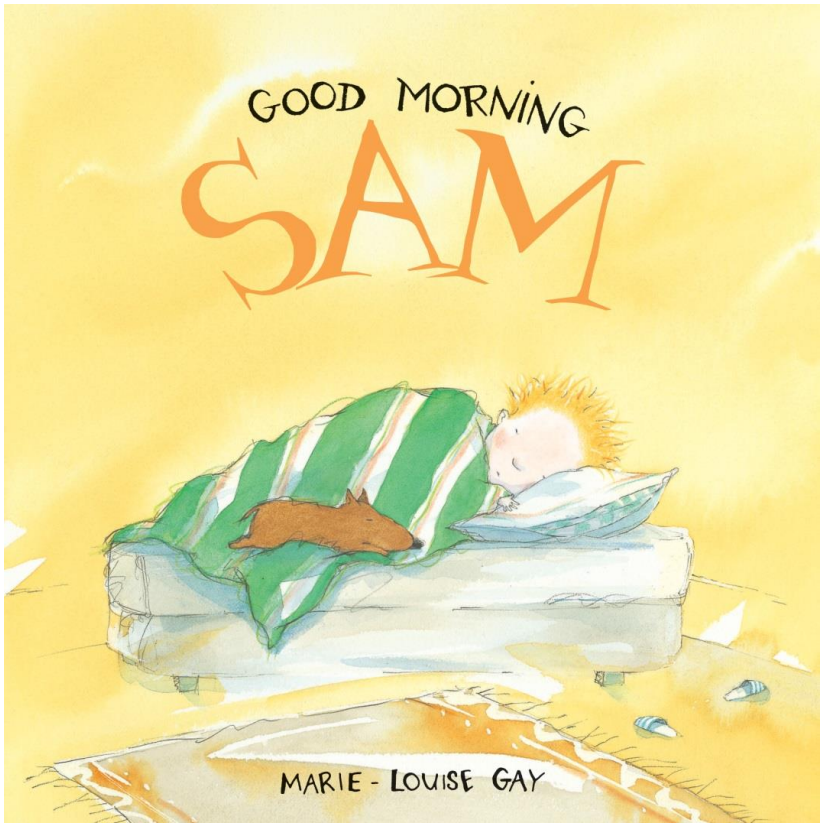

Figure 1-1. The first book from our first attempt at morning stories. Reprinted with permission from Groundwood Books.

department meeting were just further examples of ***stories of mourning*** which science teachers told about curriculum renewal that served to support the existing dominant identities and even appeared designed, at times, to suppress more humanistic innovations (Aikenhead, 2003). These stories of mourning only served to pull me back away from some of the changes in my identities that I was working towards. They were seductive stories, stories which were hard to resist as my stories to live by were still somewhat rooted in the positivistic threads of the grand narrative. For me, this experience was a ***mourning story***, a story about the loss of a landscape I thought we were collectively working to construct. I was looking for others to share in the construction of ***stories of morning***, future looking stories that could lead to the development of new ways of being in the classroom and new experiences, ***morning stories*** that we could share as we worked to construct new

landscapes. I wanted to focus on experiences, on stories derived from the liminal space[2] I had stepped through, a space that called "forth new scripts, improvisations that reflect a different way of being in the classroom" (Kennedy, as cited in Huber, Murphy & Clandinin, 2003, p. 351). The liminal space I am referring to is my and our provincial attempts at shifting our identities, our attempts at restorying our storied lives (Clandinin, 2006) which started four years ago with the Science 9 pilot.

Even writing about the department meeting in relation to the pilot stirred emotions that I did not think I had. I was disappointed in my peers, in myself, I was angry that I had not challenged them, challenged the stories of mourning once again. I was concerned that I had let myself be sucked back towards modernity, towards the grand narrative. It appeared that the stories of morning about shifting assessment practices and student-directed inquiry I had constructed were turning into yet another mourning story, an experience that highlights the struggles I have faced in attempting to shift my identities away from a "modern" identity to identities supportive of a holistic and humanistic curriculum. This appeared to be a shift on my emergent landscape from what I thought was a significant morning story, which I thought was on the way to possibly even becoming a *competing story* (Clandinin et al, 2006), a story which lived alongside, although in tension, and even challenged the dominant narrative of high school science, back towards a *conflicting story* (Clandinin et al, 2006), a story which collided with the dominant narrative of high school science and was not likely to be sustained. It represented a loss in the gains I thought I, and other science teachers, were making on our future landscapes. I was concerned my morning story was becoming a mourning story before it even became a competing story. I was frustrated that this was an experience that could not be used to weave into my shifting identities, that is it was not educative, worse, it even felt mis-educative.

On the other hand, maybe it was educative, maybe it was a weighty enough experience that it would push me back up the slope, and over the edge again, into a collection of identities that themselves were weighty enough as to avoid being pulled back into my more "modern" identity that

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[2]Horvath, Thomassen, and Wydra (2010) describe liminality, as originally developed by van Gennep (1909) and Turner (1967, 1974) as a place "characterized by the dislocation of established structures, the reversal of hierarchies, and uncertainty regarding the continuity of tradition and future outcomes" (p. 1). The utility of this definition comes from the idea of stepping through a space where uncertainty reigns, where new possibilities to live in different ways exist due to the dislocation of established structures and hence the construction of voids.

was so familiar, tensionless at times in the past, and oddly comfortable. Maybe this experience would provide the impetus for the start of another *story of morning*, an envisioning of new and different ways of being in the classroom, or even a *morning story*, a set of experiences within an emergent landscape that represent an attempt to experience anew, an opportunity to rework my experiences, my narrative threads, and find a new narrative coherence (Carr, as cited in Clandinin et al., 2006) – a constant struggle between the multiplicity of identities we hold and wish to bring forward, between our past, present and future stories to live by as we live, tell, and retell our existing stories or choose to relive in different ways. I wonder if the experience of stepping into research with teachers, in a safer, more supportive and less confrontational place, on an emergent landscape will somehow help me to further establish a different set of identities with which I could put forward a new way of being in the classroom, a new morning story within the landscape of "modern" high school science.

Retrospectively, I was looking for support during this period of curriculum renewal. I was looking for a place, a school context or professional knowledge landscape (Clandinin & Connelly, 2000), a school "landscape narratively constructed with historical, moral, emotional, and aesthetic dimensions" (Clandinin et al., 2006, p. 6). I was looking for a particular professional knowledge landscape, an emergent landscape that had people with similar identities and experiences to my own, who were also looking to shift further, looking to throw their identities into a bit of narrative dissonance so they could rearrange their narrative threads and emerge (Stanley, 2005) with a different set of identities, narratively coherent in a new way, based on the experiences they had. I was looking for the emergence of new, shifted, and reformed identities, a complex, dynamic and evolutionary process (Stanley, 2005). I was also looking for that which was already there but hidden, looking for the identities I and others had that had "always been there although they [had] been invisible in light of reductionist paradigms" (Stanley, 2005, p. 144), that being the realm of "modern" high school science. I was looking for support to help me not fall back from the dissonance I had created in the narrative threads of my identities, looking for support to prevent me from falling back into that familiar "modern" identity, not wanting to allow my experiences, the narrative threads of my identity, to fall back into a narrative congruence with dominant stories and identities of "modern" high school science. I was looking for support in trying to put forward morning stories which could possibly become competing stories.

In addition to my department, I had looked outside of the landscape of my school. A few years earlier, after piloting the new science 9 curriculum released by the Ministry of Education, I

attended an interdepartmental meeting with the complete diversity of all of our science teachers in the division. I tried to engage our science teachers in the concepts of outcomes and indicators, in the idea of inquiry in its broadest sense and the necessary but yet to be clarified shifts required in assessment. I wonder if I presented it too much as a mourning story and not enough as a morning story. I struggled to share my shifting identities, a shift in my philosophy further towards a set of identities supportive of constructivism and inquiry. Instead what inadvertently evolved within the collection of teachers present was a collective set of stories of mourning, stories about students and parents and the inability of others, stories about a lack of professional development and the shortcomings of inquiry. I was also thrown into a discussion about valid and rigourous summative assessment and it was suggested to me that if I wanted clarity on how to assess and evaluate in science that I spend part of my summer developing questions for the provincial departmental exams, a set of exams known for their heavy focus on multiple choice questions. Clearly this was not a direction supportive of constructivism and inquiry and not a path I felt would be supportive of the shifts I was trying to make. This was once again an experience that was so far away from what I was looking for that I left the meeting frustrated. The stories of mourning told at the meeting about what teachers and students would lose out on as a result of the new provincial curriculum are not unique to our division and are well documented in the research on inquiry. The failure of scientific inquiry, a subset of inquiry as defined in our Saskatchewan curriculum, in high school science (Anderson, 2002; Weiss, Pasley, Smith, Banilower, & Heck, 2003) as documented by educational research is supported by a collective modernistic identity that largely sees no problem with the existing grand narratives of knowledge level consumption and reductionistic assessment of learning practices. It is these two grand narratives that form a sacred and often purported single story (Adichie, 2009), and often the only story to be shared, a powerful story that is deemed by the culture of high school science *to be greater than any other* stories of high school science – it is "*nkali*" (Adichie, 2009). This single story supports the hegemony of "modern" high school science by "showing people as one thing, as only one thing, over and over again, and that is what they become" (Adichie, 2009). I did not want to become a reflection of the sacred story.

Looking for Stories of Morning and Morning Stories: Finding Research Wonders

I guess I was looking for a place within a place to reorganize my narrative experiences and to construct new experiences recognizing that this restorying of identities took place not only within an emergent landscape but also within the landscape of "modern" high school science. I suppose I was looking for a "*betwixt and between"* (Turner, 1967) place where I could engage in playful and fluid

discourse, a more dialogical, equitable, and respectful discourse than that which existed in my department and that which existed in our interdepartmental meetings where it was obvious certain voices were muted. I needed a playful place that allowed for risk free shifts between the liminal and the emergent landscape I was trying to help construct, a place that allowed one to put forward stories of morning, possibilities of how it could be, in order to test them against reality, against the throes of experience. I needed a playful space and I needed the support of other's identities also attempting to shift their identities in order to continue working towards more humanistic and holistic curricula in the courses I was involved with. I was looking for others who were also working at putting experience to their stories of morning. I had heard about what appeared to be emergent landscapes from some of my recently graduated peers. These peers had told me about working in schools where constructivism and inquiry was starting to happen as was collaboration through professional learning communities which included thinking about being different in the science classroom. I had also heard many stories of morning about how things could be in the classroom. Stories of morning were often just possible scenarios (Crites, as cited in Olson, 1995), thin and vague stories which were outlined as "a mere sketch with many empty places and variables in it" (Schutz, as cited in Olson, 1995, p. 124) about how things may fall out of the liminal and onto emergent landscapes. Stories of morning are stories about what it might look like to be in a newly emergent landscape. Specifically, they were theorized stories from the throes of liminality largely lacking in supportive narrative experiences, about how we could be different, about how we could challenge or live alongside the sacred stories of modernity. I was looking for possibilities, stories of morning, but I was also looking for actual experiences from that emergent landscape. I was looking for morning stories to read, to tell and retell not only to inform my own shifting identities but to help others as they attempted to shift their own identities. As such, I became very interested in teachers perceptions of their own identities and their own practices. Flowing from these narrative beginnings were my early research wonders:

- **How does an individual's understanding of his or her own identities affect the emergence of an inquiry-based curriculum?**
- **What emergent experiences such as changes in classroom-based assessment for, as, and of learning are supportive of an inquiry-based curriculum?**

While these wonders remained at the heart of my research and hence my thesis, early in this research with my participants I would come to know what they wondered and how my wonders would intersect with theirs.

CHAPTER 2

THE INTERSECTION OF SCIENTIFIC LITERACY AND IDENTITY

As provincial curricula are renewed, teachers have the professional responsibility to engage in that renewal; however, before stepping into this renewed landscape, one necessarily must ask what it is that is being renewed and hence requires investigation.

Shifting from What to How: What is Scientific Literacy and Inquiry in Saskatchewan?

At the heart of our renewed high school science curricula, and all K-12 science curricula in our province, is a philosophy of inquiry founded on constructivism and divided into four learning contexts: cultural perspectives; scientific inquiry; technological problem solving; and science, technology, society, and environment decision making. This was the "how" of our renewed curricula and what I felt was the necessary professional development that science teachers needed to engage in if we were to help all of our students become scientifically literate citizens (Figure 2-1), a

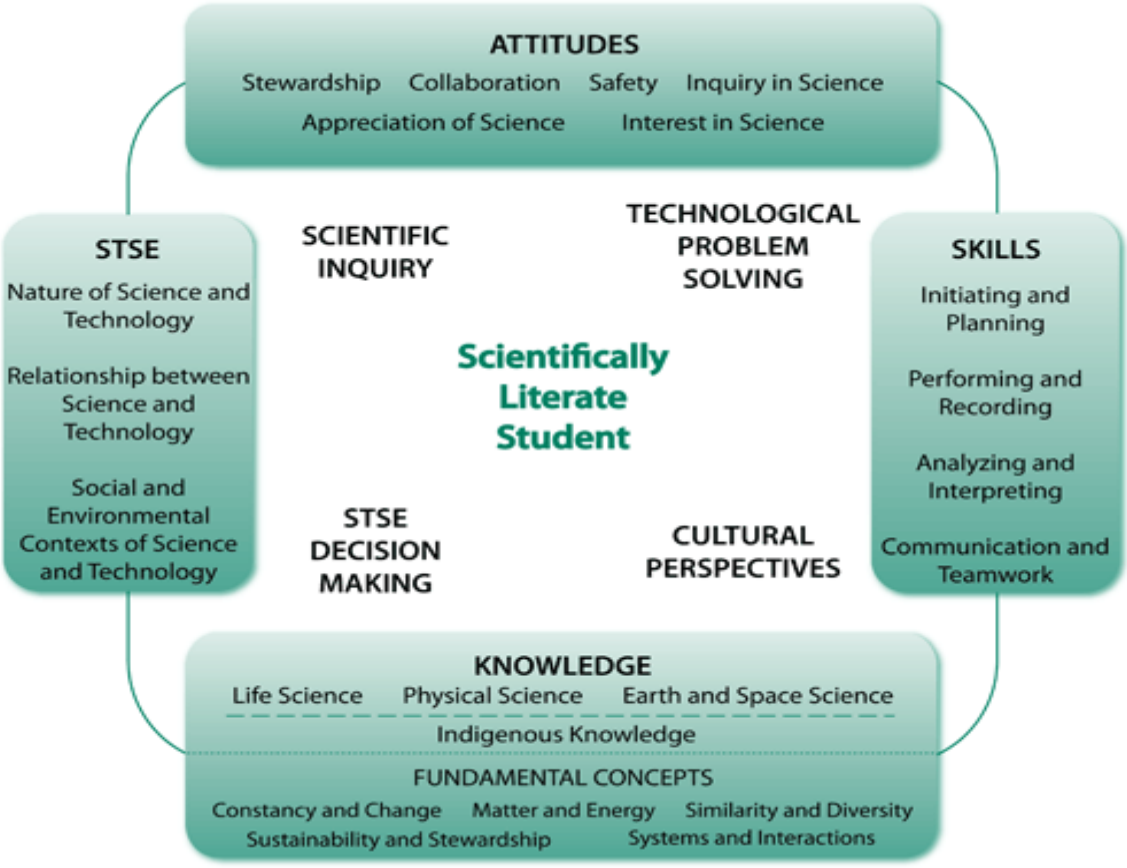

Figure 2-1. The Scientifically Literate Student. Reprinted from "Teaching Science 9", Saskatchewan Ministry of Education, accessed December 5, 2010, retrieved from https://www.*edonline.sk.ca/webapps/moe-curriculum-BBLEARN/index.jsp?view=* teaching&lang=en&XML=science_9.xml.

goal of our past and renewed curricula. Students who were scientifically literate were students who were capable of more than knowing just the canonical content of science, that which was solely suitable for the pipeline – science-for-scientists. Rather, they were students who were also capable of understanding and appreciating Indigenous Knowledge as it relates to science, students who were capable of understanding the interaction between culture and science, students who were capable of inquiring in its broadest sense into the natural and physical world, who had attitudes that supported stewardship, appreciation and interest in science, and they were students who were capable of looking at and working with science in the contexts of technology, society, and the environment. Our renewed provincial curriculum was asking us to work towards science-for-citizenry.

In my mind, science teachers needed to focus on creating emergent landscapes that allowed teachers to work together at shifting their identities to shift their practices. This rebalancing towards a more holistic and humanistic form of scientific literacy and away from a focus on solely reductionistic knowledge acquisition in science education is a dire need in Saskatchewan. Bryce (2010), Aikenhead (2003), Aikenhead and Michell (2011), and Aikenhead, Orpwood, and Fensham (2010) concluded that there is a need for more humanistic and holistic forms of science education that include scientific literacy and scientific literacy in action (Aikenhead, Orpwood, & Fensham, 2010) for all of our students. Inquiry in its broadest sense in a diversity of learning contexts has the potential to address the demands of moving towards scientific literacy and has been shown by Minner, Levy, and Century's (2010) meta-analysis of one hundred and thirty eight studies to be an effective pedagogy when the learning is focused on conceptual understanding as opposed to solely the retention of knowledge. Hattie (2009) found in his meta-analysis of inquiry, that while inquiry was not overly effective if the learning goals were focused on knowledge and comprehension, it was highly effective at enhancing the application of scientific process and developing critical thinking skills which include analysis, synthesis and evaluation which often occurs in contextualized situations. The curriculum foundations in the new Saskatchewan curriculum extend well beyond knowledge and comprehension and as such there is very much a curricular mandate for teachers to implement inquiry to address more complex cognitive and affective learning.

As such, the implementation of inquiry in Saskatchewan science classrooms presents a complex pedagogical task. Although inquiry is now associated with good science education (Anderson, 2002) and a large number of well-defined classroom practices, existing research highlights many barriers or dilemmas – supported by the stories of mourning of many science teachers – facing the further implementation of inquiry. A large number of these barriers are rooted

in assessment and evaluation, which in turn are determined largely by teacher values and beliefs, which derive largely from the identities of teachers. Anderson argued that technical barriers, which include state or provincial assessments and difficulties with group work, impede inquiry. Furthermore he stated that political dilemmas including limited professional development and parental resistance as to how science was taught to them and unresolved conflicts among science teachers about what is of value to learn and how to teach also restrict the penetration of more holistic science education envisioned through inquiry. In addition he stated that cultural dilemmas exist in the areas of the views and purposes of assessment amongst science teachers that only further drive science towards modernity. The purpose, value and pedagogical implementation of assessment and evaluation in classrooms lie under nearly all of these barriers or dilemmas. Our purpose and values, as teachers, exist largely due to our identities and as such there is a dire need to explore the emergent experiences and relationships amongst identity, constructivism, inquiry, and assessment.

Rather than focus on barriers and stories of mourning from the realm of modernity, largely a vision from the viewpoint of an identity from the pipeline, it is pertinent that we look at inquiry from the viewpoint of those middle-of-the-road teachers and humanistic teachers who face their own challenges in moving towards a more humanistic science curriculum. Teachers wishing to tread this path, including those humanistic and middle-of-the-road teachers, require a complex mix of enabling experiences – morning stories – that focus on shifting roles, values, assumptions, beliefs, ideologies, and identities while at the same time being supported in a dialogical, reflective and supportive emergent landscape born of the stories of morning teachers choose to construct. In a similar look at new curriculum designed to improve scientific literacy, Kilian-Schrum (as cited in Aikenhead, 2003) concluded in her research of the implementation of a science, technology, and society (STS) curriculum "that one's self image as a science teacher and one's loyalty to a specific discipline both have to change before the teacher's taught curriculum approximated the intended curriculum" (p. 43). The support for more humanistic based science is often not present on the landscape of "modern" school science (Aikenhead, 2003); in addition it is often challenged and undermined, which itself is a barrier. As such, this existing landscape calls for the sharing of experiences within an emergent landscape and the establishment of an alternative to positivism, the establishment of a collective narrative authority (Olson, 1995), rooted in teachers' personal practical knowledge and constructed through the continuity and interaction associated with experience (Dewey, 1938). Hence, it is necessary for middle-of-the-road and humanistic science teachers to

share their morning stories – a set of richly contextualized experiences as teachers attempt to construct new landscapes and emerge with new identities supportive of inquiry in its broadest sense in the realm of high school science. If we are to help more of our students, especially those not destined for the pipeline, become scientifically literate citizens, a shift in our identities both individually and collectively as teachers is essential.

"Modern", Post-Modern and Experiential Views on Identity

In order to research teachers' understanding of their own identities and its effect on the emergence of an inquiry founded curriculum, a thorough understanding of the formation and characteristics of identity is required. There is much research centered on three categories of teacher professional identity, the formation, the characteristics, and the stories of teacher identity (Beijaard, Meijer, & Verloop, 2004); however, the most common thread in all of this research is the idea that identity forms through experience and story. This research relies on researchers seeing participants no longer as small but as big (Greene as cited in Clandinin et al., 2006), seen in depth, in context and in relation. Beijaard et al. (2004) defined identity or "self" both modernistically and post-modernistically. A modernistic view of identity sees the self as "strongly related to be authentic and fulfilling a pregiven individual autonomy" (p. 124). This view of self comes from a specific "modern" paradigm, an identity that thrives on Truth and the individual. On the other hand Beijaard et al. also defined self post-modernistically and put forward that the self was viewed as "strongly related to how people organize their experiences in stories, which may differ in time and depend on context" (p. 124). This experiential and storied view of self also comes from a particular paradigm that relies on a Deweyan ontology of experience (Clandinin et al., 2006) and the milieu (Schwab, 1973) that one exists within. Dewey (1938) very clearly laid out several criteria for an ontology founded on experience. The first of those criteria is that experience occurs temporally, constructed over a significant periods of time. Second, Dewey brought forward the criteria of continuity in that our experiences are organic as one experience grows from other experiences and that one experience also can lead to new experiences. That is, our experiences exist and grow along the continuum of an imagined past, imagined present and imagined future. The last of Dewey's criteria is that experience is founded on the interaction between the personal and the social and hence experience develops in context. It is this ontology of experience that Clandinin and Connelly (as cited in Clandinin et al., 2006) use to define teachers' identities; "a unique embodiment of his/her stories to live by – stories shaped by the landscapes past and present in which s/he lives and works" (p. 112). Based on this ontology of experience, narrative inquirers hold that teachers' identities are

constructed through their experiences represented by narratives, or narrative threads, which occur temporally across a continuum and are developed within a personal and social context. Hence, it is through inquiring into the telling and retelling and the living and potential reliving of stories that we can come to an understanding of our and others' identities.

Stability or Bounded Chaos: Is Identity Fixed?

Modernistically we may be tempted to define identity as stable and fixed. Certainly it would appear to be easier emotionally to maintain a constant and stable identity. It is likely quite efficient as well. Contrary to these thoughts, however, is research that shows that identity or the self is socially constructed and built on teachers' belief systems – paradigms – and lived experiences (Eick & Reed, 2002; Clandinin & Connelly, 2000). Identity itself is constructed through discursive practices and interactions within social relationships (MacLure, as cited in Day et al., 2006). This identity construction is intersubjective (Gee, as cited in Beijaard et al, 2004) and is accomplished through a negotiated process of interpreting and re-interpreting the experiences we have (Beijaard et al., 2004). Building on the work of Clandinin and Connelly, Clandinin et al. (2006) contended that individuals are continually reshaping their identities through this negotiated and relational process of resolving tensions around the narrative threads in their lives. These narratives come from a diverse number of sources including self, peers, family, school and other teachers occurring in both in-school and out-of-school spaces to name a few. Individuals then *attempt* to create a coherent weaving of these threads – a narrative coherence – to construct their identities. As we live and experience the variety of landscapes we exist in and on, our identities are continually in flux. The goal of narrative coherence is a task that we are always engaged in and largely depends on the context and temporality on any given landscape. As such, our identities are never completely coherent; rather, they are in a state of being more or less coherent (Carr, as cited in Clandinin et al., 2006).

Teacher identities then are experiential constructs formed within a social web of narratives or stories to live by, formed from a bounded chaos of possible experiences including experiences obtained from other teachers, education policies, university teacher education practices, community views as well as one's own philosophical and epistemological views (Smagorinsky, Cook, Moore, Jackson, & Fry, 2004). This plurality of influences on teacher identities includes, according to Smagorinsky et al., the duality of traditional paradigms existing in schools and constructivist (or other) paradigms from research and teacher education programming. In order to strengthen one's teaching identities, Smagorinsky et al. noted that some philosophical tension followed by socially

contextualized intellectual resolution is required. That is, the process of narrative coherence requires interaction with one's peers in a landscape that is supportive of the sharing of story, of experience. While some of the research on identity thus contends that the stability of identity is possible (Day et al, 2006), it is not as simple as declaring our identities as stable or unstable. It is through the tensions between one's agency – one's ability to pursue the goals one values – and existing structures (Beijaard et al, 2004; Day et al., 2006) within the milieu that allow one's identities to become more or less stable as well as more or less positive.

Single or Multiple: Do We Have an Identity or Identities?

Viewing identity as a story to live by, Clandinin et al. (2006) declared that identity is not singular but rather multiple, shifting and even contradictory. In fact, they contend that we exist with a number of identities within what we classify as "our self". This view is not unique as several other authors also talk about having multiple selves (Lugones, 1987) or multiple professional identities (Sachs, 2001). These identities are formed through ongoing life experiences that "create the narrative unity out of which images are crystallized and formed when called upon by practical situations" (Clandinin et al., 2006, p. 153). It is these unities or identities, which emerge and guide us in our future experiences.

As such, this multiplicity of identity can result in competing identities (Clandinin et al., 2006) that can form healthy tensions enhancing our identities through new narrative arrangements. Likewise, our identities can be conflicting and the resulting tension can cause a dissonance and possible rifts in the unity of our narratives making resolution difficult. These tensions, created by the interaction between our identities and the experiences we face, result in an attempt at narrative coherence such that our identities or "sub-identities … more or less harmonize" (Beijaard et al., 2004, p. 122). Narrative coherence is an important resolve for teacher identity as it "seems to be essential for a teacher that these sub-identities do not conflict" (Beijaard et al., 2004, p. 122) especially when they are sub-identities that form the core of their professional identity. Teacher sub-identities from disjoint paradigms hence would create much internal conflict and a narrative dissonance that would be difficult to make coherent.

Independent or Interconnected: Which Identity Where and When? Who's Identity?

The formation of, characteristics of, and stories of identity are well researched and a multiplicity of identities informed and negotiated through a social milieu is also well established. The question then becomes, which identities are brought forward in which contexts and are these identities or sub-identities independent of other identities? Furthermore, if these identities are

created within a web of social relationships, how much of that identity is our own and how much of it is garnered from and interconnected with the milieu? These questions are central when we look at our personal and professional identities and the relationship between the two. Do teachers leave their personal identities at home and their professional identities at school? Identity as a phenomenon involves both the person and the context (Beijaard et al., 2004) and as such results in personal identities that are strongly interwoven with professional identities. Biejaard et al. (2004) determined that identity formation is "practical knowledge-building characterized by an ongoing integration of what is individually and collectively seen as relevant to teaching" (p. 123) and as such it would appear that our professional teaching identities are tied to the collective, the culture of school and as such are subject to the pulls of the dominant stories of school (Clandinin et al., 2006).

This complex entanglement of the multiplicity of identity between the personal and the professional is supported by many researchers including Bateson (as cited in Clandinin et al., 2006) who claims that identities are not made of separate pieces but rather are entwined narratives from our personal and professional lives. This interrelationship between the professional and the personal exists due to the "overwhelming evidence…that teaching demands significant personal investment" (Day et al., 2006, p. 603). In fact teacher identity is very much an emotional investment according to O'Connor (2008) who relies on the work of Hargreaves and Zembylas to define identity as a "means by which individuals reflexively and emotionally negotiate their own subjectivity" (p. 118). This emotional component in the formation of identity means that we are deeply invested not only in our personal identities but also in the identities of our colleagues and students whom we care for and about (O'Connor, 2008). Perhaps the clearest definition of this connection between the personal and the professional in the formation of a teacher identity is Clandinin and Connely's concept of personal practical knowledge (Clandinin et al., 2006). Personal practical knowledge is defined by Clandinin et al. (2006) as "that body of convictions and meanings, conscious and unconscious that have arisen from experience (intimate, social, and traditional) and that are expressed in a person's practices" (p. 5). Clandinin et al. (2006) contend that in order to understand teachers and hence teacher identity,

> we need to understand each teacher's personal practical knowledge, his/her embodied, narrative, moral, emotional, and relational knowledge as it is expressed in practice. We need to attend to the different kinds of stories – secret, sacred, and cover stories – as we attend to stories of teachers and teachers' stories. (p. 172)

It is in these teacher stories, such as the fictionalized cover stories (Clandinin et al., 2006) used to protect one from the dominant and often sacred stories of school or the secret stories (Clandinin & Connelly, 1996) that teachers use to play with non-dominant pedagogies in the safety of their in-classroom spaces, that this personal and emotional identity becomes highly visible in relation to professional identity.

Our identities are inherently interconnected, not only with other identities within our socially constructed self, but also interconnected with other people's identities, past and present, who influenced our own negotiation of identity through both curriculum and assessment making experiences (Huber et al., 2011) – identities formed in a cultural milieu connected to context.

A Distinct Subject Matter Identity

"The universe is made of stories, not of atoms."
Muriel Rukeyser (1968, p. 111)

Existing research (Bateson, as cited in Clandinin et al., 2006; Beijaard et al., 2004; Clandinin & Connelly, 2000; Clandinin et al., 2006; Lugones, 1987) shows that a teacher's identity is woven into one's personal identity and that our identities are multiple, often formed from narratives that form other identities or sub-identities. That is, our own identities are woven from narrative threads and some of these narrative threads are woven into more than one of our identities. Furthermore, different individuals often have identities woven from similar or even the same experiences, in other words, woven from the same narrative threads. However, if we look closer into the identities of high school teachers, we can see that their ontological and epistemological beliefs and values are often very closely aligned with the identity associated with the subjects they teach. Clandinin and Huber (2005) described this situation well when they said, "teachers teach what they know. Teachers teach who they are. Teachers teach what each situation, each encounter, pulls out of their knowing" (p. 43). Unfortunately many high school science teachers' identities are tied strongly to subject matter, a subject matter identity, due to the "weightiness, the dignity, the current esteem, in which the subject matter is held or … dominated by lovers of that subject matter" (Schwab, 1973, p. 511). As a result this subject matter identity can tend to "shut out other educables" (Schwab, 1973, p. 511) such as attitudes, propensities and values, ignoring three of the four curriculum commonplaces – the teacher, the learner, and the milieu – which are all vital in any curriculum with

"no one sufficient in itself, no one indispensable" (Schwab, 1973, p. 511). Some teachers argue that having a strong tie to subject matter is positive educationally; however, it is quite evident that an identity associated solely with the subject matter of "modern" science as an institution can result in an ignorance to the importance of relationships with students and to the relationship of science to technology, society and the environment – milieus classified under the term scientific literacy that have been ignored for far too long. This lack of engagement in scientific literacy, often accomplished through inquiry, is well established in the research literature (Aikenhead, Orpwood, & Fensham, 2010; Barrow, 2006; Weiss, Pasley, Smith, Banilower, & Heck, 2003). These same researchers have argued for a renewed focus on scientific literacy and scientific literacy in action (Aikenhead et al., 2010). I would contend that this lack of engagement with students and scientific literacy in its broadest sense is supported by the *stories of mourning* shared in order to protect existing identities and maintained by a comfortably numb and reductionistic culture of science. It is a detriment to all of our students, pipeline included.

This tie of teacher identity to subject matter is also well established and I contend is largely associated with a tie to the dominant paradigm via a very densely woven narrative thread. That is, a subject matter identity has a particular focus ontologically and epistemologically – a particular "modern" or positivistic identity is dominant within a subject matter identity. As such teacher identity, if strongly associated with subject matter identity, has the chance of taking on qualities of that subject matter identity across other identities or sub-identities. Of course, one has the choice to take on competing or conflicting identities in relation to the subject matter identity despite the coherence issues it may create. Teacher identity then is negotiated and reified through colleagues, culture, language and the epistemologies associated with one's subject matter (Melville, 2008). Within this subject matter identity exists an overt and particular identity as "the disciplines [of] language and epistemology are interwoven in the ways teachers – as subject matter specialists – conceptualise the world, their roles within it, and the nature of knowledge, teaching and learning" (Sisken, as cited in Melville, 2008, p. 1186). Melville argues that this subject matter identity is supported through a culture of academia that prepares science-educated teachers who identify with the role as an intellectual leader, scholar and subject matter specialist, positivistic traits consistent with modernity.

The resolve of subject matter identity is built upon a hegemonic subject-affiliated community of false rigour (Helms, 1998) where science enjoys "a higher status owing to their association with the university, and often a broad professional community outside of academia"

(Helms, 1998, p. 812). As such, Helms contends that this subject matter status in science is derived "from the academic background of the teachers, the rigour of the high school curriculum, and the perceived quality of the students who take these courses" (p. 812). Teacher identity is constructed according to Helms in direct relation to science, within the milieu of the science department with goals of cohesiveness and belonging – a professional culture that supports a personal identity where the narratives are tightly woven to the epistemological and ontological views of science. In fact Helms contended that high school science teachers feel "a sense of personal identification with science; that is, their sense of what makes science special is rooted in their own sense of themselves as science teachers and individuals in the world" (p. 812). If we are to believe Helms, a strong association to subject matter identity creates a reductionistic barrier that restricts the emergence of identities and landscapes which would offer a more dynamic and holistic educative environment. In fact Helms (1998) contended that

> a strong connection between the self and the subject matter may close off teachers from opportunities that could enhance their professional experiences or from ways to understand more about themselves, which in turn could have implications for the experiences of their students. (p. 832)

Clearly, an understanding of one's own identities and the relationship to the grand narrative that may be threaded through one's identities, within the culture of high school science and the relationship between a teacher's own identities and the subjects they teach is critical if teachers wish to provide the best educative experiences in science so all of our students are more scientifically literate. In her research into the identity of teachers in a renewed science, technology and society curriculum aimed at improving scientific literacy in Alberta, Kilian-Schrum (as cited in Aikenhead, 2003), concluded "that one's self image as a science teacher and one's loyalty to a specific discipline both have to change before the teacher's taught curriculum approximated the intended curriculum" (p. 43). Clearly opportunities will be lost if teachers hold onto their subject matter identities too tightly.

Spillane's (2000) research with identity also indicates that teacher identity is subject matter sensitive and dependent on one's history as a learner relative to that subject – teacher professional identity as a multiplicity of several identities including a learner identity interwoven with subject matter identity that varies much from subject to subject. Spillane described that Adams, a teacher of literature, had an identity that supported an environment of constructivism and cognitive play (Doll,

1993), risk free cooperative participation, and assessment for and as learning experiences. Adams, also a teacher of math, pulled forward different combinations of her narrative experiences to form an identity on the math landscape she constructed that supported an environment that was quite modernistic, filled with high stakes assessment, competitive and individualistic tasks, and focused on efficiency. As such, Spillane described Adams as having a duality of identities or a subject-matter dichotomy which was "all the more puzzling given that Adams was a thoughtful teacher, well-disposed to constructivist notions" (p. 322). According to Spillane, this reductionistic math subject matter disposition was built on Adams' modernistic learner identity in math where she felt insecure due to an oppressively traditional math learning history encompassing convergent thinking, strictly linear thought, a lack of moral purpose, and a focus on an efficiency of time and task and was juxtaposed against her post-modern and constructivist learner identity in literature. Both were relatively stable identities each with its own impact on the identities of her students.

Melville (2008) contended that language or science classroom discourse forms a major component of a teacher's professional learning and hence professional identity. Building on the work of Gee, Melville expressed that there is a "crucial concern for science teachers who see their subject matter identity as their primary professional identity" (p. 1192). In my experience, this represents the majority of science teachers. Furthermore, it is language that forms the part of a code that develops this subject matter identity which "communicates a specific view of the world" (p. 1189), a *lifeworld* language, which in "modern" science composes a very reductionistic world for students who are expected to buy into the specific identity in that world. Melville expressed that language is so critical that the new reform[1] language – that associated with constructivism and inquiry – is seen as "incompatible with this sense of identity" (p. 1192). Melville goes on to summarize Gee's work, which fits quite closely with Clandinin and Connelly's construct of personal

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[1]In Melville's (2008) article, he refers several times to a reform curricula or curricula reform in Tasmania, Australia. This is not to be mistaken for the "reform" movement of the 1950's in the United States. In order to not change his intended meaning I have left Melville's terminology in favour of what is used in Saskatchewan – "renewed" curricula or curriculum "renewal". Certainly while there are differences, both "renewed" curricula are founded on constructivism and inquiry and hence require much identity work for many teachers. Furthermore, the Tasmanian curricula had other similarities in that it's essential learnings – thinking, communicating, personal futures, social responsibility, and world futures – held many similarities to the broad areas of learning in Saskatchewan's renewed curricula – lifelong learners, sense of self and community, and engaged citizens. Undoubtedly both of these curricula imply a similar focus on inquiry in its broadest sense in science, inquiry into the social, cultural, technological, and environmental aspects of science.

practical knowledge. Gee (as cited in Melville, 2008) contends that teachers need embodied experiences with the social language of change and access to "the perspectives of more advanced users of the language in the midst of practice" (Melville, 2008, p. 1190) in order to see the new language as a gain. In fact, Gee contends that in accepting the new language, teachers must accept a loss of part of their identity as language is heavily tied to identity. As such, resistance to taking on the new language of reform may often be due to individuals being unwilling to leave behind their existing identity, and being unable to "recognise the acquisition of the new language as a gain" (Melville, 2008, p. 1190). Clearly, there is a need to share the morning stories from teachers and their students who are on an emergent inquiry landscape so that teachers with identities in concert with their subject matter identity can see the gains associated with renewed curricula in addition to the associated and perceived losses.

Weighty Threads of the Grand Narrative: The Core of a High School Science Subject Matter Identity

The subject matter identity typically associated with high school science and often taken on and promoted by pipeline enthusiasts is one composed of two sacred stories (Clandinin et al., 2006) or grand narratives: an epistemology of behaviourism used to ensure knowledge level content consumption and an ontology of "Truth" made visible through high stakes knowledge level evaluations (Duncan & Noonan, 2007). Teachers who associate themselves closely with the pipeline, often have their identities tightly woven with these grand narratives and as such their identities are highly coupled to a view of science as scientism where science is viewed as "authoritarian, non- humanistic, objective, purely rational and empirical, universal, impersonal, [and] socially sterile" (Aikenhead, 2002, p. 151); this is undeniably a "modern" and reductionistic identity that exists tightly coupled with the grand narratives of knowledge level content consumption and judgmental evaluation – evaluation which can only be described as dogmatic[2]. This world or culture is supported through what Sachs (2001) defines as a dominant discourse of managerial professionalism that focuses on efficiency, accountability, and I would argue arrogant perception (Lugones, 1987) about its teachers and its students. Clearly trends towards accountability lead to the deskilling of teachers (Sachs, 2001) and therefore, reductionistic attempts at the enculturation (Aikenhead, 2002) of students and as such represents a construction of oppressive entrepreneurial

[2] Evaluation is dogmatic in the sense that the majority of classroom evaluation in my experience is in essence unproven and arguably unprovable in terms of its use as a predictor of 'success' beyond knowledge level objectives and the criteria for success are questionable and often reductionistic.

identities that Sachs (2001) claimed are individualistic, competitive, controlling and externally defined – an entrenching of the subject matter identity in not only our students but our future teachers.

As a result, curriculum reforms such as those associated with constructivism and inquiry in high school science that focus on the ontological nature of assessment and evaluation or the epistemological nature of pedagogies like behaviourism and constructivism tend to challenge those teachers with identities tightly coupled to their subject matter. Willis (2009) contends that the change within a renewed inquiry-based curriculum requires professional confidence, consciousness and a supportive context, otherwise changes may be treated "more like techniques" (p. 6) with the "attribution of ineffectiveness [being] placed on the student's lack of readiness, reminiscent of a behaviourist understanding of learning" (p. 6), a deficit story or a story of mourning. I had heard many of these stories of mourning over the last few years as I discussed inquiry with my peers. A weak role identity (Eick & Reed, 2002) can also result in teachers falling "back on remembered patterns of teaching" (p. 403), back into the tendrils of modernity, especially when teachers are faced with contextual difficulties or "belief systems [identities] that are incongruent with the goal of inquiry education [and] could interfere with the efforts of science teacher education reforms" (p. 403).

It is this falling back, where stories from an emergent inquiry landscape – morning stories – quickly become conflicting stories (Clandinin et al., 2006) stories that teachers are not able to maintain in the face of the dominant stories, in the face of the grand narrative, that concerns Melville (2008) as the end result is often a renewed modernism simply masquerading as reform. Melville describes this as a superficially adopted reform movement and feels that it occurs due to the lack of acquisition of reform language in a real sense. These experiences constructed of a superficial conversational framework serve to maintain stories of mourning, maintaining the dominant subject matter identity and the grand narratives within high school science. This can result in trivialized reforms and reform fatigue (Melville, 2008) such as that which has occurred in the realm of the constructivist movement in education where a definite trivialized constructivism (Sumara, Davis & Laidlaw, 2001) exists and talk abounds in certain worlds about the fatigued death of constructivism.

Due to the interdependently woven nature of the narratives that make up subject matter identity and hence teacher identities, both ontology and epistemology must change (Willis, 2009) in a renewed inquiry-based curriculum even though there is debate about which change should come first, ontology or epistemology. As such, changes to assessment and evaluation practices, often

founded ontologically, must accompany changes to epistemology such as constructivism and inquiry, otherwise a tensioned wash back effect (Willis, 2009) occurs when "assessment practice is out of step with effective teaching and learning theory or where traditions and routines of assessment are each based on entirely different theories of learning" (p. 5). This requirement for a duality of change in ontology and epistemology, the heart of the grand narrative of subject matter identity in high school science, has the potential to create disparate narrative threads resulting in tension filled curriculum and assessment making experiences (Huber et al, 2011) for teachers and students as "constructivist and sociocultural theories are not well developed in the areas of assessment practice" (Gipps, as cited in Willis, 2009, p. 5). These tensions are particularly noticeable when teachers look for experiential support within their culture or milieu, are unable to find it, and hence are unable to build confidence in their own morning stories.

Challenging the grand narratives of high school science, the collective identity of a culture, is not easy as high school science teachers may likely be challenging their own very identities. As a result, "when programs and curricula change, teachers lose a sense of themselves … [resulting] … in new stories to live by" (Beijaard et al., 2004). That is, they throw their narratives into a bounded chaos and as a result require time to restory (Clandinin et al., 2006) their narrative threads into a new narrative coherence (Clandinin et al., 2006) that reforms their teacher identity, their stories to live by. As such, this process is both a morning story and a ***mourning story***, an experience of true loss, as, although teachers are creating enabling stories for themselves, they are also giving up a part of their identity that has garnered some stability for them in their personal and professional lives. It is important I believe to not perceive high school science teachers arrogantly (Lugones, 1987) through this process as "the more central a sub identity is, the more costly it is to change or lose that identity" (Beijaard et al., 2004, p. 122).

Creating Morning Stories: Challenging One's Own Subject Matter Identity

If a teacher's identity is highly tied to their subject matter and they construct their teaching and learning environment through that subject-matter-specific lens (Spillane, 2000), then they have defined a specific world (Lugones, 1987) for their students to exist in. That is their subject matter identity has been used as a world template to construct an instance of a world which defines the bounds of identity that can exist within that world. These worlds can be much different than the worlds that students come from and as such they will need a culture broker (Aikenhead, 2002) to fuzzy the borders as they travel between worlds (Lugones, 1987). A more culturally sensitive curriculum, one aware of student worldview (Chang & Rosiek, 2003) and hence student identities, is

required as students face competing and conflicting stories (Clandinin et al., 2006) to those that make up their existing identities as their out of school curriculum making experiences (Clandinin et al, 2006) and their in school curriculum making experiences bump up against each other creating tensions "in ways not anticipated by their teachers or administrators" (Chan, 2007, p. 184). My wonders in regards to the experiences we construct on emergent inquiry landscapes then become: How do we help students resolve the tension of competing and conflicting curriculum making experiences? How can teachers hold some of the tension and fuzzy the borders to allow for easier and more playful "world travel" (Lugones, 1987)? How do teachers help students resolve competing narratives in order to enhance their identities as opposed to creating conflict and tension amongst the identities they hold and are forming?

What morning story should be constructed to support the emergence, the restorying, of teacher professional identities in high school science that support the role of teacher as culture broker? Sachs (2001) argued for a discourse of dialogical professionalism that supports the formation of an activist teacher identity, which includes the open flow of ideas, faith in the individual and the collective, critical reflection and analysis, concern for others and concern for the rights of individuals and minorities in order to "reduce or eliminate exploitation, inequality and oppression" (p. 157). Certainly morning stories from a dialogical professionalism would pull professional identity towards the goal of culture broker, away from the oppression of a modernistic high school science paradigm hence allowing for a more loving perception (Lugones, 1987) of students as teachers intentionally travel to their worlds in order to "understand what it is to be them and what it is to be ourselves in their eyes" (Lugones, as cited in Clandinin et al., 2006, p. 87) in order to better support them in their playful (Doll, 1993) journey into the world of Western science.

This new professional activist identity as a culture broker requires a multiplicity of identity (Clandinin et. al, 2006) or a plurality of selves (Lugones, 1987) that moves away from a modernistic stance and towards a dialogical one that when envisioned as a culture broker "identifies the border to be crossed, guides students across that border, and helps students negotiate cultural conflicts that might arise" (Aikenhead, 2002, p. 157). It is a set of identities which allows for a shift from simply knowing, to coming to knowing (Delandshire, 2002; Ermine, as cited in Aikenhead, 2002) that can be supported with the emergence of a rebalancing (Earl, 2003) of assessment for, as, and of learning in the light of this new dialogical professionalism. This new professionalism is required to maintain the cultural identities of our students while still allowing them access to high school science. As this dialogical, equitable, and respectful discourse is not the dominant narrative, it is important that the

stories to live by (Clandinin et al., 2006) of those who choose to work within this paradigm are storied and restoried (Clandinin and Connelly, 2000), and their stories are lived and relived (Clandinin and Connelly, 2000) by others through a form of dialogical engagement that allows us to "shed the shackles of the past, thereby permitting a transformative attitude towards the future" (Sachs, 2001, p. 157). These narratives are an extremely important part of a more dialogical, equitable, and respectful discourse and "provide a glue for a collective professional identity and provide a provocation for renewing teacher professionalism" (Sachs, 2001, p. 158) which in turn creates rich and complex professional identities.

This implies that as teachers we must, within a more dialogical, equitable, and respectful discourse, become playful with our identities. That is, we must move our identities as culture brokers away from an agonistic and competitive playfulness towards a loving playfulness (Lugones, 1987), one that involves an "openness to surprise, openness to being a fool, openness to self-construction or reconstruction and to construction or reconstruction of the 'worlds' we inhabit playfully" (p. 17). Lugones (1987) also claimed this means being open to "a metaphysical attitude that does not expect the world to be neatly packaged" (p. 16). I would contend that this playfulness means being open to challenging one's ontological and epistemological beliefs and moving away from the grand narratives that exist within the modernity of high school science and towards a complexivist (Bloom, 2011; Davis & Sumara, 2006; Doll, Fleener, Trueit, & St. Julien, 2005; Gough, 2012; Ricca, 2012) and post-modern (Doll, 1993) identity that is supportive of a bounded chaos imbued with cognitive playfulness (Doll, 1993), an identity that intentionally fuzzies the borders for our students to more successfully world travel – a culture broker identity.

With that said, throwing one's identity into narrative dissonance can be chaotic and the reorganization of those narratives is challenging especially when one's ontology is challenged as in our modernistic society "there is a fear of the chaotic" (Kennedy, as cited in Huber, Murphy & Clandinin, 2003, p. 351). We must therefore acknowledge, "that rethinking classroom practice is exceptionally demanding." (Sachs, 2001, p. 150) and encourage teachers to enter into this restorying with an attitude of serious playfulness in order to create morning stories that enable. Spillane (2000) contends that teacher identity restorying through professional learning opportunities is shaped by subject specific teacher learner identities and determines, to a large extent, a teacher's ability to enact reforms within that subject. A good example of this is Ms. Adams (Spillane, 2000) who, due to her traditional mathematics identity, attempted to memorize the reform teaching strategies that she was exposed to in her professional development opportunities. This contrasted the dynamic,

reflective and dialogical constructivist inquiry approach she took with her professional development around literacy reforms. As a result of this research, Spillane questioned the research that argues for more professional development as opposed to refocusing on the nature of professional development and hints that it should shift from learning about reforms to learning about one's own identity in relationship to their teaching, that is "who [one is] as a *learner about instruction*" (p. 327) including one's core purpose as an educator. As such, teachers need to move towards a constructivist form of long term professional development that scaffolds *identity making possibilities* (Huber & Clandinin, 2004) with a science specific focus on identity – the ontological and epistemological nature of teaching and learning science – that is dialogical and reflexive (Doll, 1993) in a public sphere of deliberating (Schwab, 1969) peers that forms the local culture of teachers, a focus on morning stories developed on emergent inquiry landscapes.

CHAPTER 3

STEPPING INTO A LIVING NARRATIVE INQUIRY

As I contemplated how to step into a section on narrative inquiry as a methodology it only made sense to start with an experience that illustrated the nature of narrative inquiry as both a methodology as well as the phenomenon under study (Clandinin & Connelly, 2000). I specifically have focused this research on a living narrative inquiry (Connelly & Clandinin, 2006) which particularly addresses not only the past but also the present and the possibly imagined future experiences of the participants. As such, given the complexity of inquiring into teachers' identities on emergent inquiry landscapes, the unfolding of the telling and retelling of this narrative inquiry will not be linear but rather more holistic, moving back and forward temporally and often unfolding in dribs and drabs in order to parallel the nature of the narrative inquiry itself.

Sharing an Inquiry Identity: Christina's Tension with Contextualized Inquiry Experiences

Christina[1] approached me at the end of the high school science inquiry group professional development meeting. Although it was clear Christina was ready to leave – she was standing with her coat on and her computer was in her bag on her shoulder – she stuck around until everybody else had left to go back to teach in the afternoon. It was clear she had something pressing to share that was creating much tension for her. She said very tentatively to me: "*with my posts, do you think **they** will 'get it'?"* (Field notes, December 16, 2011). In our meeting, we had been sharing our inquiry experiences and discussing non-traditional artifacts that would be useful for sharing our inquiry experiences with other teachers. Collectively, the group was attempting to address the question that continually came up: *How do you share a philosophy?* We had been together as an inquiry group for about three months and had met on four different occasions for formal professional development on inquiry and more informally to co-construct our format for sharing the experiences of our inquiries with students – a contextualized inquiry experience (CIE - Figure 3-1) – and to share our inquiry experiences. Today we were at what had been Halter School, which is now a set of meeting rooms used in part by the school division we work for and in part by the local tribal council. The meeting room we occupied was expansive, far too large a space for our group to fill, with large windows that allowed the light to stream into the room. It was a positive space with the smell of Sweetgrass – no, Christina tells me it was Sage as there were women present – illuminating

[1]Note that all the names of the participants and the places which would reveal their identities are pseudonyms in order to protect their identities.

Contextualized Inquiry Experience

Teacher Developer: Christina **Subject**: Biology 30 **Date:** 27/04/2012

Teacher Contributors: **Classroom Context:** Shure Falls, 35 students, 2 hour block

Unit of Inquiry: Animal Systems

Length/Staging of Inquiry: 5 - 6 weeks and 5 disclosures

Inquiry Question: How can we create an educational outreach program that informs our community about the health risks associated with poor nutrition and fitness in such a way that will address at least four body systems affected, describe in detail these body systems, and how & why they are adversely affected by poor nutrition and lifestyle choices?

Inquiry Level (Demonstrated, Structured, Guided, Self-Directed/Open)**: Guided PBL**

Learning Context (Scientific Inquiry, Technological Problem Solving, STSE Decision Making, Cultural Perspectives)**: STSE Decision Making, Cultural Perspectives**

Curricular Outcomes: Unit 4 Animal Systems: 2.0, 2.1, 2.4, 2.5, 3.0, 3.1, 3.2, 3.4, 4.0, 4.1, 4.2, 4.3, 4.4, 5.0, 5.5, 5.6, 5.7, 5.8, 5.10

Summary of Inquiry: In this problem based learning case, major human body systems are learnt as students take on the role of nutrition outreach workers and prepare an educational outreach program that describes the effect that diet, nutrition and lifestyle have on these body systems. The case begins with some startling facts related to human fitness decline in Canada based on information presented in the Canadian Health Measures Survey. Subsequent disclosures go on to have students understand the circulatory, endocrine, reproductive and nervous systems. How food and lifestyle choices positively and/or negatively affect these systems is to be included in the outreach program. Expect this to be a high impact and engaging case that will take learners in a variety of directions.

Supporting Materials Checklist:

- ☒ **Teaching Notes (Required Prior Knowledge, Culture of Inquiry, Scope and Sequence)**
- ☐ **Student Resources**
- ☒ **Teacher Resources**
- ☒ **Assessment and/or Evaluation Strategies/Documents**
- ☒ **Video Artifacts of the Inquiry**
- ☒ **Assessment and/or Evaluation Anchors and/or Exemplars**
- ☐ **Student Artifacts**
- ☒ **Student Comments and Reflections (ex] exit slips, anecdotal, interviews, conversations)**
- ☒ **Teacher Reflections**

Other Notes:

Figure 3-1. A contextualized inquiry experience (CIE) cover sheet. This document was set up as the first place to look when trying to see the experiences of another teacher within a particular inquiry. This document and the supporting materials were uploaded onto the division website which was restricted to those teachers employed by the division who were interested in viewing or contributing to inquiry in high school science. This particular problem based learning case was co-developed by Christina.

the air from a Smudge earlier in the day performed, as I understand it from Christina, to drive negative feelings and thoughts from the building and from the lives of those who would be gathering there, those of Treaty Four and Six which we were all part of.

I knew what Christina meant regarding her CIE posts eventually to be accessible via a SharePoint site to all high school science teachers in the division, not all of whom had yet to embrace the liminal spaces required to shift themselves onto an emergent inquiry landscape; in fact, some teachers, some real and some fictionalized constructions of our minds, were quite verbal about their disdain for our new inquiry-founded provincial curriculum and about their preference for teaching science using traditional *factual gavage*[2] methods for those select pipeline students (Aikenhead, 2003) with identities suitable to the consumption of reductive and decontextualized science content. Interestingly, and unfortunately, at some points in my life this would have suited my learning style quite well. I wish I had been challenged with something richer.

Exploring Christina's Tension on her Emergent Landscape: Relating Purpose and Question

While Christina's question – "with my posts, will they get it?" – may appear to be inconsequential or possibly even dichotomously divisive, it was evident to me that this represented a significant tension for Christina that can best be understood through the exploration of her experiences in an attempt to understand what she has vested into the identities she has constructed. The broader purpose of this research was to explore how an individual's understanding of his or her own identities affects the emergence of a renewed inquiry founded curriculum through narrative inquiry and to investigate the emergent experiences in the areas of planning and assessment that were supportive of the implementation of this renewal. Early on in the research it became evident that understanding one's own identities was not done in isolation, but rather in mutual interaction (Ricca, 2012) with other identities, in the social milieu on the landscapes that we narratively construct and live within. A strong group focus emerged around the question, *How do you share a philosophy?* As such, this partial but careful telling and retelling (Clandinin, 2006) is a sharing of the emergent identities of several teachers in relation, including Christina, in a way that values their experiences and highlights the sharing of their philosophy, of their emergence, their shifts through

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[2]Gavage specifically is the process of force-feeding waterfowl a high caloric and high fat diet through a feeding tube forcibly inserted into the esophagus. It works particularly well on select bird species such as waterfowl due to their suitably weak gag reflex and flexible esophagus. Gavage fed waterfowl are fed multiple times a day for weeks in order to fatten up their liver in preparation for the "pipeline" production of foie gras. The similarities of gavage to Tyler's rationale (1949), to Cubberly's factory model, and to Friere's (1989) "banking model" of education are striking.

liminal spaces, towards more complex and holistic identities on an emergent inquiry landscape. The primary focus of this telling and retelling then is

> not only a valorizing of individuals' experiences but also an exploration of the social, cultural, and institutional narratives within which individuals' experiences [are] constituted, shaped, expressed, and enacted – but in a way that begins and ends that inquiry in the storied lives of the people involved. (Clandinin & Rosiek, 2006, p. 42)

As I step through the artifacts and field text from nearly a year ago in order to retell their mo(u)rning stories, their stories to live by (Clandinin & Connelly, 2000) from the beginnings of their shifting identities on an emergent inquiry landscape and to and fro through liminal spaces, I am once again experiencing the engagement, the falling in love with the field (Clandinin, 2006) and feel somehow once again in the midst of the lives we experienced together as I was throughout this research which spanned nearly two years. My hope is that these mo(u)rning stories explored through narrative inquiry can enrich our identities and can offer the possibility to high school science teachers including Christina, Joel, and Beth – the primary audience of this telling and retelling – to relive their storied lives differently.

¶ The secondary focus of this telling and retelling, is to highlight the borderland space (Clandinin & Rosiek, 2006) between narrative inquiry and complexity. It is an attempt to avoid the tendrils of modernity (Doll, 1993), of the positivistic and post-positivistic pulls on my own identity as a researcher, an attempt to shield myself from the throes of "spooky action at a distance" that so much influences the narrative construction of our identities as we construct emergent inquiry landscapes in and amongst existing landscapes and identities in high school science. This second focus, written softly, as illustrated here, through the main research text, then is here to highlight narrative inquiry as a methodology that avoids complexity reduction in educational inquiry (Gough, 2012), that avoids "fall[ing] short of capturing the fundamental patterns of relationships and the contexts within which they exist" (Bloom, 2011, p. 22). It is a cautious attempt to illustrate the richness that narrative inquiry can provide to others with identities in concert with complexity, an attempt to answer Gough's question: "how might understanding our worlds and selves as open, recursive, organic, nonlinear and emergent make 'a different practice' possible for educational inquiry" (Gough, 2012, p. 53)?

¶ In this illustration, however, exists my own tensions. While I am not contending that narrative inquiry in any way needs concepts, validation, enhancement or justification

> from complexity, I do want to explore this particular borderland space for its ability to offer up "new possibilities for analysis" (Clandinin & Rosiek, 2006, p. 64) for complexity through the lens of narrative inquiry and an ontology of lived experience. In this exploration of new possibilities, I will be taking care to not place the priorities of complexity ahead of the priorities of narrative inquiry or ahead of the experiences of Christina, Joel and Beth – hence the visual interruption as I step somewhat away from experiences and towards the theories of complexity. As such, this research text will be primarily storied, with a soupçon of complexity, wonderings in the borderland space. The tension I continually write with is one of "staying with the complexity of experience and trying to describe it [while] staying away from the seductive words of a theory that talks about complexity but steps away from experience" (S. Murphy, personal communication, November 9, 2012). It is really a tension of audience and purpose and as such, care will be taken to not "ameliorate this tension by seeking universal themes in which the narrative tensions can be contained" (Clandinin & Rosiek, 2006, P. 60).

Coming to Narrative Inquiry: Conflicting Ontological Commitments

I had just started my Master's work which I knew would focus on our renewed Saskatchewan science curriculum which was holistically (Aikenhead, 2003) focused on the scientifically literate student (Figure 2-1), on inquiry in its broadest sense as a philosophy, on engaging learning contexts (scientific inquiry, technological problem solving, cultural perspectives and science, technology, society, and environment decision making), and on four foundations – scientific and Indigenous knowledge; attitudes; skills; and science, technology, society, and environment. Saskatchewan's renewed science curriculum, a decolonization of the Pan-Canadian Science Framework is currently in the process of emerging to support "decolonizing, place-based, [and] culturally responsive science instruction" (Aikenhead & Elliott, 2010, p. 321).

I knew Dean Elliott and Glen Aikenhead well and had worked with both of them extensively. I was in the process of approaching professors to be on my committee for my thesis research. I had asked Glen, one of my former professors and a leader in science education in the province, if he would be willing to sit on my committee despite the fact that he was technically retired. He agreed but felt we should meet to discuss my ideas about what I wanted to research. My goal was to involve myself with research in the areas of scientific literacy, inquiry and environmental, place-based and First Nations ways of knowing. I was interested in why inquiry had not been successful in our schools, interested in the idea of holistic education (Aikenhead, 2003),

and thought that a qualitative survey and semi-formal interviews of many teachers across several school divisions would be of use – a mixed methods study with a focus on validity, reliability and triangulation.

One cold and dark February night after Tehalen and Evan had their bedtime story – *I wonder if we could make time for morning stories* – I headed over to Glen's and I pitched him my research question and methodology and instead of embracing my idea, he suggested I look for those teachers who were successful with inquiry and find a way to research their experiences. I was glad that Glen had shared his years of experience with me but I felt deflated, unsure of how and what to research in the way he was suggesting. Glen's recent work (Aikenhead, 2011) focused on quality science teaching in regards to what teachers teach and do not teach, the self-identities of students, and what students could do with their learning in science. This recent work also highlighted the need to look at teachers' identities, their pedagogies and classroom cultures, and the relationships they established with students. Although my ideas about what to research were moving away from more reductionistic views of science education, my thoughts about educational inquiry, about research were clearly still quite tied to positivistic and post-positivistic ways of thinking. Like others, I am sure, I spent much time thinking about my research question and rather than choosing a methodology first, as I had done the first time around with the first draft of my proposal, I instead came up with a question and then attempted to find a research methodology that would be useful to explore the complexity of the question I had chosen.

In my first semester I had spent much time working on a proposal for research based on my research questions related to teacher identities and pedagogies. I had researched much about scientific literacy, constructivism, inquiry, barriers to inquiry (Anderson, 2002; Weiss, Pasley, Smith, Banilower, & Heck, 2003) particularly in high school science, about holistic education and about various paradigms and Western, place based, and First Nations worldviews (Aikenhead, 2002, 2003; Aikenhead & Michell, 2011; Battiste, 2000, 2007; Ermine, 1995; Gruenewald, 2003;Hodgson-Smith, 2000; King, 1991). I had taken a survey class on quantitative and qualitative research methodologies taught by a professor who largely did quantitative research; however, at the time I was still unclear as to what research methodology I could use to research the complexity of teachers' experiences without negatively affecting those experiences or reducing the complexity of those experiences. In the second semester, I took a class on identity composition in curriculum making which focused on narrative inquiry, as well as a class on qualitative research methods. I was attending classes at night and teaching part-time during the day. My son Evan, who was five, and

who is now turning eight, attended the first hour of my qualitative research methods class. He was stellar and spent his time reading books and drawing while the class discussed the nature of reality and the works of a plethora of authors, quietly sneaking out when his mother and sister came to pick him up after my daughter's Music for Young Children class.

While my committee had embraced the research questions I had put together focused on teacher identities and pedagogies such as assessment practices, my experience in my qualitative research methods course was far from supportive of the form of educational inquiry that I clearly needed. I was attempting to utilize my research methods course to expand and clarify my research proposal which needed to go to ethics by the end of the course. I had written my proposal and submitted it for my professor's review. I received much feedback, some of which was useful and some which was not – it was the lowest mark I had received in graduate school. What struck me, however, was the concern surrounding the research questions I had. Admittedly, the writing I had to go along with my research questions was still confounded with positivistic tendencies – a fact that my committee was quick to point out later in the semester: "where is Kevin in this?", "why is narrative inquiry important to you", and "this will have to be rewritten if it is to be narrative inquiry" (S. Murphy, personal communication, April 9, 2011).

I decided to go in to discuss the feedback with this professor. As this professor outlined the issues that were of concern, I did come to realize that much of the disconnect between my view and my professor's was related to my research question. When I probed further, I was told that I had put forward "an impossible question", a question with no definitive answer. This professor was concerned about the impossibility of a researcher determining an "individual's understanding of his or her own identities"; however, I couldn't see how one could look at identity without involving the individual who had constructed it. After all, identity was a construction – built from an imagined past, imagined present and imagined future (Dewey, 1938) – and not something one could place on the table before me to observe and measure. This professor wanted me to change my question to something that was definitively answerable, something that ***I*** could come to a conclusion about. I was not concerned about the answer; rather, I was interested in how *we* constructed *our* identities, about the lived experiences of those who had started to utilize inquiry in their classrooms to engage students in more holistic ways. I had read about modernity and post-modernism (Doll, 1993), about post-positivism (Lather, 2007) and about the connection between various ontological and epistemological ways of viewing the world. I very much understood that any significant research endeavour had the potential to not only influence the identities of the participants but also the

identities of the researcher. I was searching for a methodology, a way of inquiring that would reduce the influence of positivism on me and on the inquiry group which was already in the process of forming. What I now realize is that this professor had a different set of ontological commitments (Clandinin & Murphy, 2009) than I was starting to form. I was shifting from post-positivistic versions of truth to an ontology focused on lived experience (Clandinin & Connelly, 2000; Dewey, 1938) that viewed reality as relational, temporal and place or context focused. Due to my confounded mixture of a research question founded in an ontology of lived experience and post-positivistic ramblings that formed my proposal, I had not communicated the richness of my questions nor had I communicated the poverty associated with viewing those questions through the post-positivistic lens of educational inquiry which would have excluded "large regions of human experience that influence human affairs – personal meaning, love, hate, aesthetic considerations, religious experience, [and] narrative coherence of individual lives" (Clandinin & Rosiek, 2006). Certainly, I am now much more comfortable with the uncertainty and tentativeness (Clandinin & Rosiek, 2006) associated with narrative inquiry than I was at the time of my first proposal and feel that in order to fully explore teachers' shifting identities and practices that we need research methodologies that construct meaning together with those teachers as we experience each other's storied lives.

Deformalization of Methodology: The Foundations of Narrative Inquiry

In order to illustrate the emergence of teachers' identities and changes in classroom practices, their mo(u)rning stories, I spent much time over the course of two years in the classrooms and meeting spaces of the teachers that were part of this research including time spent with them individually in person and in correspondence. As such, the research itself, including the questions that were pursued is very much "a collaboration between researcher and participants, over time, in a place or series of places, and in social interaction with milieus" (Clandinin & Connelly, 2000, p. 20). As narrative inquirers, it is essential that we enter "this matrix in the midst and [progress] in the same spirit, concluding the inquiry still in the midst of living and telling, reliving and retelling, the stories of experiences that made up people's lives, both individual and social" (Clandinin & Connelly, 2000, p. 20).

The framework utilized to explore this milieu is itself unique to narrative inquiry in that we strive to generate research text in a rich three-dimensional narrative inquiry space (Clandinin & Connelly, 2000), situated in a particular place, on a temporal plane oscillating backward to the past and forward to the future, and on complex relationships and interactions which move inward

towards the personal and outward to one's social milieu. This inquiry space is founded on an ontology of lived experience (Clandinin & Connelly, 2000) derived from a Deweyan (1938) definition of experience inclusive of continuity, interaction and situation. Narrative inquiry in itself is a deformalization, pulling away the impeding formalistic and reductionistic – the positivistic and post-positivistic – ritualizations and artifacts such as the illusions of objectivity in educational inquiry or mitigated subjectivity and triangulation of other qualitative methodologies, in order to put forward a new, more complex and emergent methodology focused on new ritualizations and artifacts founded on experience.

Elaborating on Narrative Inquiry to (Re)Story an Emergent Inquiry Landscape

It is my belief that in addition to producing research that contributes to the emergence of constructivism and inquiry in Saskatchewan high school science classrooms, research should enable the participants to expand their identities as well. As Clandinin and Rosiek (2006) stated, the research itself should work at "collaboratively enhancing those persons' continuing experience" (p. 61) and as such my methodology should also enhance the emergence of constructivism and inquiry in my participant's practices. Therefore, instead of being reductionistic, research should be holistic; instead of being evaluative it should be supportive; instead of being generalizable it should have depth and be transferable to similar contexts.

Due to the exploratory and context specific nature of the research wonders involved it is likely that along the qualitative continuum of research (Ellingson, as cited in Marshall & Rossman, 2011), a method from a middle-grounded approach – as opposed to a scientific, modernistic, approach or an impressionist approach – will serve best to not only explore and to describe the emergence of an inquiry-based curriculum but also to create critical, emancipatory, and transformative opportunities within the high school science community in light of known barriers (Anderson, 2002; Aikenhead, 2003) to the implementation of our renewed inquiry founded curriculum. These barriers are well known tensions within high school science education in need of exploration and as Aikenhead (2003) states, "there are daunting challenges to educators wishing to change the traditional science curriculum into a humanistic one" (p. 39).

As a result of the specific contexts, complexities and idiosyncrasies of researching more humanistic science curricula, Aikenhead (2003) concluded that many past quantitative and qualitative studies had limited generalizability and inconsistencies from study to study which very likely restricts their utility for teachers. Utility for teachers is of utmost importance and hence the selection of a methodology is critical in bringing forth that utility. Chang and Rosiek (2003) found,

in their narrative inquiry in high school science, that there were three main developments that led to their selection of a more narrative approach to their research. First, there is much teacher knowledge that exists in narrative form. Second, this knowledge is best documented using collaborative research methods, and third, narrative representations are best at capturing the "wisdom of teaching practice" (p. 252). As such, narrative inquiry (Clandinin & Connelly, 2000) will be utilized to illustrate the emergent experiences of teachers in the process of implementing an inquiry founded curriculum within the hegemonic culture of high school science. Furthermore, narrative inquiry will provide me with the ability to explore social change and identity (Elliott, as cited in Marshall & Rossman, 2011) which, as previously argued, is required due to the nature of our renewed curricula. This draw to narrative in researching high school science's largely modernistic curriculum is not unique. As Chang and Rosiek (2003) so eloquently stated in their study:

> If our conception of the curriculum is adversely influenced by an ideology so pervasive that few if any practitioners may be thinking outside of it, then looking only to existing practises for wisdom will simply reproduce that hegemony. Given these conditions, narrative research would be needed that generates new counterhegemonic understanding of teacher practice. (p. 252)

It is this new wisdom about teacher practice that I hope to share with the teacher community, the successes and struggles associated with changing paradigms and changing identities associated with the deployment of a more humanistic curriculum founded on constructivism and inquiry.

As a recovering modernist and a continually emergent constructivist, post-modernist and complexivist, it is narrative inquiry, with a "Deweyan ontology of experience" (Clandinin & Rosiek, 2006, p. 43) that paradigmatically bumps up best against the borders of the identities I have formed as a teacher and a researcher. It is not my intent in this research to search for universal cases or themes, divisive dichotomies (Clandinin & Rosiek, 2006) or further hegemonic structures. Rather, it is hoped that this research can find the "tension produced by constantly proliferating counter narratives" (Clandinin & Rosiek, 2006, p. 60) such that teacher's emergent, contextual, and descriptive experiences within our renewed inquiry curriculum can be multiply illustrated. As opposed to existing descriptive qualitative research on constructivism and inquiry in high school science, such as that by Stephans and Schmidt (2009), which often focuses on successful programs or specific classroom strategies, this research will explore, analyse, and interpret the mo(u)rning

stories – enabling stories – in an attempt to provide vicarious critical, emancipatory, and transformative experiences for those who read this research.

In terms of narrative inquiry's utility for analysis, Wiebe (2010) described the flexibility of narrative inquiry and explained that the analysis or restorying approach can take many methodological forms including restorying through narrative re-presentation, by thinking through narrative, through character, thematic, or structural approaches. In addition, there are sociocultural, personal, artistic, and pedagogical contexts for restorying that enhance the possibilities for representation and hence for one's work to be engaging and emancipating or transformative for research participants, co-researchers and future audiences. This capability for reflection and exploration of identity and change in practice has been led, in the education field by Connelly and Clandinin (Bell, 2002) and according to Bell (2002), narrative inquiry has the advantage of an analysis that recognizes that narratives are structured and restructured "in the light of new events…[that are]…shaped by lifelong personal and community narratives" (p. 208). Narrative inquiry will then be ideal for showing insight into identity, which, like narrative inquiry, is a function of temporality, place and milieu (Clandinin, Pushor, Orr, 2007; Clandinin et al., 2006). In addition Bell contends that narratives allow an understanding of experience, an analysis of hidden assumptions, an illumination of the temporal notion of experience; it allows a presentation of "experience holistically in all its complexity and richness" (p. 209).

Restorying to Relive Holistically: Narrative Inquiry Analysis and Context in Science Education

In order for the formal analysis section in this research text to be understood, it will be useful to understand the analytical approach that was taken in the collection and construction of field text and in the construction of this research text, in the telling and retelling. My research wonders focused largely on experience and identity which are influenced by personal and social factors, and sought to illustrate as opposed to explain the experiences of individuals' own understandings of their identities. Thus, this research and hence analysis is focused on Clandinin and Connelly's (2000) three dimensional narrative inquiry space (see Table 3-1), itself founded on a Deweyan ontology of experience. Focusing on collecting and constructing field text of teachers' present experiences while looking backward to past experiences and forward to future experiences ensures a continuity and temporality of experience. Looking inward towards the personal experiences of teachers and how those experiences relate to the social milieu around those teachers ensures that the experiences shared occurred in interaction. Finally, focusing on the collection and construction of field text from

a variety of contexts or places will help to illustrate the milieu of this inquiry. Additionally, given my conceptual framework of emergence – derived from complexity – and the necessity to move away from modernity in support of constructivism and inquiry, a holistic, experience oriented approach to analysis will hopefully avoid the comfortable tendrils of a more linear cause and effect modernity. Interestingly, Ollerenshaw and Creswell (2002) noted that the selection of analysis structure might depend on "whether a more linear approach is suitable (i.e., as in some science education research)" (p. 345). I have to admit that I am quite happy that they felt it possible to allow me out of my "modern" cage with the inclusion of the word "some". Certainly, if one favours a post-modern (Doll, 1993) ontology in relation to science education and its research, as do I, with its focus on recursion, relations, and rigour, a rigour that focused on a combination of complexity of indeterminacy with the hermeneutics of interpretation through critical community, then one would have no choice but to step away from a problem-solution narrative analysis structure and towards a more holistic analysis structure such as Clandinin and Connelly's three dimensional narrative inquiry space.

Table 3-1. Clandinin and Connelly's Three Dimensional Narrative Inquiry Space

Situation/Place	*Interaction*		*Continuity*		
	Personal	*Social*	*Past*	*Present*	*Future*
Look at context, time, and place situated in a physical landscape or setting with topological and spatial boundaries with characters' intentions, purposes, and different points of view	*Look inward to internal conditions, feelings, hopes, aesthetic reactions, moral dispositions*	*Look outward to existential conditions in the environment with other people and their intentions, purposes, assumptions, and points of view*	*Look backward to remembered experiences, feelings, and stories from earlier times*	*Look at current experiences, feelings, and stories relating to actions of an event*	*Look forward to implied and possible experiences and plot lines*

Adapted from "Narrative Research: A Comparison of Two Restorying Data Analysis Approaches," by J. A. Ollerenshaw and J. W. Creswell, 2002, Qualitative Inquiry, 8, p. 340.

Although narrative inquiry has been utilized extensively in the field of education to look at teacher practice and teacher identity, a search on ERIC – Education Resources Information Center 1965 – Present – for narrative inquiry and science education revealed few entries especially in the

area of high school science. Two studies were found, however, that were specifically related to high school science. The first was a narrative inquiry study conducted by Capobianco (2007) looking at secondary science teachers' attempts at integrating a feminist pedagogy, transforming their practice through collaborative action research. Capobianco's study paralleled this research in that both looked at teachers in a collaborative action research situation. The second study which relates to the emancipatory nature of this research, conducted by Hwang (2009), was a narrative inquiry set up to understand secondary science teachers' interpretations of their own environmental teaching experiences. This study brought out themes related to teacher identity and elaborated on how narrative inquiry was able to disrupt or create cracks and ruptures in traditional school education.

Primary Research Hopes and Desires

It is hoped that through this narrative inquiry the experiences of teachers and their existing and newly formed tensions "can be a source of new ideas and rich interdisciplinary dialogue" (Clandinin & Rosiek, 2006) for high school science teachers to use in storying and restorying their identities or *stories to live by* (Clandinin et al., 2006). Through the process of telling and retelling the storied lives of teachers I hope that teacher leaders in constructivism, inquiry, and assessment emerge with rich morning stories to share. Furthermore, I hope that the storied narratives that are a result of this research can be utilized in long-term teacher professional development.

Although this research was done with teachers, its ultimate purpose is to have an impact on learners in science. That is, I hope that through engaging teachers in inquiring into their identities as related to constructivism, inquiry, and assessment that we can engage students in a richer form of scientific literacy that is founded on constructivism and inquiry in high school science. As such, I hope that through the experiences of the teachers in this research, we will be able to inform the teaching-learning climate in high school science in Saskatchewan and benefit our students as they strive to achieve a more holistic view of science that includes both the cognitive and the affective. I truly believe that it is every science teacher's desire to have their learners become better critical thinkers in the cognitive and affective domains of science, technology and the environment – hence more scientifically literate. That is, I hope that our learners become imbued with abilities and attitudes such that they are capable of scientific literacy in action (Aikenhead, Orpwood & Fensham, 2010).

Considering Ethics: Co-constructing Emergent Inquiry Landscapes and Negotiating Research Relationships within Existing Landscapes

As I was trying to shift my own identities, I could not find a group of teachers to construct an emergent inquiry landscape with. I was tired of being sucked into the tendrils of modernity, into the stories of mourning about our renewed curricula and about the "realities" of the classroom and our students. I wanted to story my identity differently and wanted other, more dialogical and reflexive, conversations that I and other high school science teachers could choose to partake in independent of the research I was planning on doing. I wanted to hear other's stories of morning, ideas about how things could possibly be done differently with our renewed curricula, and experience their morning stories, their experiences with actually living and being different in their classrooms. As a teacher within our division, I was able to procure funding for a professional development group focused on looking at inquiry as a philosophy and the associated assessment with the upcoming renewed Science 10 curriculum from the Ministry. For ten of our Science 10 teachers, including me, we were able to secure ten half days and a two day professional development course on inquiry facilitated by the Saskatchewan Professional Development Unit (SPDU) – a branch of the Saskatchewan Teachers Federation. I also applied for some funding from the Stirling McDowell Foundation for release time for myself and participants in the research to spend time in other people's classrooms. The benefits to teachers who participated in this professional development group included multiple opportunities to develop supportive relationships – a discourse community – on which they can continue to draw. Furthermore, their professional development and their readings could be used as evidence for re-accreditation for senior science subjects as well as to lead others in the areas of inquiry and assessment. In addition, these teachers would be well positioned in the process of implementing new provincial curricula in high school science in the school division.

Our school division exists in a Western Canadian city that has a diverse population of over 100,000 people including approximately ten percent who identified themselves in 2006 as Aboriginal (Statistics Canada). The school division itself has multiple high schools with student populations ranging from approximately two hundred to fourteen hundred students from grades nine through twelve. With funding in place, I proceeded, on my own time to approach high school science departments within the division to pitch not only the structure for this teacher initiated professional development but also the possibility that some teachers, who involved themselves in the professional development group – the inquiry group – may be approached to be a participant, or

even a co-researcher, in this research study looking at teacher identity and assessment practices. Despite several requests to present the idea within my own school, I never did get a chance through the department head to formally address the department. We were, and still are, a fractured bunch. I did attempt to talk to people individually; however, what I ended up stepping into at the individual teacher level was largely more *stories of mourning*, about the flawed new provincial curriculum, about pedagogical, epistemological, and even ontological issues with constructivism and inquiry, and about the incompetence of our students and the teachers that taught them prior to grade 9. These were not the people that I wanted to converse with anymore; I was done trying to convince. I wanted to find colleagues who chose to share *stories of morning* and *morning stories*.

Negotiating Place: Stepping into the Existing Landscape

I made it out to five high schools in May and June, the end of the school year, prior to starting the inquiry group in August of the following school year. Two of these schools were relatively small and as such my conversations with them was rather enjoyable. Based on my past experiences with the teachers at these schools, I knew there would be few stories of mourning. Rather, there were already stories of morning about the possibilities of our renewed curriculum would offer us. The teachers at these two schools also spent much time sharing their morning stories, their experiences from the inquiry landscape they were constructing, sharing artifacts from their students, and stories about the activities they did. I found it hard to pull myself away from these conversations. They were attractive and enabling stories, stories which awoke me from the stupor of May and June that many teachers face. At three of the schools, I was less fortunate. At all three I felt welcomed but definitely felt a tension as I stepped through the brief PowerPoint describing the structure and funding of the professional development group. At each school, several teachers came and went during the presentation due to other commitments and I suspect for some, a lack of interest. Discussion ensued after the presentation at each school and the most vocal stories were stories of mourning again about students and their inabilities and about the pedagogical and epistemological concerns about constructivism and inquiry, concerns about the direction of the renewed curriculum. There were also those present who were silent who I suspect had much to say based on the twisting and turning in their seats, their crossed arms, and sometimes even their huffs, grunts and groans when others shared their stories of mourning. I was not stepping into a new tension. There were several science landscapes at each school, traditional landscapes and emerging ones. These were also hard conversations to step away from in that it was easy to debate, to try to convince, but I did step away eventually from these discussions which largely were discussions with

pipeline enthusiasts, those with identities highly coupled to their subject matter, coupled to the "modern" view of science. They were hard to step away from as I was once very near to there and might have argued the same given that I started as a middle-of-the-road teacher with significant threads from the grand narrative. I could not help but vent to my wife after each one, however, about the reductionistic view that some teachers held about science and about their students, about content consumption and about issues of motivation and engagement of our teachers and our students. Maybe I was just reifying the narrative reconstruction of my own identities, maybe this venting was part of maintaining and finding a more coherent set of identities more supportive of an inquiry landscape.

Negotiating Research Relationships: Finding Others Interesting in Sharing Morning Stories

Out of these conversations, there were ten to twelve teachers who were interested in becoming involved with the two day professional development on inquiry and about nine or ten who were interested in being involved with the inquiry group. Based on my past professional development and teaching experiences with some of the teachers, I had an idea about who I might ask to be involved in the research. These were teachers who were either middle-of-the-road teachers or those who were humanistic science teachers whose experiences, I felt, would make for great morning stories. At the end of one of these meetings, Joel, a teacher with twenty plus years of teaching experience in high school science and a teacher with whom I had volunteered in the community, approached me to talk further about the professional development group. It was this conversation, which, at times bordered on stories of morning about the renewed curriculum, stories about opportunities for students – *"if we're bored, you can imagine what they're thinking"* (field notes, February 29th, 2012) was a favourite expression of Joel's – and about some of Joel's past morning stories about his past teaching experiences which I think drew me to approaching Joel about becoming a research participant in this study. Joel also had concerns about morning stories he had witnessed before that never materialized into something more permanent due to issues of time and teacher burn out (field notes, September 13th, 2011). This was a tension that Joel and I discussed on several occasions. I did not approach Joel, however, about becoming a participant until well after our two day professional development session on inquiry and after several meetings that we had as an inquiry group. Both Joel and I seemed somewhat hesitant on entering into a research relationship; however, our comfort with it improved with time. Maybe it was that we were just both too busy to have the conversations we needed to have to make it more comfortable. Maybe it was the concerns about time and teacher burn out that prevented us from stepping further into

things. Maybe Joel was intentionally moving slowly and cautiously. In the end, I never did spend time in Joel's classroom as he worked with students. I do not know why. Maybe I was not quite comfortable enough to ask, maybe he was not comfortable enough, maybe I just did not have time. I did, however, spend about ten half days with Joel in inquiry group meetings, chatted with Joel extensively several times as part of the research, and I did get to see Joel in his classroom through the videos that he collected from his classroom while his students inquired into science.

The other participant I approached for this research study was Beth. Beth had engaged herself in starting a Master's at the start of this research and her first class was one co-constructed by myself on assessment and inquiry and taught by my supervisor. Beth signed onto this research study early in the year and had been very much engaged in the process of finding a way to implement inquiry in her classroom. Beth had seen a video of students involved in guided inquiry in biology that was shown as part of the SPDU inquiry workshop. This experience of sharing inquiry resonated with Beth, and hence with me, for quite some time and formed part of her morning story:

Kevin: We're having trouble trying to share this [inquiry], right. So usually we try to share products. But in my mind, with inquiry, what is the product? Is it a set of experiences? Is it connections and relations with students? What part of that do we share?

Beth: *Well, I think for me, you know that video that they showed when we went to the PD session?*

Kevin: Um hmm.

Beth: *It was that one on the neuron… or no, the brain, and the teacher and what she was doing. Seeing something like that, I was like, "Oh, I could do this." And then I had my own ideas.* (taped conversation, October 19, 2011)

Beth and I had taught across the hall from each other for a semester a few years ago and had developed a good working relationship. Beth and I also spent much time together inquiring into her experiences with renewed curricula in the form of discussions in the aforementioned grad class, reading of her posts for the class, presenting with her on three separate occasions both in and out of the division, observing and participating in her classroom on at least five or more occasions, participating in professional development days with her in the inquiry group, and having many in depth research conversations. Although Beth's field text and research text is rich and engaging with much utility for other teachers, especially those who wish to step into open ended inquiry, I have

chosen to largely exclude her experiences here as part of this research text given the depth and breadth of experiences we shared. Rather, her experiences have been shared through a paper (Riffel, 2012) given at the American Association for the Advancement of Curriculum Studies and will be further explored with Beth as co-researcher, in a report produced for the Stirling McDowell Foundation.

Christina – "will **they** get it" – was also a participant in this study. I approached Christina to be in the study largely due to the questions she engaged in asking at the SPDU professional development days and her known involvement in problem based learning, a form of guided inquiry. I also had worked with Christina prior to her work at Shure Falls and as such stepping into a research relationship was relatively straight forward after the three or four days we had spent together discussing inquiry. Both Beth and Christina quickly understood what we were trying to develop, both in terms of our professional development group and as part of the research. They understood from the presentation the goal, the focus on "the how" of our renewed curriculum – a philosophy of inquiry – as opposed to "the what" – the content – and they understood that we could construct our wonders together, that we could research our identities collectively and that we would attempt to tell morning stories, to construct an emergent inquiry landscape together. I also believe they fully well knew that we were doing this amongst others who held the dominant identity in science, a subject matter identity; in fact the existing landscape was a persistent discussion in our first few meetings together. This understanding was developed over a number of different conversations. One of those conversations happened when Beth shared a ride back with me from our first inquiry group meeting. Beth mentioned her teaching at a previous school where there were many stories of mourning as she worked alongside a very traditional teacher, a pipeline enthusiast (field notes, September 13, 2011). While that was a significant experience for Beth, she was still able to stress the utility of sharing her morning stories. In fact, Beth stressed the need to start small and the need to share with others that they already did some inquiry in their science classes. She also felt that "*people need to see it"* (field notes, September 13, 2011). Beth got what we were trying to do; we were trying to create morning stories. On several other occasions, both Beth and Christina stuck around after our inquiry group meeting to discuss the purpose and process of what we were trying to do as an inquiry group. We spent much time talking about who we were developing morning stories for – it was not the pipeline enthusiasts – and about not engaging in conversations with colleagues that were largely stories of mourning, conversations that were not productive in terms of the morning stories we were attempting to create. They understood the need

to develop morning stories and share them despite the risk of their morning stories being reduced in their complexity (field notes, October 26th, 2011). It was a continual tension but one we found we were able to live with.

Negotiating Field Text: A Co-construction of Experience

Our inquiry group, consisting of ten or so teachers, including Beth, Christina, and Joel, proceeded to meet regularly – about once per month – for the first year. During the first eight half days of professional development, our group spent time inquiring into and deliberating the meaning and purpose of assessment and inquiry as well as determining key inquiry questions for science 10. As we proceeded to attempt to create inquiry experiences, we realized we needed a tool to share with and developed the contextualized inquiry experience document. Several of these days were in consultation with Dean Elliott, the science curriculum consultant from the Ministry of Education who was the driving force behind curriculum renewal. During this time, several books (Lewellyn, 2011; Aikenhead & Michell, 2011) and articles on inquiry and assessment were utilized to generate discourse and ideas. As we developed our CIE's, teachers, often with my support, videotaped inquiry lessons on a regular basis to bring back to our group as entry points to dialog, a telling of their experiences in the classroom. Teachers also brought back assessment tools and other artifacts from the classroom such as pictures, student work, projects and the like. As our experiences with inquiry grew, we moved to posting our CIE's online along with teacher and student reflections as well as artifacts from the classroom. As a group we were inquiring into inquiry, telling and retelling our inquiries as we produced further narratives of the experiences for others to partake in, a process that grew out of the work of Lebak & Tinsley (2010) and out of the nature of narrative inquiry itself.

At the end of this first year, our group used several half days to finish posting our CIEs and prepare for sharing our morning stories the following September with other high school science teachers who were not part of the group this year. The professional development session in September was well attended and teachers, along with three of my students, were facilitated through a guided inquiry by the teachers involved with our inquiry group. Additionally, teachers listened to , and discussed, my students' experiences with problem based learning, scientific inquiry, and technological problem solving in my Science 10 class the previous semester. Just recently one of the students who attended said to me that this teacher professional development day was one of the coolest experiences that he had in high school as he was inquiring, building and learning right alongside teachers and teachers were talking with him about what he thought about the learning. I

wonder if that is what teachers would want if they were in the role of student; inquiring alongside their teachers.

The reason for sharing the details of our inquiry group as part of this research is to illustrate the emergent inquiry landscape upon which I was involved with Beth, Christina, and Joel, a co-constructed landscape. Furthermore, I believe it illustrates the length of time and depth of involvement with Beth, Christina, and Joel which serves, I hope, to illustrate the type, length, and depth of professional development required to inquire into inquiry and hence identity and to illustrate the apparency and verisimilitude or recognisability, the authenticity, plausibility, adequacy, and invitational quality of this narrative inquiry (Clandinin & Connelly, 2000). In addition, the detailed workings of our inquiry group provides a context for the variety of field text that was co-constructed in this inquiry which included group and one-on-one conversations, emails, discussion boards, semi-structured interviews, field notes, inquiry group meeting transcripts, teacher analyzed inquiry video observations and reflections, graduate course reading responses, and inquiry group produced documents.

Exploring The Borderlands of Narrative Inquiry and Complexity

¶ While narrative inquiry borders a number of well-defined post- paradigms (Clandinin & Rosiek, 2006), it is my contention that narrative inquiry provides the enabling constraints (Davis & Sumara, 2006) necessary to maintain the experiential richness required to avoid complexity reduction while at the same time permits those who view their landscapes from a complexity lens to focus on the temporal and contextualized relationships and complex systems (Bloom, 2011) which tend to be open, recursive, organic, non-linear and emergent. Clandinin (2006) contended that narrative inquiry is "a methodological response to positivist and post positivist paradigms" (p. 45) and as such has a similar goal as complexity science. Clandinin and Connelly (2000) describe narrative inquiry as both the methodology and the phenomenon under study and contend that "for the narrative inquirer, the fact that the inquiry is altering the phenomena under study is not regarded as a methodological problem to be overcome. It is the purpose of the research" (Clandinin & Rosiek, p. 45). As such narrative inquiry is complex in that it is recursive and non-linear/autopoetic, itself the enabling constraint (Davis & Sumara, 2006) for further inquiry. In the case of this inquiry into teacher identities, the original research wonders diffracted through the experiences and landscapes of the participants – "will **they** get it?", "How do you share a philosophy?" – equally "impossible" wonders, essentially wonders born of the similar genetics, of similar

wavelength, fractalled (Mandelbrot, 2010) wonders whose coloured richness is embedded in the complexity of experience. The self-similarity and apparent immeasurability of experience – properties shared with the nature of fractals – leads me to contemplate the richness of narrative inquiry and its potential fit with complexity. The self-similar wonders, the recursive nature of narrative inquiry being both the method and the phenomenon under study, and the inability to measure the quality of narrative inquiry in traditional positivistic ways all implies a connection, a borderland space worthy of exploration, through experience between narrative inquiry and complexity.

Emergence and Deformalization in Education: Utilizing an Ecosystem Analogy

¶ Working in the realm of complexity science, Stanley (2005) dually defines emergence. His first definition of emergence is "the discovery of features in some phenomena that have always been there although they have been invisible in light of reductionist paradigms" (p. 144). His second definition of emergence is "the appearance of new things that arise through evolutionary processes" (p. 144). While there are cases of emergence where one or the other of Stanley's (2005) definitions applies, it is my contention that in many cases, emergence requires both of these definitions. That is, the deformalization of methodology implies that the removal of formalizations or reductionistic paradigms as evidenced by ritualizations and artifacts from the existing landscape is often required before the emergence of something new can occur through evolutionary processes. That is, we need to see that often emergence, the evolution of something new, is confined by the historical ritualizations and artifacts of existing landscapes and as part of emergence, there is a need to expand the landscape we look at to include a more significant focus on both temporality and place. As Gough (2011) states, a destabilizing of orderly and predictable processes is required. Using an ecosystem analogy, we can see that even nature often requires deformalization for emergence when complex systems are already in place. While Stanley's second definition applies to primary succession – where emergence occurs through evolutionary processes on bare landscapes, it does not fit well with the idea of secondary succession. Secondary succession, an analogy to education change, requires the construction of a void, the removal of existing processes/ritualizations and species/artifacts prior to the emergence and growth of the seeds of a renewed and equally complex emergent landscape under the right conditions – dependent clearly on temporality and place.

¶ Furthermore, the desire of Bloom and Gough to have methodologies and associated paradigms that resist complexity reduction fits well with Clandinin and Connelly's (2000) definition of narrative inquiry which relies on a Deweyan ontology of lived experience itself founded on continuity, interaction and situation (Dewey, 1938). The ability of narrative inquiry to work around reductionistic boundaries through the utilization of a three-dimensional narrative inquiry space – temporality, sociality, and place – for analysis and interpretation also illustrates an intersection with the post-modern and hence complexity. Recently Reynolds and Vu (2013), two scholars engaged in the chaos and complexity special interest group, highlighted at the 2013 meeting of the American Educational Research Association the necessity to move towards a proleptic view of time in education. This proleptic vision of time moves away from the "modern" vision of time as linear and towards a vision of time that views the past, present, and future as incomprehensible without an exploration of the spectrum of time. According to Slattery (1995) proleptic time demands that educators explore proleptic experiences, which involve a "temporality where the present experience is infused with an evolving interpretation of the past and a socially constructed emergent future" (p. 629). It is evident that both complexity and narrative inquiry have a common intersection point, a borderland space that both draw from Dewey's (1938) ideas about continuity and interaction. Narrative inquiry and the process of elaborating on teachers' mo(u)rning stories, stories drawn from the shifting identities of teachers from within existing and emergent landscapes, will allow me and hopefully other researchers to "hold open both the beginning and endings of the narratives presented" (Pinnegar, as cited in Clandinin et al., 2006, p. 179) leaving, and sometimes constructing, an enabling inconclusivity (Pinnegar, as cited in Clandinin et al., 2006). This openness and inconclusivity of narrative inquiry, an invitation to continue wondering proleptically, is in contrast to other methodologies which "deliberately reduce the complexity of the objects of their inquiries and/or the data they produce in one or more ways" (Gough, 2012, p. 47).

¶ This descriptive and recursive landscape illustrated through narrative inquiry allows for a contextualized and experiential embrace of subjectivity that is unique to narrative inquiry and addresses many of Blooms (2011) requests for a research methodology compatible with complexity and the examination of relationships in educational inquiry. Finally, narrative inquiry "relies on criteria other than validity, reliability, and generalizability" (Clandinin & Connelly, 2000, p. 184) and seeks non-borrowed, a concern of Gough's (2012), and alternative criteria to determine what constitutes a good narrative such as apparency and verisimilitude or recognizabilty of the field in one's research text, resonance, wakefulness,

transferability, the avoidance of the illusion of causality, and having invitational quality, authenticity adequacy and plausibility (Clandinin & Connelly, 2000) – all measures of the roughness of the wonders explored – both the initial wonders and the fractalled ones from the living and telling and the reliving and retelling – and of the richness of experience.

CHAPTER 4

TEACHERS' MO(U)RNING STORIES: DEFORMALIZATIONS TO RESIST COMPLEXITY REDUCTION ON EMERGENT INQUIRY LANDSCAPES

While this thesis so far has focused largely on my experiences, on my narrative beginnings, on the metaphors of mo(u)rning that I have framed my thinking around, and on the negotiation of relationships and details related to narrative inquiry, I feel it is pertinent to now step back into the experiences of others, into the morning stories that were co-constructed on our emergent inquiry landscapes.

Morning Stories: Identity and Change on Christina's Landscape

I was not used to the smell of burnt Sage but I suspect Christina was as she had been teaching for over a year in a school with a largely First Nations population where Smudging was common. This was not her first school but rather her most recent school (Figure 4-1) after a plethora of other diverse school experiences with a diverse range of students. Christina was very comfortable with change; in fact change and constant flux was a significant part of Christina's professional identities (Field notes, November 14, 2011). "*Ten years in I guess I would have been, ten years in thinking, I don't think I can do this for another twenty years. Not the way that I was. Bored and I guess I just had never… it had been a while since I'd been in a school where I felt like I connected really well with the kids*" (Field notes, March 7, 2012). I wondered what it was that reconnected Christina – different students, a focus on inquiry, her peers, her past teaching experiences. Christina is part of a group of division science teachers, part of a larger group of science teachers in Saskatchewan, who are collectively attempting to restory (Clandinin et al., 2006) their identities, shifting themselves towards a new metastable collection of identities, in response to emergent high school science curricula. These curricula are shifting towards a philosophy founded on inquiry and have the potential to be more open, holistic, reflective, contextual, personally relational, experiential, and active –significantly more complex than the previous and more "modern" (Doll, 1993) curricula founded on behaviourism. These shifts are supportive of other identities, non-"modern" identities, such as those connected more to place (Gruenwald, 2003), and to the ideas of sustainability and Indigenous ways of living with nature (Aikenhead & Michell, 2011). Furthermore, these shifts are required to support the large number of First Nations and Métis students in their attempts to approach Western science (Aikenhead, 2002, 2003; Aikenhead & Michell, 2011; Battiste, 2000, 2007; Ermine, 1995; Hodgson-Smith, 2000; King, 1991) and to include Indigenous knowledge as an integral part of all of our renewed Saskatchewan curricula for

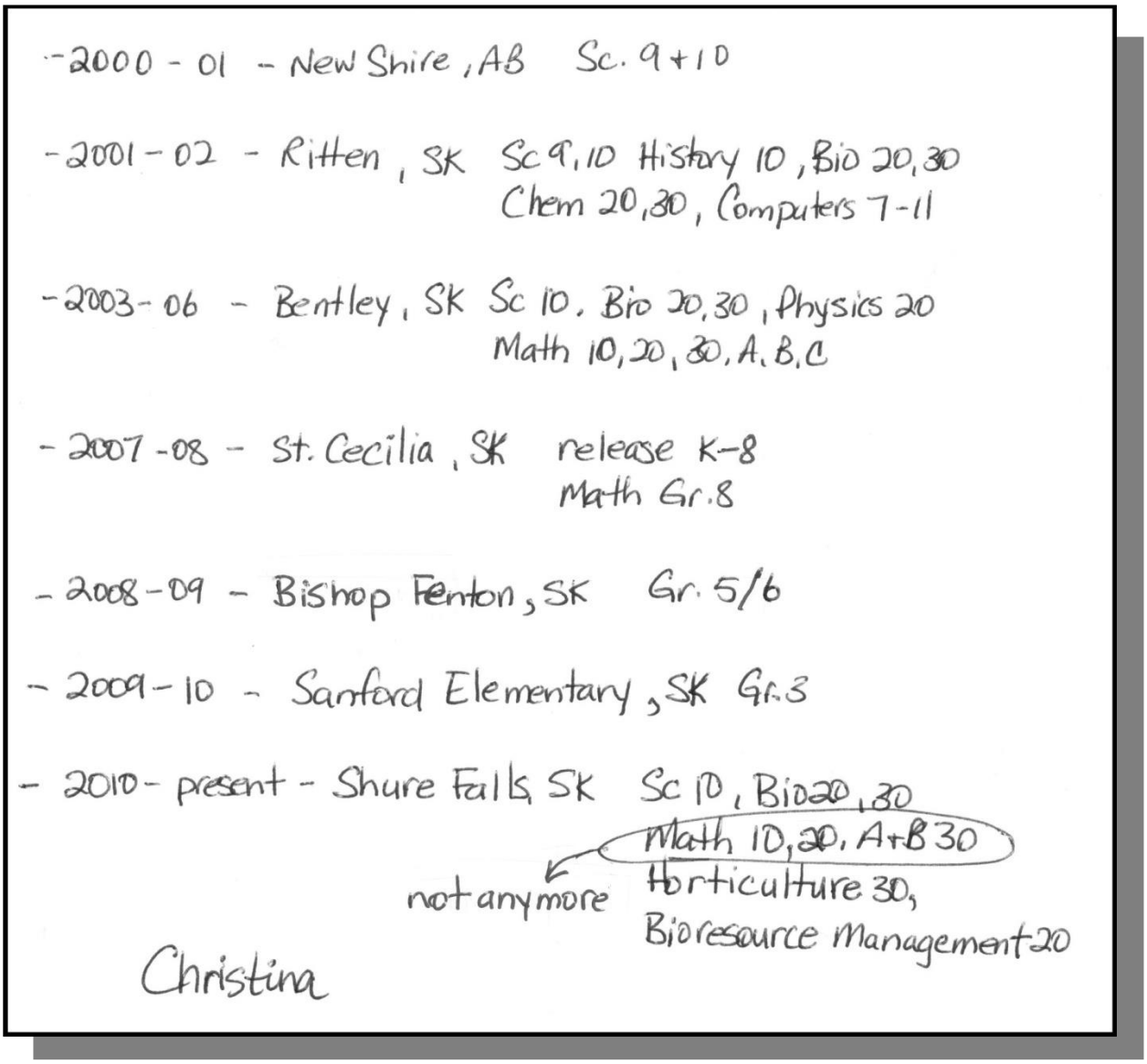


Figure 4-1. Christina's 11 year teaching career path. (Teacher artifact, February 29, 2012)

all of our students; overall these shifts suggest a more inclusive form of scientific literacy for all students. Christina, along with the other members of our professional development group, has plunged her identities into a complex yet rich reorganization, a practice often not permitted to be visible within the dominant stories of high school science. In this reorganization, and as we come to realize that assessment and identity are interwoven in the discourse of Western science, Christina and her peers are experiencing dissonance in their knowledge of practice. As they attempt to resolve this dissonance in the tensioned moments (Clandinin et al., 2006) produced by living alongside and within the "modern" landscape of high school science, they strive to allow their shifting identities to

emerge and coalesce as they attempt to achieve new scientific literacy goals with their students on an emergent inquiry landscape.

Unpacking Christina's Tension: Deformalization of Place to Resist Complexity Reduction

Christina's tension in sharing her contextualized inquiry experiences, her identities, with her peers was not limited to a single interaction. Rather, it was a recurring conversation that we had. As it turns out, Christina has one of the same concerns about sharing her inquiry experiences that I, Jeff Bloom (2011), and Noel Gough (2012) have about educational inquiry – the reduction of the complexity of her experience.

Kevin: So in our last science group inquiry meeting, you mentioned that you were here for your PD and that you weren't overly concerned about others learning from your experiences.

Christina: *I never said that.* [laughs]

Kevin: Yet at the same time, you mentioned that when others are not doing inquiry, it's harder for you to do inquiry.

Christina: *Yes, it's a bit of a contradiction.*

Christina: *I guess the frustration is not… okay, to put that into a context, I feel like if I do all of this work on preparing for inquiries and then somebody's going to take that and it's going to be like a step one I do this, this, this and they're not really interested in, or passionate about, the delivery of that. It will fall flat on its face no matter what. So I feel like there needs to be some buy in before I'm willing to be sharing, do you know what I mean?*

…

and I think that sometimes… well, I think no matter what it is, it could turn into that if that's the mindset of the person who takes those resources, right? (taped conversation, November 14, 2011)

As Christina and I chatted about how to engage other teachers with our artifacts to allay her concern about other's mechanizing, methodizing, or reducing the complexity of her shared inquiry experiences, I was brought back to thinking about Christina's teaching history and the diversity of experiences she had along the way. Christina's CIE was not just a CIE, it was an artifact of her emergent identities, an artifact over ten years in the making despite the fact that Christina felt it was newly emergent:

Kevin: Did you always teach this way?

Christina: *No, this is a new thing. I went to the PBL* [problem based learning] *workshop at the end of October last year, and just being in this school and knowing that things had to be done differently because traditional teaching practices were not working here. Not that they work awesome anywhere, but they really weren't working here. So it was that whole idea of trying to come up with something different. They wanted modular teaching. They wanted something engaging – inquiry had been thrown out there. …There was a lot of pressure just to do something different … so when that email came out* [about the PBL workshop], *I thought okay, well I'll go and take a look at it. When I went, it felt like this is what I wanted to do.*

Kevin: And this was last year?

Christina: *Um hum.*

Kevin: So this is only year two of you stepping into PBL? See I had a vision that you were…

Christina: *No, see this is why I don't… You're thinking expert, are you kidding me? I've only been… like, it's been, what a year and a half? Yeah.*

Kevin: But how did you teach before? Was it the traditional or…

Christina: *Yeah, it was boring. It was terrible.* (taped conversation, March 7, 2012)

As we discussed to create meaning of her narrative experiences that formed her morning story, her shifting identities, we saw that this emergence was not a single experience but rather a number of experiences, narrative threads wound together over time to form a more complex identity that was comfortable with guided inquiry, with PBL.

Christina: *See I've taught so many different things though. So for me to say… I don't think I've always taught traditional boring, but it hasn't been PBL. Like, I taught…*

Kevin: Any inquiry?

Christina: *Well, some, maybe some small inquiries because I've taught science at a number of levels, and that's always been what I've been interested in. And so I probably have focused a little bit more on interesting stuff in there, but if I was teaching History 10, yeah, it was boring. [laughs] Because I was bored.*

….

Kevin: So do you think you were starting to do some inquiry?

Christina: *Yeah, you know what? I really focused on science especially those two years. I don't know what program was I using? It wasn't a textbook. It was called hands on science. They had that program at Sanford Elementary. They had bought it years ago and it fused into the new curriculum that was coming out, or the Pan-Canadian Framework. So it was not with the old curriculum. It was all new stuff and so I decided that I was going to develop some units around that.*

I think that the new stuff that I sort of planned around lent itself a lot more to inquiry. There were definitely portions of it that was a lot more hands on. So there was a lot of stuff that the kids had to do. Obviously at grade three it was a lot more guided. But I did grade five [science] as well, ... I mean, just two years of development, they can do so much more than the grade threes could. And so there was a little bit more freedom as to what they could plan. They did plan a few different things on their own. They had to develop their own little model for digestion using whatever they sort of wanted. They had, like, juice boxes for stomachs. It was kind of cool some of the things that they did. So I think definitely my focus on science that year, was leaning more towards inquiry than what it had been previously.

Kevin: In that environment, you were very much the science "expert".

Christina: *Yeah, I guess. I guess.*

Kevin: Was the content an issue? You didn't have to learn any of the content did you.

Christina: *No, not at all.* (taped conversation, March 7, 2012)

As Christina described her experiences working with elementary and then middle-years students, I wondered how those experiences informed her emergent inquiry identities. Was it the deformalization of place – the removal of reductive contexts and the culture of high school science that focused heavily on factual gavage – that allowed her to step through the liminality as she constructed new and shifted identities? Did the separation from existing formalizations allow for further deformalizations for herself and her students, further steps into uncertainty – "*they could plan*"? Did it give her the freedom and time to play on an emergent landscape with the uncertainty of guided and open ended inquiry – itself a deformalization of the planning and learning that occurred in her classroom? I was jealous frankly; envious of the freedom she had gained through the diversity teaching experiences, particularly elementary and middle years, which allowed her to

step further into the uncertain (field notes, December 16, 2011). I should not have been as I know it was the result of much work, identity work that I was trying to do from within the traditional landscape of high school science. Maybe that would be my next step, middle years.

Kevin: But how do you think that experience informed you? It must have informed you in some way in terms of how you are now, right?

Christina: *Well, I learned a lot about what I could do I suppose.*

Kevin: In what way?

Christina: *Well, it was a really challenging year. If I could make it through that year, I could get through anything. [laughs] I think in terms of making a person a more well-rounded teacher, exposing yourself to the many different levels of teaching, grade levels, styles I mean, the way you teach a primary class is completely different from the way that you teach middle years or high school. But I think you take those experiences and they are very useful in other levels as well. Like, just in being able to differentiate in your classroom that as an elementary school teacher, is what you do every day. I think as specialists, we often times find that difficult to do within our classroom. We say, okay, well, this is the content. How do you modify that? You know, and I think we're very… it's not as easy for high school teachers without learning assistance, people coming in or whatever. I think in elementary school you get very used to doing that every day. So I think that was something that I definitely took from that experience as well.*

Kevin: Were you boring in elementary?

Christina: *Well, sometimes I'm sure I was. But I worked very hard to not be, and that's I think the other reason why it was a hard year too. You're on all the time as a primary teacher. It's very high energy all the time and that's a difficult enough thing to do when you're teaching something you're really passionate about, let alone something you're not. [laughs] That was a really hard year. And it isn't that I didn't like the kids or anything. I really did.* (taped conversation, March 7, 2012)

I was starting to understand the nature of Christina's tension. She was not sharing just one experience, a simple CIE, she was sharing her morning story, she was sharing her shifting identities which she had vested much into and was putting them up for others to judge, to evaluate, and possibly to reduce and formalize, potentially unweaving the threads of experience that she had so carefully allowed to coalesce into more coherent identities. Perhaps she was concerned about the

partialness of experience that the CIE implied. Perhaps she was also concerned about others understanding the classroom context, a section added to the CIE, about seeing her students for who they really were. This reconstruction of identities was hard work, and Christina had dedicated many hours towards it between her work in elementary/middle-years, her PBL workshops and development of PBL cases, and her professional involvement in our inquiry group. I am confident that she had spent the 100 plus hours that Duschl and Duncan contended it takes to be competent and confident in inquiry-based instruction (Duschl & Duncan, as cited in Duffy, 2009). Christina had emerged to become an excellent facilitator of student driven inquiry – guided and open ended, even differentiated inquiry (Llewellyn, 2011) was in her repertoire. Christina had constructed her inquiry compatible identities not from one memorable experience but from one experience after another, a continuity of experience where "experiences grow out of other experiences, and experiences lead to further experiences" (Clandinin & Connelly, 2000, p. 2). Unique to Christina's experience, however, was that each experience was a deformalization of place which allowed her to step away from previous more reductionistic ritualizations and artifacts in order to construct new ritualizations and artifacts, to continue to construct an emergent landscape founded in inquiry. Christina's hard work was identity work, work that occurred after weighty experiences in new contexts that led to narrative dissonance and a rearrangement of her narrative threads that made up her identities. This rearrangement has led, for Christina, to shifted identities that allowed her to put forward different *curriculum making experiences* (Clandinin et al., 2006) with her students, experiences that grew out of the lives of her students, a "curriculum as a course of life" (Clandinin & Connelly, 1992, pg. 393). Christina had found a way to implement high quality science education and somehow managed to skirt around the political realities of traditional high school science (Aikenhead, 2011) much to the benefit of her students' identities.

I left our conversation with many new wonders. What exactly is identity "work"? How do we support practicing teachers in their 100 hours of professional development such that they too can experience identity "work"? How do we construct deformalized experiences without teachers moving from high school to elementary/middle-years? Should we be offering high school science teachers the opportunity to cycle, with their students, from grade 9 through 12 or from grade 5 through 12? I wonder if I could find a middle-years teacher who would be willing to job swap for a few years for a full day or even for half a day. They could teach my science 9 and 10 in the morning or afternoon, their former grade 7 and 8 students, and I could teach their current 7 and 8 students in the same morning or afternoon. We could follow a set of students from grades 7 through 10 and be

mentors for each other. We could even plan contextualized inquiry experiences together. I wondered how we could facilitate and give permission to teachers to construct formalistic voids, to remove the rituals and artifacts of positivism so that they could step into the uncertain, into guided and open ended inquiry, through liminal spaces, and onto emergent inquiry landscapes? Perhaps our high school science teachers should be offered the opportunity to step into middle years classrooms for a year to experience the deformalization that Christina so much drew on as she was forming new identities compatible with guided and open-ended inquiry.

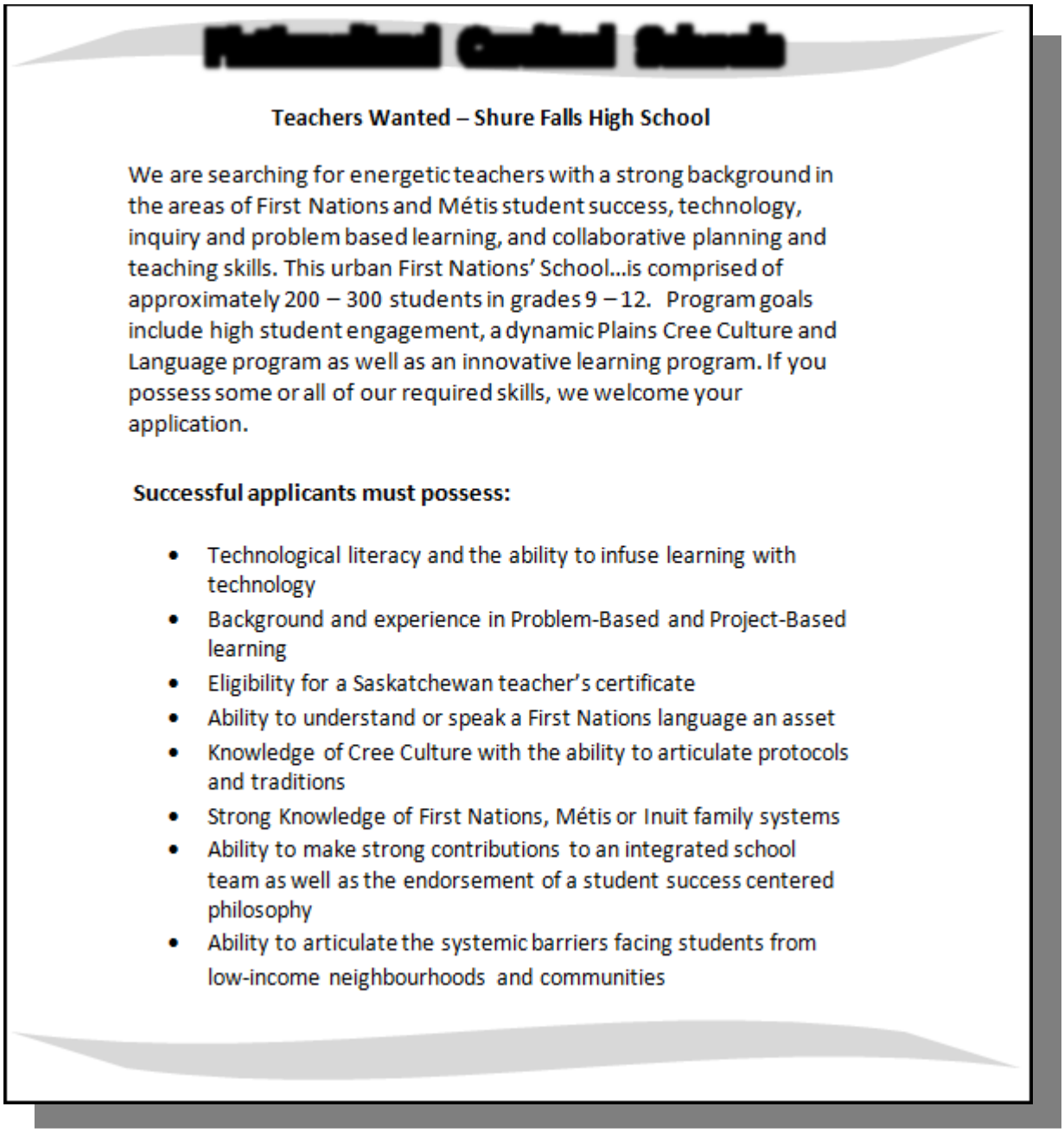
¶ While emergence is often thought of by the observer as being a rather short or punctuated process, only seeing the outward artifacts of that which has emerged, like the theory of punctuated equilibrium of evolution (Ricca, 2012) and occurring due to a single event or simple combination of linear steps, or significant experience, with long moments of stability, it is clear that in Christina's morning story the emergent shift in her identities was more gradual. That is, our identities can be seen to be a growing-complex system that is "the result of a series of highly contingent events that would not happen again if we could rewind the tape" (Gould, cited in Ricca, 2012, p. 33). Christina's identities did not appear to evolve through a punctuated process but rather formed through hard work, through a multitude of experiences in interaction with a social milieu that induced internal changes. This emergence was obvious to Christina as she stepped through liminal spaces and narrative dissonance on the way to a new narrative coherence. As Christina worked through the dissonance in her identities created by the collection of new experiences on new landscapes, she spent time trying to find a new coherence of identities via the organization and reorganization of her narrative threads to the eventual formation of shifted identities. As such, the study of identity requires a methodology that itself is capable of illustrating the contingency of events, people, and places that lead to our shifting identities across the imagined past, present and future. This illustration and construction of past experience, the rewinding of the tape, is impossible without the observer and due to the non-linear path of contingent events, I can only imagine rewinding that tape with the mutual interaction of my identities and the participants' identities and as such, in order to understand and hence illustrate the contingent events, one would necessarily have to be part of the complex system, part of the milieu and hence in the midst.

Redefining Expert: Stepping into Christina's Classroom on the Island

Revisiting Christina's experiences through the field text left me wondering about an unexplored tension of hers and that was the tension of potentially being classified by others as "the expert". It was Christina who used the term "expert" first in our conversation and certainly something I would not have intentionally imparted on her as I myself would not want the term, in its "modern" sense, imparted on me. Christina clearly did not see herself as an expert yet appeared to be judging herself based on the term. What I saw, however, was not what she saw. Christina was engaged at her most recent school, connected via strong relationships. "*It had been awhile since I'd been in a school where I felt like I connected really well with the kids"* (taped conversation, March 7, 2012). Christina was teaching at a school with a largely First Nations population. Administration, as always, was looking to continue shifting school culture to support and grow the existing identities within it. Christina mentioned to me (personal communication, March 6, 2012) that they were hiring and I tracked down the Teachers Wanted advertisement sent out by the division (Figure 4-2). Her students were often those not successful for a number of reasons at other schools within the division. They were students who wanted to or who had for the most part rejected the formalizations of traditional school; the traditional rituals and artifacts of academic high school science were not of interest to them. These students were, for the most part, not destined for the pipeline (Aikenhead, 2003), students engaged and enculturated into the stream of future scientists focused on *wish-they-knew science* (Aikenhead, 2011). Rather, these were students with traditions and culture different from the realm of Western science. They had their own contexts. They were some of the students that the new provincial curriculum was renewed to include in a more holistic way.

There was more to scientific literacy than the pipeline, than the wish-they-knew science. There were other relevant types of science content that overlapped and interacted with each other, which were useful to students. In fact, Aikenhead (2011) clearly identified six other types of school science besides "pipeline" science or wish-they-knew-science. There was functional science about science-related occupations and everyday events and issues. There was have-cause-to-know science related to real-life events, determined as relevant by science-related experts. There was need-to-know science which was science needed to resolve real-life problems which was determined as relevant by the public. There was enticed-to-know science that drew on controversy in the media to engage their readers. There was also personal-curiosity science where students determined what would be interesting to study, certainly important if one wanted their students to engage in open-

ended inquiry. Finally, there was science-as-culture where students explored socio-scientific issues, issues of culture and science. Christina's students' contexts and the Indigenous Knowledge of our curriculum would be as, or possibly even more important than the "pipeline" science, as would the learning in the areas of *personal-curiosity science, need-to-know science, science-as-culture, functional science, have-cause-to-know science,* and *enticed-to-know science* (Aikenhead, 2011). I



Teachers Wanted – Shure Falls High School

We are searching for energetic teachers with a strong background in the areas of First Nations and Métis student success, technology, inquiry and problem based learning, and collaborative planning and teaching skills. This urban First Nations' School...is comprised of approximately 200 – 300 students in grades 9 – 12. Program goals include high student engagement, a dynamic Plains Cree Culture and Language program as well as an innovative learning program. If you possess some or all of our required skills, we welcome your application.

Successful applicants must possess:

- Technological literacy and the ability to infuse learning with technology
- Background and experience in Problem-Based and Project-Based learning
- Eligibility for a Saskatchewan teacher's certificate
- Ability to understand or speak a First Nations language an asset
- Knowledge of Cree Culture with the ability to articulate protocols and traditions
- Strong Knowledge of First Nations, Métis or Inuit family systems
- Ability to make strong contributions to an integrated school team as well as the endorsement of a student success centered philosophy
- Ability to articulate the systemic barriers facing students from low-income neighbourhoods and communities

Figure 4-2. Shure Falls teachers wanted advertisement. (Division artifact, April 22, 2012)

believe this focus away from solely "pipeline" science or wish-they-knew science is not just useful for Christina's students but also useful for the 90% of all of our students who are not destined for the pipeline.

The first time I stepped onto "the island" as Christina had called it, I was met at the door to the school, nicely welcomed in Cree, I believe, and escorted to the classroom by one of her former students. Christina had arranged it. I felt foreign but welcomed. I could tell by the student's hurried steps through the school that I was late. I had trouble extracting myself from my own school, from my students at lunch and then had trouble finding parking near Shure Falls. Christina had just started a new block course, which is why she had invited me. She wanted me to see her students inquiring from beginning to end. It was early in the course, November 14th, 2011. Christina's classroom was bustling but not full. Maybe I was not late, they had not settled down yet. No, wait, she was started. This was a bioresource management block course – two hours – and Christina was introducing the start of a PBL. I had been in the school for maybe five minutes and my nose and eyes were running – they had Smudged recently. Christina had warned me that this was a small class, just 13 students total. There were only six students present today. No, seven. No, six. Was he part of this class? He was in and out of the room. Definitely a part of the class. Seven students in total today. Students were all in one group around tables. Later Christina explained that she had her PBL set up in two groups of six or seven and due to attendance she had to quickly rearrange things.

I quickly found a seat in the back and started to observe the classroom as Christina proceeded with explaining the introduction to PBL. There were many recent artifacts of past PBLs – guided inquiry projects in the form of dioramas that were student proposals, real proposals for the landscapes of renovations and new buildings within the division – proposals about real places within the community. There were progress calendars on several boards. These were different than most high school classroom calendars in that instead of exam dates, quizzes, and due dates of worksheets or practice problems, there were really only milestones, entries for when guest speakers were coming and for excursions out of the school. My attention was drawn back to Christina as she proceeded to discuss how the students would be assessed – daily tasks, informal feedback, daily group and self-assessment, informal discussion, checklists, and a final project in a student chosen form that would be evaluated. There was a lot of informal assessment, the traditional ritualizations and artifacts had been removed. I wanted to know more and would come back another day to experience assessment in her class.

Christina then moved from the front and started to get students to work on group norms and commitments. Different students took on different roles, constructed team names – "*Team Lionheart"*, and documented team norms – spoken from behind the dark sunglasses "*Be here, its ok to be late but be here; do your work; no headphones when we're working in group"*. Christina moved around the room supporting the group leaders with their new roles. The first disclosure was handed out and as teams related the disclosure to their prior knowledge and hence their context and assigned tasks to each other it was clear that Christina had quite skillfully started a culture of inquiry that engaged students in context. There was no pre-assessment or pre-teaching, no quizzes at the start and no discussion about marks. It was mark free, risk free – at least for now. Traditional ritualizations and artifacts were not present or certainly were not the main focus if they were. Christina continued to roll through the room as students started researching their tasks with their laptops. Some wore headphones and listened to music, some were more engaged than others as one would expect in any classroom.

---------: "*Tell me if I am right"…*

Christina: *"I don't give out the answers"*

I engaged with Christina and her students as she circulated while they worked. I was interested in how she was going to continue to facilitate student engagement with each other as they were now working independently. She described that she had used a number of things: paper notes with the sharing of folders, a SharePoint site one semester and was moving towards Popplet (www.popplet.com) and a process of group sharing that she monitored and supported with further instruction, guest speakers and field trips. Her facilitation of inquiry was growing, shifting with her shifting identities. As the class wound down and students completed their work, one student had loaded a video from a Powwow he had participated in on the weekend. He wanted to show Christina the drumming and singing he was involved with. As I prepared to chat with Christina after being in her class, I thought of the drumming and how the student's context was very evident here, how I would use that context, cultural perspectives – one of the four learning contexts of our renewed curriculum – to explore physics concepts like waves and sound.

Christina: *Last year when I came here, the biggest thing about being here is that, what's worked… or sorry, what has been done for years and years and years, is not working for our First Nations students particularly. We were looking at hybrids* [online courses offered in combination with a teacher facilitated classroom experience]. *We were looking at technology. We were looking at*

all these kinds of things, and I was trying to figure out how it would work in with science. I did Science 10 originally when I came as a hybrid and I still found that engagement was not where it needed to be with most students.

Kevin: I know you've done a bit of reading about First Nations worldviews. How do you think your PBLs fit with First Nations worldviews?

Christina: *Well, I think it leaves it open for kids to bring to it what they will. Their worldviews make a difference in how they are going to move forward with the information that they have. I also try to, whatever case we're doing, bring in that First Nations perspective, whether it's bringing an Elder in or going and doing some of the traditional things, like berry picking or however we can fit that in, to tie that into science. (taped conversation, November 14, 2011)*

After several group inquiry meetings with Christina, I stepped into her class again on March 6th, 2011. I am late again. "*That's OK, they're still rolling in*" Christina responded. They run a different schedule here for lunch and I really am struggling with balancing this research role, a new identity for me, and teaching – important pulls in many directions including my home life. I wonder what important pulls Christina's students had that kept them from sometimes not arriving "on time". This is Christina's Biology 30, Horticulture and Communications class, another 2 hour block class. It is a large class of 35 students. Class has started and there are about 14 students present. 1:00 – two more students show up. Christina starts putting up some summary notes by pulling information from various group members' disclosure work. Students have already been through this material but this was more about a coming together around the learning that had occurred. It was the law of segregation; it is critical to the current disclosure from the PBL they are working on so Christina once again steps back into her content expert identity; however, this time she was not the only sage, sharing the stage with other content experts, drawing contextualized information from various group members. 1:10 – two more students come in. A student asks me to help fill out a passport application for the class field trip. Notes continue to be constructed as a class. 1:15 – the last of the latecomers arrives. It was the student from Christina's class the last time I was here – "*Be here, its ok to be late but be here"*. It was not about serving time in Christina's class but rather about connecting with their peers and the learning. Nineteen made it in today (field notes, March 6, 2011).

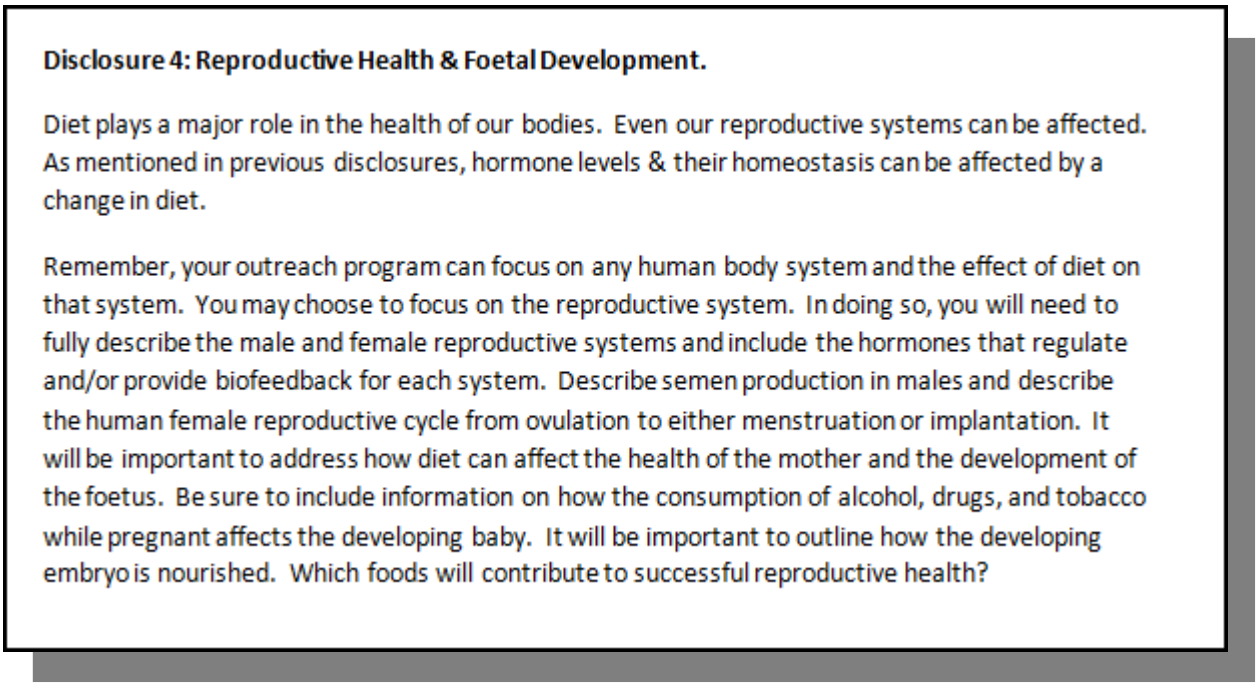
Christina's co-construction of notes was itself a deformalization of practice and planning. There were no PowerPoints, no fill-in-the-blank notes sheets, and no traditional artifacts. The ritualizations were different as well. It did not start with the typical note taking rituals such as

reminders about taking out your notes or the ritual of one-way transmission. Christina did have a set of jot notes with her but it was vacuous if one was to compare it to the typical teacher's preparation for "notes". With this construction of a void, Christina was able to change "notes" into a coming together of the learning that had occurred – a new ritualization. Student contributions indicated an engagement that I would not have expected. It was also much shorter than I would have expected for the law of segregation. I am not sure why I was surprised; students largely had all the learning and this was really about checking student understanding and driving the inquiry forward. Rather than reducing the complexity of student learning to a focus on solely knowing the facts and the vocabulary, Christina had managed to focus these students on clarifying their understanding of the law and its implications related to their disclosure, to their contexts. It was a rich curriculum making experience for her students and for me. It was the culmination of much work the students had done in the culture of inquiry Christina had engendered in the class. I am not sure how she would have handed this off to a substitute teacher – an ongoing tension for those of the inquiry group who had shifted into guided and open ended inquiry.

¶ I am not sure if all substitutes or all teachers necessarily, would have the narrative diversity, the narrative threads of experience necessary to step into a classroom like Christina's. That is, if we define narrative diversity as the number of varied narrative threads of one's experience, one could contend that the growth and expression of an individual's identities would be somewhat dependent on that diversity. An obvious parallel is the complex and organic process of a species' ability to adapt to new environments, the ability for continual change. Those species with a large genetic diversity, a large number of usable potential traits in their genotypes, are much more likely to express a phenotype that is capable of adapting to the environment. Likewise, I wonder if Christina's narrative diversity is what has allowed her to come to a set of more or less coherent identities that allow her to thrive in the milieu that is Shure Falls. That is, it was through the interaction with the identities around her and the places she has traversed through and in that has allowed her to arrange the threads of her experiences in a way that allows for a set of expressed or enacted identities that help to facilitate rich curriculum making experiences, contextualized inquiry experiences, with her students.

Disclosure four is given to the groups. There are discussions about a girl somebody knows being shot on 5th and Richards – close to where many students live. Christina brings the discussion to a tactful close and directs the groups to start focusing on disclosure 4 – she introduces students to

popplet as their new tool to share their learning with each other and then helps several students with their online passport applications. As the groups are working, I am able to mingle and chat with Christina. Sixteen of the 35 students are missing and Christina says this has been typical since February break. There are three or four students absent due to parental commitments – difficulties with finding child care. Christina holds back the laptops until they have dissected the disclosure (Figure 4-3) as a group. As groups show that they had assigned tasks they are given out laptops to



Disclosure 4: Reproductive Health & Foetal Development.

Diet plays a major role in the health of our bodies. Even our reproductive systems can be affected. As mentioned in previous disclosures, hormone levels & their homeostasis can be affected by a change in diet.

Remember, your outreach program can focus on any human body system and the effect of diet on that system. You may choose to focus on the reproductive system. In doing so, you will need to fully describe the male and female reproductive systems and include the hormones that regulate and/or provide biofeedback for each system. Describe semen production in males and describe the human female reproductive cycle from ovulation to either menstruation or implantation. It will be important to address how diet can affect the health of the mother and the development of the foetus. Be sure to include information on how the consumption of alcohol, drugs, and tobacco while pregnant affects the developing baby. It will be important to outline how the developing embryo is nourished. Which foods will contribute to successful reproductive health?

Figure 4-3. The fourth of five disclosures of a PBL on body systems co-developed by Christina. See *Figure 3-1 for further details. (Teacher artifact, March 6, 2012)*

do research. Christina works at signing out laptops, resolving log in issues, the creation of email accounts and early growing pains with popplet which are quickly resolved. I am on the phone with tech support regarding a student password at some point in all of this. "*Popplets need to be done for tomorrow"* (field notes, March 6, 2011).

After my participation today, seeing more of the facilitation and interacting with students, I think I will be able to step into a PBL in my own classroom. I was interested in how she was using assessment to drive the process and she discussed with me her tools for enabling group collaboration: blogs, paper, popplets, *"try it and see, change is good"* Christina quipped. Christina gave groups feedback right in their popplets, informal feedback in the form of jot notes and comments and she also used group interviews which I asked to come back to see. Christina also mentioned that the final presentation/product was assessed for marks and that she would also have a

multiple-choice exam to prepare them for the departmental final, a standardized provincial final exam, which was all multiple-choice and required to be 40% of their final mark. She mentioned that the preparatory exam was only 10% of their grade though – *"or less, don't tell them that though!"* Christina was not accredited in Biology 30 which meant that she could not give her own final exam but rather had to give the departmental final – a provincial final exam for non-accredited teachers. Accreditation in Saskatchewan is required for certain grade 12 subjects and teachers are able to be accredited if they have two years teaching experience, seven university courses in the subject, and one university curriculum and instruction methods course in the subject area. She had mentioned that she had looked into accreditation so her students would not have to write the departmental exam but it would have meant taking several university courses. She had her own family commitments and it was obvious she was engaged in much professional development outside of her work at school. I wonder if we would all be able to be accredited based on the lived curricula put forward on Christina's emergent inquiry landscape?

I wondered if we would all play these games so professionally if we were not accredited. I respect Christina and her ability to still spend time inquiring despite having the pressure to prepare students for a departmental final which did not fit with an inquiry philosophy of teaching or with the contexts her students came from. Christina was doing what she could to buffer her students from the reductionist assessment making experience that was the departmental, an assimilative assessment experience. I just hoped that her other assessments would provide a rich enough experience to counter the departmental. I would have to wait until next time to see her assessment practices.

As class starts to wrap up, a student asks Christina to hold her baby while she packed up her stuff and coordinated the remaining work with her group – she had just fed her. Another young child, 3 or 4 years of age, steps into the classroom briefly. His father, who was part of the class, is working in the hall. As students start to filter out and as I finish jotting notes down, Christina is at the front, still holding a baby with one arm and with the other hand she is signing out laptops with a scanner so her students could work at their disclosures from home. Several students are discussing a Powwow that they would be going to as part of their drumming group (field notes, March 6, 2011). This was not how class ended in many schools in my experience. In Christina's class, many students stayed well past the end of the period both for academic and for non-academic reasons.

I certainly learned much from Christina – mostly about how to engage students in group inquiry. Christina's morning story, a set of experiences from her emergent landscape, provided me

with a rich curriculum making experience that had started to inform my shifting identities as I stepped back into my high school science classroom, onto my own emergent inquiry landscape. What I also learned was that Christina was an expert on the emergent inquiry landscape she was constructing. She did not consider herself an expert though. I wondered if it was because being an expert on this inquiry landscape required more of a teacher, somebody not only comfortable with the subject area but also somebody who was comfortable with uncertainty and facilitating relationships, somebody who was comfortable with change and utilized change – *"change is good"*, somebody willing to play, somebody who was willing to hand over some of the control and question making to their students, somebody who understood that context was as or more important than content and that content was secondary to context. Christina felt she still had much to learn, perhaps that was her hesitation with being deemed an expert, or maybe it was a hesitation in being able to explain the complexity of what she did in the classroom. In any regard, Christina's classroom and her facilitator identity exuded holism. Her students were engaged in a community of learning which she ensured was founded on relationships, they inquired into places that were found in their communities, and she drew from student contexts.

Perhaps Christina's hesitation was due to the definition she held of what it meant to be an expert from the existing landscape she had been enculturated into. I saw her as an expert, but she did not. Was their more than one definition of expert? Which was Christina using to judge herself, to understand her own identities?

Kevin: In a group of emails that we exchanged, you talked about the concept of not wanting to be labelled as the expert and… why do you laugh?

Christina: [Laughs] *Because I can hear myself saying that. I've said it a few times.* [laughs]

Kevin: To me? You've only said it once to me.

Christina: *No, to other people I've said that.* [laughs]

Kevin: Does it concern you? Like, what's the…

Christina: *I don't know. I still feel like to be an expert you should be able to say, this is how it works and be successful in it a good amount of the time. With the frustration that I feel, I just feel like I'm constantly having to change things, and I haven't found something that I can say, this is it. This is how it works. This will work for you, and I guess it shouldn't… it's so dependent on the group that you have anyway. But I just feel like I've never done it the same way and maybe you shouldn't be doing it the same way.*

Kevin: Isn't that being an expert though too?

Christina: *I guess so. I don't know.*

Kevin: You've experienced it in multiple situations, with multiple classes and multiple courses???

Christina: *Yeah, I guess. I just feel like I'm still learning. And so in that way, I don't know, in my mind, an expert just knows it. Just knows it all. [laughs] I don't know. I guess it's just in my head more than anything. It's like an intimidation thing of being seen as that person. The go to person, because I don't have all the answers, right. I feel like an expert should have all the answers.* (taped conversation, March 7, 2012)

How is it that she was using the "expert" definition from academic Western Science? Given that approximately 90% of our students experience science as a foreign culture (Aikenhead & Elliott, 2010), Christina's approach of holistic science education created the right environment for her students, who were for the most part not potential scientists. Her students had an environment to learn anthropologically about science and/or acculturate themselves to science – as opposed to being assimilated[1] into it (Aikenhead, 1997) – something that had not worked for them in the past. Christina was an excellent culture broker (Jegede & Aikenhead, 1999) acting as a tour guide and/or travel agent as her students required. She was an "expert", a teacher with an excellent facilitator and culture broker identity specifically in the area of inquiry. She was an "expert" as she inquired along with her students as they inquired. She had wisdom-in-action (Cajete as cited in Aikenhead &

[1]Aikenhead (1997) defines assimilation as the process that occurs in learning canonical science content in traditionally taught science courses which results in a replacing or marginalizing of a student's Indigenous views. This is in contrast to science taught humanistically from a cultural perspective where students can learn anthropologically – investigating science as a foreign culture and utilizing that which is deemed useful by the student depending on the context. Alternatively, students can learn through autonomous acculturation, a process where a student borrows from Western science replacing some of their own indigenous views in an integrative fashion.

Elliott, 2010), a journey of coming to know or *yipwakawatisiwin* ("wisdom in practice" Beaudet, as cited in Aikenhead & Elliott, 2010), and she had facilitated others to become experts with respect to wisdom in practice:

Christina: *The girl who was in here before and one of her really good friends, they were both through my course. They came in and I attached them to a group for that first day. So I had a group. The more challenging group was mine, and then I put them each with a different group to take them through that whole first process.*

.....

Christina: *One of those girls sat on Wednesday after school with her teacher to try and come up with a case because she likes problem based learning. She wanted to do it that way, and it… just the way it looks is a little bit different. So she set it up with the original question or the original problem, and then as groups, they were going to come up with the questions that they wanted to go from there. Rather than having it structured with disclosures, although you could do that. I think it works. I think it's just finding something that the kids are really interested in.* (taped conversation, November 14, 2011)

Christina's facilitator identity, a sub-identity of her teacher identity, had not formed in isolation but rather in a milieu, in interaction with her students and as Christina shifted so did her students who clearly were interested in asking their own questions – shifting the PBL process they had learned to a more open ended form of inquiry hence shifting not only their own identities but also the emergent inquiry landscape Christina was also attempting to shift.

Sharing Morning Stories and Stories of Mo(u)rning: Whispers on the Island

The day after being in Christina's class I came back to chat about the experience. I was interested in understanding more about some of the concerns she had made about the landscape around her, how it was not shifting as fast as she would like, wishing that her students came in to her class with more inquiry skills and about feeling like she was on an island. These were not the semi-structured interview questions I had written as part of my proposal which by now were largely irrelevant. I set those questions aside, artifacts from a more reductionistic inquiry identity, which constructed a void that allowed for a much richer and less formalized experience – an opportunity to step into uncertainty through the process of play (Lotto & O'Toole, 2012). The initial questions were decontextualized artifacts from outside the milieu I was now in. Much like the traditional

planning that the group was trying to deformalize, the questions I had initially created were done so in the absence of relation, without my participants and my co-researchers. The questions I had now constructed to lead the conversation, as opposed to an interview, were contextualized, generated from being in her classroom, and formed from brief conversations and from emails we shared back and forth. Was this the wakefulness, the thoughtfulness about our inquiry decisions and part of the inherent fluidity to narrative inquiry that Clandinin & Connelly (2000) were referring to? I found the same thing with Beth, another teacher who was part of our inquiry group and this research. I wish that I had found this deformalization of methodology, that I had been as wakeful with Beth, early on in my time with her. I wish I had set aside my initial decontextualized semi-structured questions sooner.

In any regard, Christina had just finished working with her Biology 30 class. I helped clean up the tables where students were working in groups of 5 or 6. Christina was completing all of the various tasks that go with the end of the day – attendance, putting away materials from experiments from earlier in the day and of course putting away laptops. We sat at the far end of Christina's room at one of the sets of tables, far away from the door and near a small window. Christina sat down and after some small talk about the day, and about her students, she started talking again about wishing her students were more experienced with inquiry when they stepped into her class and about the inquiry that was and was not happening on the landscape around her.

Kevin: Do you feel supported in your attempts to implement inquiry?

Christina: *Like in my school or…?*

Kevin: In your school, in your division.

Christina: *I think the high school science inquiry group that we have has made it easier to at least have a network of people to talk to. I am on an island still as far as my subject area. It is nice to have people to talk to that are doing the same thing.*

Kevin: In science?

Christina: *Exactly. The new staff that we've gotten here has made a world of difference I think as far as the collegiality of the building too, and I think that's gone a long way. Because we talk about how we're doing things in our classes, even though it's not the same subject. They're also trying new things, and so it's not just me trying new things.*

Kevin: So it doesn't even necessarily have to be inquiry. It's just willing to try new things.

Christina: *Although they're trying inquiry too in their classes. The teacher across the hall teaches English. She's doing inquiry with her English 10s, and she said, "Well, I don't know how, I've never done this before. So what do you think of this?" And so we're throwing ideas at each other. I'll say, "Well, I don't know. That's out of my comfort zone. I've not taught that, but this, have you thought of this?" That wouldn't have happened last year at all. I think this has helped. So I think inquiry is starting to get out there.* (taped conversation, November 14, 2011)

Christina did feel that inquiry was emerging on her landscape and on the landscapes that she was constructing hers within. She was not alone in her efforts to construct new identities and new ways of putting together curriculum making experiences with her students. Sharing her early experiences, her morning stories with others both on and off the island were a large part of what helped her in the growth of her own enacted identities. While her identities emerged due to much of the work she had done, it was not done in isolation but rather with identities that were also working to emerge. In Christina's landscape, her morning stories *appeared* to be growing into *competing stories*; stories that existed in a positive tension with and challenging the grand narratives of what high school science was for so many years (Clandinin et al., 2006). Certainly this was a step in the right direct as in the past Christina's experience was quite different:

Christina: *The inquiry group is really helpful because honestly, I didn't even realize all of the things that were happening in the division. You had been taking your kids to the wave pool and using inquiry. There's no opportunity for us to share things like that. So it almost feels like you're the only one doing that, right. It's just nice to hear other people's ideas and success stories and all of their frustrations. I mean, it doesn't work 100% of the time for everybody, and I think that's important, probably more important even than talking about your successes.* (taped conversation, November 14, 2011)

Prior to this year, Christina's morning story, a secret story, was at risk of simply becoming a *conflicting story* (Clandinin et al., 2006). My experience with inquiry was much like Christina's last year, on an island of my own, isolated from others with like identities, and my concern was that my, and other's morning stories from within our inquiry group, would also become *conflicting stories*, stories that appeared to be brief and fleeting due to colliding with the grand narrative of what was high school science. While our group had thoughts about how to share our morning stories – *How do you share a philosophy?* – I was unsure how we could continue to share our morning stories,

those stories of emergence that might help others to also shift their identities, such that our *stories to live by* (Clandinin & Connelly, 2000) could become competing stories as our provincial curricula continued to be renewed through inquiry over the next several years.

My concern about our stories becoming conflicting stories was not that I did not have faith in the work the inquiry group was doing, or believe in the new curriculum founded on inquiry, it was that I knew there were other stories out there. There were powerful competing stories from the grand narrative that wrote what is now high school science. Many of us also had threads of experience that were born of that grand narrative that were woven into our constructed identities in one way or another. Christina, along with others of the group including myself, were in the morning of our emergence, it was early, right after the liminality that we had stepped through and there were pulls both ways. We all held identities on the landscapes on either side of the liminal space we had shifted through that influenced us. I wondered if we had enough of a collective diversity of experience, enough interaction and weaving of our experiences, a collective narrative coherence, for our shifting identities and emergent landscapes to survive, for our morning stories to hopefully become and possibly remain as competing stories.

Kevin: The grade 9 curriculum has been out for several years and it is all inquiry based with outcomes and indicators.

Christina: *Right, and yet everybody is concerned with when the textbook is coming out.*

Christina: *I spent some of the summer, coming up with some cases for Science 9 that work with the curriculum. I brought them to my school, to the grade 9 science teachers and I said "This is what I did. It goes with the new curriculum. You can use it in your classroom. I would be more than willing to talk about the process and all of that stuff with you." They responded with "Yes, but have they said when the textbook will be done?" So there's a mind shift needed though. We need to get around that.*

Kevin: Do you think it's more than a mind shift?

Christina: *It's being comfortable with that role of facilitator and backing off from being in control all the time which is what they're used to. But I mean, even when you look at our big multi-school science meeting that we had when we were talking about the new curricula that are coming out. The biggest thing that everybody was talking about is what the resource is going to be. Is there a textbook?* (taped conversation, Nov 14, 2011)

There were other stories that people were telling and that others were listening to, stories told by those standing within the existing landscape and in this case, retold by Christina. They were *stories of mourning*, often fictionalized stories (Clandinin et al., 2006), othering stories about the emergence of inquiry, of the new provincial curriculum, from those who had not stepped onto the emergent landscape, from those who had not experientially stepped through the liminality required to start constructing new or shifted identities and landscapes. These stories of mourning were often about the pitfalls of inquiry and the apathy and inability of student capabilities in the area of inquiry. These emergent identities and landscapes were needed to fit with the philosophy of inquiry the curriculum was founded on and with a holistic view of education that would suit our non-pipeline students better than the reductionistic focus on content that was/is high school science. These stories of mourning still had an influence on us, and on Christina:

Christina: *Right now we are doing a book study as a staff.*

Kevin: Which book?

Christina: *Comprehension and Collaboration: Inquiry Circles in Action*

...

Christina: *Right now we're just doing a book study and talking about where it already is in our classes, if it is. People have been encouraged to try inquiry. They knew that I had been doing a form of inquiry in my classes already so they wanted me to make my way into some other classes to see if I could help teachers become more comfortable with inquiry. Right now I'm doing it with the Science 9s but the idea is that hopefully I'll get to English and Native Studies before I'm done and help them.*

Kevin: Right. How is it going? Going into the classrooms that is...

Christina: [**Whispering**] *Well, there's been a lot of resistance. I think the grade 9 teachers are starting to come around, but originally there was this sense of, "*everything I've ever done is wrong because now they're telling me I have to do everything different…" *Two years ago we had only a few students graduate grade 12. Last year we had ten times that. Obviously it wasn't all due to different teaching methods last year, but I think that had a lot to do with it. It is the fact that it kept kids coming back.* [**Even quieter**] *So yeah... it has been met with criticism.*

Kevin: Well, we talked about that earlier, that inquiry is kind of one of those things that you just kind of have to try and then kind of move forward with it.

Christina: *And I don't know if people are stressed about whether it's going to work or not or whether they're going to fail or not or what. ... But again, the way we've been doing it for years and years and years is not working and we need to try something different. Even the teacher who's doing the inquiry that was initiated by one of my former students, the girl we spoke of earlier, they said to the class* "I'm being forced to teach this way. It's not my choice." *And I just thought, really? You said that to your whole class?*

Kevin: That's unfortunate.

Christina: *My former student responded by saying*, "I don't know why you wouldn't want to teach this way because it's proven to be one of the most effective teaching things out there." *I laughed really hard when she told me that.*

I think until you've gone through it and you see how it can work, if you're open to trying it, then you'll be a little bit more on board. I know the grade 9 teachers are starting to see a change in the climate of the room, you know. Hopefully it continues.

Kevin: I think even in our group, we talked about… one of the big things people have talked about in our group is all of a sudden the engagement of students is way higher and it's a real draw I think to inquiry.

Christina: *Uh huh.* (taped conversation, Nov 14, 2011)

This was my tension, the influence of stories of mourning. I think it was a tension of Christina's also as the stories of mourning represented the identities she was asking about when she asked: "*With my posts, do you think they will get it*"? Stories of mourning were constructed stories, not based on experience but often rather a lack of it. They were stories about the fear of failure and stepping into a role where uncertainty and play needed to be embraced. Perhaps people who told these stories had no threads of experience related to uncertainty and play in science to draw from and as a result were truly afraid to fail; after all, most high school science experiences do not prepare students to experience failure. One of the first questions that many in our inquiry group asked was "*Is it ok to fail at this?"* The answer we came to was yes, it was alright to fail. Stories of mourning were also stories constructed about oneself; about feeling like one's identity was being challenged and that what one had done was all wrong or was being forced to change. Stories of mourning were about self-preservation and the protection of one's narratively formed identities. Stories of mourning were also about challenging what inquiry was about; whether it would work or not and if

students would be successful with it. Christina and Shure Falls knew clearly what was NOT working and it was all about student engagement. I wondered about how it is we measure whether or not it is "working". That is, there is more than one definition of success and different identities will determine what success is on their landscapes. Inquiry was shown to result in success for students (Hattie, 2009) when learning was focused on higher level understanding such as learning about science process (effect size of 0.52), learning transferable critical thinking skills (effect size of 1.02), improving attitude towards science, increasing student led exploration and classroom discussions. Given that our renewed curricula focused on skills (process), attitudes and STSE decision making (critical thinking skills) in addition to Western and Indigenous knowledge, it was clear that success required inquiry. For Christina, success was about student context, student engagement, learning and hence graduation rates. As Christina whispered her comments to me about resistance and criticism, others' stories of mourning, I quickly came to understand how "spooky action at a distance" worked with respect to our identities. What was surprising was that she felt she had to whisper despite being a leader in her school regarding inquiry and contextualized learning. That is, the grand narrative that ran through high school science ran through other subjects, embedded in the identities of all of us, and it was here on the island too. Its reach was far both in terms of the space and time dimensions of the three dimensional narrative inquiry space.

> ¶ The dynamic nature of the network, of the enmeshed landscapes we exist within, are such that "even weekly linked relationships provide for incredible extension of connections and for the stability of social 'structures'" (Bloom, 2011, p. 4). Clearly there were narrative threads of experience that we shared – that helped to form our narratively constructed identities – which were weightier than and which held significantly more hysteresis than others.

Deformalization of Planning: Developing the CIE off the Island and in the Midst

Early on in our inquiry group meetings, we were introduced to a Ministry provided planning template developed around the ideas found in Understanding by Design [UbD] (Wiggins & McTighe, 2005). While focusing on the big ideas and the overarching questions for curriculum outcomes and units was engaging for the inquiry group, the group quickly moved away from the formalized and structured approach of UbD. I was not surprised. The group had spent much professional development time on the philosophy of inquiry in its broadest sense and on the definition of a scientifically literate student. They understood the need to plan but the UbD artifacts – templates, worksheets – and ideas about "best practice" seemed too formalized and structured for

the purposes I saw the group interested in. From my viewpoint, it was too formalized and didn't allow for the construction of a void and for the development of new ritualizations and artifacts. The artifacts and the ritualizations of UbD were all too familiar and as Ricca (2012) points out, Understanding by Design "contains essentially Tyler's four components, albeit in a 'backwards design' ordering" (p. 31). The group had already engaged with contextualized inquiry artifacts in videos presented as part of the professional development we had participated in and I had seeded the idea of capturing video and other artifacts and then coming back together to reflect on them (Lebak & Tinsley, 2010; Lotter, Harwood, & Bonner, 2006).

The group's question: "How do you share a philosophy?" centered around a different way of viewing curriculum. It was more about contextualized practice and the enacted curriculum and it was not planning that they appeared to want to focus on. The group had several questions early on about what inquiry looked like in the classroom and quickly realized that there was more to answering these questions than there was to the planning. Beth and Joel, two members of the inquiry group, had expressed early interest in designing new artifacts to share our philosophy that were not traditional, not from the landscape of reductionistic high school science. They were quick to move past UbD. I had spent much time with Beth in her classroom and in a graduate course on assessment and inquiry, which I helped construct with my supervisor. Beth and I had spent much time discussing the deformalization of the planning process and about the nature of guided and open ended inquiry requiring a wakefulness in the classroom, a fluidity with continual reflection (Clandinin & Connelly, 2000), that could not be planned for, that could not be scripted. Beth, whose focus was high school Biology, was in her tenth year of teaching and had a similar background to Christina in regards to her comfort with change, her continually shifting place and context, and her experience in middle-years; in fact they had taken undergraduate classes together. I had worked with Joel on the renewal of one course in the science curriculum a while back and was also involved with him outside of work volunteering in the community. I also knew his children and he knew mine. Joel had 20 plus years of experience teaching high school science largely in the area of Chemistry. Our inquiry group was together again for the afternoon and we were sharing our thoughts about planning and sharing our philosophy:

Beth: *When I look at what I wrote down for my inquiry, I think if somebody else looks at that, it's really hard for them to actually understand… You said that too, right? When you wrote it down, you sat in front of your computer for like hours, and all you could think of was…*

Kevin: Yeah, I sat in front of it for two hours thinking that there had to be more...

Beth: *And it was the same with me. I sat there and when I actually wrote my inquiry it was only half a page, and even when I shared it with my students, we still… well...more of what it is actually came about through discussion. So I think, I honestly… I don't know how you give that to somebody else. I think it comes from the experience, like seeing it.* (taped group inquiry meeting, October 26, 2011)

As Beth, Joel, Christina, and I stepped into more guided and self-directed inquiry, we quickly saw that the initial planning became minimalistic, focusing on big ideas and overarching questions. The planning was shared with our students to garner context, completed in interaction, something that was not built into UbD or other more reductionistic methods of planning – commonplace methods (Ricca, 2012).

> ¶ As I contemplate how to step into setting up professional development for and with science teachers, I am struck by the complexity of attempting to plan for inquiry in its broadest sense. It is not that its depth indicated a complicated-ness, but rather guided and open-ended inquiry was complex, it was autopoetic. Our initial preparations, enabling constraints that Beth, Joel, Christina, and I had put forward for students, would result in a diffraction of wonders that we could not share in advance with other teachers until we had stepped into our classrooms. Artifacting, the process of facilitating the collection and construction of artifacts of the experiences of teachers and students through our CIEs, a new ritualization, seemed to make more sense than producing unit plans, traditional artifacts, prior to stepping into the milieu with students and their contexts. Although Ricca (2012) was referring to courses as a whole and not units or learning areas, I too wonder if "perhaps syllabi are best conceived as a history of the course that is completed only after the course is finished" (p. 47).

Furthermore, all of us spent time gaining comfort with the uncertainty in the planning, getting comfortable with the void we had created in the deformalization of planning as we tried to create richer curriculum making experiences with our students. What we now needed were new rituals and artifacts that would capture the complexity, the growth of the inquiry in our classrooms that occurred after we set up the enabling constraints.

Kevin: So then, how do you get at someone else's experience?

Joel: *There is the problem-based learning site at University of Delaware, I just found it randomly. They've got a bunch of PBLs there, and they all have the same format.*

Different problems obviously, and people doing them different ways, but the way it's been put together at the University of Delaware site, it's common. So you have a title, the author, discipline, every target audience, all that kind of stuff, and then at the bottom basically what you're doing, how long it takes, supporting materials. And the supporting materials are all different. This one has the format of delivery, what are its learning objectives, what are the student resources, what are the teacher resources, author's teaching notes and assessment. So basically they're all different kinds of things constructed differently, but they all include all of those elements.

(Joel hands out a few samples)

Joel: *They can be different PBLs or inquiries, but as long as our format… as long as our cover face is similar, I think we're okay.*

Kevin: Well, that's what I think we should be shooting for. I think we need some sort of standard introductory type information that lays things out. What are the outcomes you are working towards? What's the general process that you use, and maybe how many days it took. Maybe we need to work from something like their site. This is good for a planning tool for us, but I think the other thing we need is the resources. I heard you had an assessment interview, right?

Beth: *Yeah.*

Kevin: That would be something that I think would be useful to others.

Beth: *Yeah, I suppose. I just… I think that it's so specific to my students and what happened in my classroom context that even if I give it… I suppose it's given as an example though.*

Joel: *Even if you look at these, like just the last few days hunting through this Delaware site, and there's a lot of interesting stuff there. I wouldn't do it precisely the way they're doing it, but I'm sure you could adapt it, and if you include the idea that you did an interview, that's something that a lot of teachers just wouldn't even think of.*

Kevin: One of the first questions we had was, "What does inquiry look like?" That's a big question.

Joel had introduced us to a resource that we would use to inform the development of our contextualized inquiry experience (CIE) cover page (Figure 3-1), a document used to highlight the details of the inquiries we were enacting in our classrooms and the artifacts that were available

related to that inquiry on our SharePoint site (Figure 4-4). Many in the inquiry group understood the need to artifact the experiences in the classroom, the enacted curriculum, the curriculum making experiences and the assessment making experiences that resulted from their shifted identities, from their emergent landscapes, from their morning stories. Documenting the artifacts for a CIE was much work and teachers needed help with capturing video and scanning and posting artifacts. That

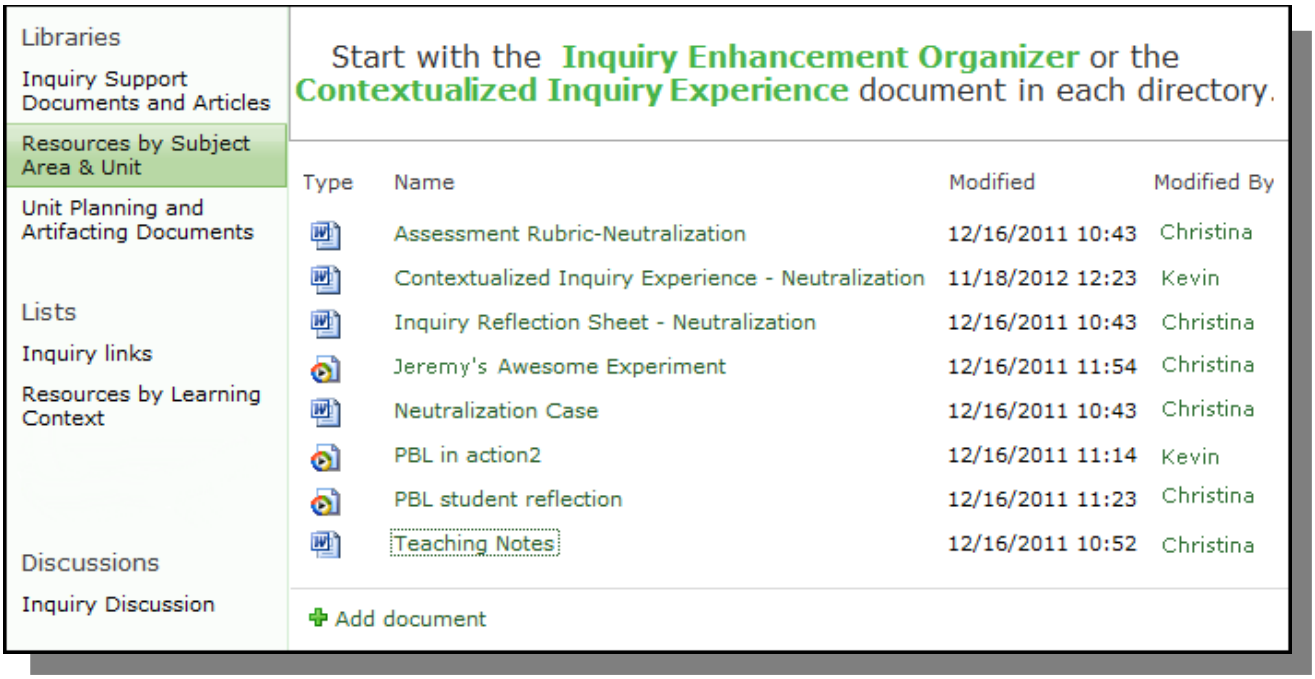


Figure 4-4. One of Christina's CIE postings showing the diversity of artifacts from the experience and the co-construction of artifacts between Christina, her students and myself. (Teacher artifact, March 6, 2012)

was one of my roles in the research – it was a rich experience, one I hoped to continue doing once the research was complete. We continued to use the CIEs throughout the year to share with others, to retell each other's inquiry experiences, a ritual that was not part of previous landscapes but that we were fortunate to have on this emergent landscape. Teachers came alive when they shared with the support of video of the classroom and student artifacts. It was truly a worthwhile experience which offered all of us the opportunity to relive within our own emergent landscapes.

I had my own tensions influenced by the institutional contexts around me. I wondered if we would be able to continue this form of professional development as curriculum renewal proceeded at breakneck speed in an effort to ensure it was implemented in time for the government initiated provincial "Student Achievement Initiative", which appeared it would be including large scale criterion referenced assessment across the grades and included science. I worried that the drive to produce, to efficiently develop professional development resources for the new provincial

curriculum, would once again push us back into producing binders and "teaching in a methodized way [that] removes the experiences of the learner, the learner's very being from the learning process" (Doll, as cited in Ricca, 2012, p. 32). I wondered if the division would continue to see the value in the artifacting of experiences of the enacted curriculum, in the sharing of identities and morning stories. It was of course in contrast to the value that had always been placed on front loaded "planning" as new curricula were released. It would require an organizational shift in terms of being comfortable with uncertainty, something that was tough under the managerial discourse (Sachs, 2001) associated with the government imposed continuous improvement framework.

> These initiatives taken together with the Continuous Improvement Framework, a common accountability framework aligning school division and provincial priorities; the recent restructuring of schools divisions from 88 to 28, providing the province with a more efficient and effective governance structure. (Saskatchewan Ministry of Education, 2012)

Perhaps we could manage to keep the artifacting and ritualizations, our CIEs and our inquiry group collaboration in addition to some professional development related to planning for inquiry that still resisted complexity reduction.

I had heard a tentativeness in Beth's voice, and I felt she was still a little unsure about sharing her experiences, her CIEs, much like Christina was.

Beth: *I think maybe my concern is that there are enough teachers out there that are kind of afraid of this, and are looking for somebody to hand them resources. I'm afraid that if we simply hand over what we did and then it doesn't work in their classroom because they haven't internalized it and they haven't adapted it to their context, then it comes back that inquiry doesn't work.*

Kevin: Oh, I see what you're saying.

Several participants (unclear): ***What's the alternative?***

Kevin: I don't know what the alternative is. When I went around and talked to science departments about the new inquiry founded curriculum, there were some people in the departments who said, *"Well, at the end of this, we want the binder."* At the time I was thinking "Well, I don't know how we're going to do that."

Joel: *So they could do all the work out of the binder?*

Kevin: Yeah, or they want the folder that they can transfer, right.

Beth: *But that's not my understanding. That's not the philosophy I've acquired, and I don't want to create that for somebody.*

Joel: *Right, but then the problem is somebody is going to take that approach and say, "Well, I tried it your way. It didn't work, so I'm going back to my way, the way I do it." They probably would have done that no matter what you had done.*

Beth: *Yeah, you're right.*

Kevin: That's true. They maybe weren't open to trying it anyway. I think the experiential part is important. The artifacts that we collect, right, the student artifacts, I think there should be some samples. I sent all of you a waiver form. I don't know if any of you have ever used it, but I presented at a conference and the student was thrilled that I asked for her permission to use her work. (taped group inquiry meeting, October 26, 2011)

Beth's tension was very similar to Christina's. She too appeared concerned that her inquiry founded experiences and hence identity, one that she worked hard to construct and enact, was at risk of being challenged by those who she felt would not internalize the philosophy of inquiry or would not include students in their planning. She too was concerned about complexity reduction. It was clear from Beth and Joel's comments that they had no intention of being involved in curriculum renewal if the group's purpose would have been to create traditional artifacts which would essentially lead to the reinforcement of traditional ritualizations such as factual gavage. With that said, both Beth and Joel appeared to come to the acceptance that for some teachers, it would not matter what we did to try to promote inquiry as they would either ignore it or approach it with such a methodized approach that it was bound to fail. I too wondered what the alternative was. I wondered how we could move those people who wanted a binder. I wanted our morning stories to become competing stories and I still worry they will become conflicting stories, or worse, secret stories, stories that existed only in our own classrooms hidden from the view of others. That was my story for my first few years of teaching as, I suspect, it was easier than pushing a competing story forward that challenged the grand narratives of high school science. Surely other teachers also desired the engagement that inquiry could provide, that Beth, Joel and Christina had found on their emergent inquiry landscape.

¶ As I step further into inquiry in my classroom and in this research, I am struck by the recursivity, and hence complexity, of inquiry. Planning was no longer solely part of my identity, solely part of my experience. Rather, it was also part of my students' experiences and part of my participants' experiences. Planning was part of inquiry. That is, I could not

> plan all of their inquiries for them in advance as I did not really know what their questions would be or if I gave the question, what path they would take to resolve that question. The problem that Beth, Joel, Christina, and I faced was one of trying to share the planning of rich curriculum making experiences in a way that did not reduce the complexity of those experiences. As we thought about sharing our experiences, we were trying to avoid developing artifacts for an enacted curriculum (Aikenhead, 2011) that occurred "in the absence of actual students: [where] the goals, assessments and experiences of school [were] chosen before the teacher knows the students" (Ricca, 2012, p. 31). Inquiries were a complex activity that grew over time in social interaction between facilitator and students/participants and between students/participants. Inquiries could not be copied and were difficult to understand from outside of the system (Ricca, 2012). Inquiries were autopoetic in that they were largely self-directed, following from earlier experiences, influenced by the milieu, by the landscape around them and hence influenced the person facilitating them. I again came to a further understanding of what Clandinin & Connelly (2000) were referring to when they said that narrative inquiry was both the method and the phenomenon under study.

Stories of Mourning: Tensions About Teaching Notes

Our inquiry group met about once every month, just enough time in between to have an interesting experience or two with inquiry to share and not so far apart that we lost connection between our shifting identities on our emergent landscapes. After we had discussed a possible cover sheet for our contextualized inquiry experiences, I put it to paper (Figure 3-1 – the finalized version), and then we met at the division office to review it with the group. It was late November and I suspect we were all wanting a break from the busied lives we led. We collectively did not like meeting at the division office. Despite being on the second floor, our meeting room had no windows and the parking was often next to impossible. It was better, however, than being in one of our own schools where it was harder to step away and stay away. We started discussing the CIE cover page and although I had felt somewhat part of the landscapes I was researching up until this point, this particular discussion interrupted my thinking and my involvement in the construction of the CIE; it caused me to notice that I too was positioned on the emergent landscape and very much was shaping and was shaped by that landscape (Clandinin, 2006). It was not just me that was researching and it wasn't just my participants who were constructing emergent landscapes.

The group was fine with almost everything on the CIE with the exception of the teaching notes. Unfortunately, it became a point of contention for several teachers in the group and came to a head during this most recent meeting. As organizer of the meeting and of the inquiry group I quickly found myself in a place between identities that were challenging each other's ideas about the CIE. The debate about the level of detail needed in the "teaching notes" had to have lasted an hour or more. It seemed like much longer, given I was trying to mediate the discussion that I was concerned could leave some people with a weighty negative experience that would be woven into their identities about inquiry.

While the tension around producing teaching notes was evident in the conversation and in the body language of members of the group – crossed arms, curt responses, and elevated voices – so were the concerns about reducing the complexity of our inquiries – something that traditional high school science was quite good at. In fact, complexity reduction was the grand narrative that was being challenged by the group. In this abbreviated and careful telling is perhaps the unobvious. I left the conversation feeling uneasy, like I had not done enough to include all of the voices. I was worried that we had pushed away one of our inquiry group members (field notes, December 3, 2011). As the conversation about providing more guidance in our CIEs went on, more dominant identities on the emergent inquiry landscape, myself, Beth, Christina, and Joel pulled the conversation to the point that we lost one of the voices that had been heavily involved in the conversation, we lost other identities in the construction of the CIE, identities which were also on an emergent inquiry landscape. We lost the input of a member of the group that had volunteered to step onto the emergent inquiry landscape with us. This was not a mandated PD group. Worse yet, I am unsure if we collectively learned anything from the experience. That is, this teacher wanted to step into inquiry and we were unable or worse yet, maybe unwilling, to include this person. It was clear that the uncertainty of where to step next was bothersome for this teacher and that the risk of failure on this particular landscape was high. I wondered if the ground we had set forward as the next step was too vague and too shaky. Perhaps the lily pads we had placed for others to stand on – a temporary scaffolding – were too scattered and too far apart and I do not know if we were interested in moving them closer together at that moment (interim research text based on a taped group meeting, November 30, 2011; January 17, 2012)

I suspect that the idea of a detailed set of teaching notes, a potential lesson plan, represented a reduction in the complexity of our inquiries and that was also risky and challenged our own identities in a way that felt hauntingly familiar. Philosophically, we did not want structured lesson

plans. We had discussed much about producing something that was more of an enabling constraint, something that allowed students and teachers to step into the uncertain and into guided and hopefully more open ended forms of inquiry in science which would allow for a more humanistic form of scientific literacy. What was hauntingly familiar is that we (Joel, Christina, Beth and I) had all produced "teaching notes" and structured lesson plans in the past. That is, we knew the landscape that teaching notes produced and it was a landscape we were trying to shift our identities away from. It was if we were arguing with our own identities, with our identities that were tied to the grand narrative. It was risky as I am sure we all felt those pulls from the tendrils of traditional landscapes, the pulls from modernity that could allow us to slip back into that comfortable set of coherent identities we were trying to shift from. I wondered though, if we had forgotten how we took our first tentative steps. Had we lost sight of our own morning stories? Did we believe that we emerged on this landscape all of a sudden? Did we believe in punctuated emergence? I know my first step into inquiry was to take a structured inquiry, a lab, and remove the "procedures" section. I remember the struggles I had with students. I was sitting beside the lab goggles waiting for students to come up with a procedure to be reviewed. I remembered the twinge in my stomach as students who had not done their homework scratched their heads and discussed with their peers in order to come up with a procedure. The minutes ticked away and all I could think was that this was going to take more than the period I had planned for. It was going to take 2 or maybe 3. What if they refused to or could not come up with a procedure? What would I do if the procedure would not give useful results? What if they just copied the procedure from each other? I had resolved those tensions in my classroom but was there a way for us to remember our own morning stories, our own stories to live by from early on in our steps onto the emergent inquiry landscape? Maybe there was a way for us to put forward a few more descriptors about how to generate inquiry about how to start the process with students?

I do not believe the exclusion of this one teacher's voice was intentional but somehow we did exclude this teacher's views and suggestions and therefore the opportunity to collectively share our experiences with this teacher in a way that was supportive of this teacher's attempt to shift one's own identities. I wondered if we had visions of this teacher's identity that really were not representative of the identities this individual had experientially constructed. I wondered if we had imparted identities, both real and fictionalized constructions of our minds of those who did not agree with inquiry or the new provincial curriculum, solely onto this teacher. Maybe the teachers and identities we thought were out there did not really exist. Maybe we were at once the grand narrative

and the emergent. That is, I knew I had constructed identities using threads from the grand narrative and that some of landscapes I constructed for students were still somewhat traditional. These identities were sometimes still useful depending on the context. I also knew that I was constructing emergent landscapes using narrative threads that were not from the grand narrative. It was not like I could differentiate the threads of the various identities I held as they were all intricately interwoven into a more or less coherent set of identities that I brought to the classroom. I was having trouble separating the real stories from the fictionalized ones. Were we now constructing *stories of mourning* about this teacher's inquiry landscape? Had we considered this teacher's experience on that landscape or were we simply creating fictionalized stories about what we thought this teacher's experiences were? Were these othering stories about what this teacher thought about inquiry that placed this person outside of the realm of our shared emergent inquiry landscapes? After being somewhat marginalized ourselves due to our shifting identities were we now marginalizing another, the oppressed becoming the oppressor (Freire, 1989)? Were we so busy reacting to the existing landscape of high school science, the dominant grand narrative, that we were inadvertently constructing a new landscape that was itself unapproachable for those who possibly had not had many of the experiences we had already had the fortune to have. I wondered about the tensions that other teachers in the group felt because of our focus on a landscape which may have been unapproachable for them. They were also interested in shifting and possibly would have benefited from some of our earlier experiences of our shifts, some of our earlier morning stories. If we were constructing something that was unapproachable for many other teachers, were we essentially setting ourselves up for an eternal conflicting story? Were we further marginalizing ourselves by marginalizing others? Maybe we had fallen into the trap that Dewey (1938) had warned about: "for in spite of itself any movement that thinks and acts in terms of an 'ism becomes so involved in reaction against other 'isms that it is unwittingly controlled by them" (p. 6). Maybe I did not create enough space for all the identities involved. Maybe I created the tension. Maybe we created the tension. Maybe our narrative threads, our past experiences, indicated to us how insidious the simple networks of connections of the identities on our landscapes could be that argued for mechanistic lesson plans (Bloom, 2011). That, however, could not justify our exclusion, or the stories of mourning. This teacher did have something to contribute.

In the end, we did end up including this teacher's suggestions in the teaching notes: required prior knowledge, culture of inquiry, and scope and sequence. These were useful inclusions in my view that could possibly provide the springboard necessary for some to make it to the next lily pad.

While this teacher did not continue with the group after this particular meeting for a number of reasons related to the busied lives of teachers, I cannot help but feel that I could have managed the interaction more smoothly in a way that would have helped this teacher to remain connected with the group. I wondered what this person's morning story, the experiences on the emergent inquiry landscape, would be.

Deformalization of Assessment: Marks and Mo(u)rning Stories

As our inquiry group stepped further into the uncertainty of guided and open ended inquiry, several questions were raised about how to evaluate these less formalized forms of inquiry. Assessment for, as, and of learning were concepts not new to the group and discussion ensued about the formal evaluation, the assessment of learning, that Christina used given the variability of the final products:

Christina: *They're never the same, and because we have access to so much technology at our school the way that they choose to present is always different between the groups. So sometimes they'll create a video and sometimes they'll even make a song. Some kids have used PowerPoint, an old standby. I encourage them to present it however they want, basically. However they can best present the information.*

...

Christina: *Because they'll upload all of the tasks that they've done, so let's say they split it up and one person is working on the characteristics of an acid. They're going to upload that information to the site. Some of the evaluation comes from the information that they've uploaded. Some of it comes from the presentation, and then this year I also started doing interviews with kids afterwards to discuss the things that maybe weren't part of their task but they obviously still need to know. So that is a large component as well. I don't do tests just because typically my students are not comfortable in that setting.* (taped group inquiry meeting, October 26, 2011)

Assessment of learning served many purposes on the traditional landscape of high school science. It served to sift and sort, to create competition, to objectively certify and for an extremely small percentage of pipeline students, to motivate. It was also historically focused almost solely on theoretical academic knowledge, epistemic knowledge (Aikenhead, 2008) through a process of factual gavage. I was getting the impression from Christina that she was not as interested in the same assessment of learning as the rest of the group was. It was clear that she had garnered from experience that her students were not motivated by typical assessment artifacts, their learning or way of knowing not fully represented, and in fact she clearly felt an interview or conversation could tell

her more about their learning than a paper or pencil test could. She appeared no longer to be wooed by the lure of objectivity and rather embraced the subjectivity required to evaluate her students in a way that represented their learning, their "ways of being" in the context of their PBL inquiry. Her practice of interviewing students showed her interest in finding out about their phronetic[2] understanding (Aikenhead, 2008) from the contexts the students were working in. I wondered what those interviews were like. I wondered if Christina was moving to an evaluation strategy that embraced and encouraged yipwakawatisiwin or wisdom in practice in her students. Had Christina found a way to have "phronesis intermingle with episteme" (Aikenhead, 2008, p. 3) in a way that valued the identities of her students in the context of inquiry?

As the group focused Christina on the evaluation of student work, on the end product, I was concerned about what was not being talked about. Based on my own experience with longer and less formalized inquiry, I suspected she also included much assessment for learning and assessment as learning, an important driver of guided and open-ended inquiry.

Kevin: Do you have rubrics for that?

Christina: *Yeah. Yeah.*

Kevin: So do you have any assessments along the way that are not part of the mark? Like do you use anything to drive things forward?

Christina: *Like feedback?* [**smiles**]

Kevin: Yeah.

Christina: *Yeah, well, I try and sit in on their group stuff as often as I can and give them feedback as I go.*

Kevin: So it's mostly all informal feedback? No formal checkpoints for marks or anything?

Christina: *No* (taped group inquiry meeting, October 26, 2011)

Christina's rather curt response about rubrics was somewhat surprising. It was not that I did not believe that she used them but rather, it clearly was part of a larger narrative, part of her shifting identities. As I would later learn, Christina had an opinion about rubrics: "Death by rubric" (field

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[2]Phronesis, a word of Greek origin, is defined as practical wisdom and as Aikenhead (2008) mentions, phronesis resonates with wisdom-in-action in that phronesis "indicates a way of knowing the world embraced by most Indigenous peoples" (p. 2). In contrast, episteme is defined as theoretical knowledge.

notes, May 2, 2012) was her response when I asked her if she used a rubric in coming up with a particular mark in her communications and horticulture class. She did not use a rubric to determine her students' capabilities in the area of communication. I wondered what the death was that she was referring to. Based on the dynamic projects her students produced I suspect her flippant and overt responses about rubrics meant that it was creativity or critical thinking that was at risk due to rubrics that tended to over-formalize, to reduce the complexity of the experiences her students were trying to share.

What I was interested in, however, was what was not happening, it was the deformalization of assessment and the construction of a void that she had accomplished by pulling away the formalized assessments removing marks and rubric scores as motivators (Kohn, 1993; Kohn, 2006) by eliminating the heavy focus on assessment of learning (Earl, 2003), and as a result creating a less risky landscape for her students to inquire within. The construction of this void allowed for new ritualizations and artifacts, something more complex, something richer – assessments done in relation with students, rich assessment making experiences that drove the inquiry forward for her students. She filled the void with assessment for learning and assessment as learning practices, something she was capable of doing largely due to her shifting identities. Christina had embraced her facilitator identity and greater learner autonomy as part of a move away from reductionistic forms of science founded on behaviourist ideals to more holistic forms of science including embracing sociocultural (Willis, 2008) and possibly complexivist (Bloom, 2011) views of learning. This embrace allowed Christina to include meaningful assessment for learning practices within the community of learning she had constructed. Within this community, it was obvious that learning was "viewed as [a] process of participating in a community of practice, where expertise is developed in social as well as cognitive ways through the use of cultural tools learned by working alongside more expert members" (Willis, 2008, p. 1). Christina had grown comfortable with the indeterminacy and divergence of the void and had continued to resist the "modern" temptations of rigid formalizations and convergent thought as a means to an end.

Looking for New Ritualizations and Artifacts: Stepping on Emergent Identities on an Inquiry Landscape

Christina had shared with our inquiry group artifacts and ritualizations from her classroom including an introduction to PBL video, several PBL case disclosures, a video of students working on PBL, student and teacher reflections about using PBL, samples of student projects and of course her CIE cover pages. She was excellent at artifacting and needed little help with it. She understood

the purpose of artifacting the enacted curriculum, the rich curriculum making experiences that she and her students were experiencing. The process was not foreign to Christina as her students were very much required to artifact their inquiries as well. What was not included as part of her CIE artifacting were the ritualizations, the informal pieces of her and her students inquiring in a community of practice, and in particular the assessment making experiences that were occurring in her classroom. Christina and I had chatted about coming to see that in action and possibly artifacting some of the more informal feedback, the group interviewing that she used as part of their inquiries using PBL. May 2nd would be the day. It would be Christina's Biology 30, Horticulture and Communications course again, a two hour block class running over two block terms.

Class started the same way it always did with regards to Christina and her students – I was on time today for a change, it only took me a year to adjust to the pulls on my landscapes – 8 students at 12:55, 10 at 1:05, 12 at 1:15, 14 at 1:20. There was no smell of burnt Sage today. I did miss how it interrupted my thinking about teaching, how it shifted me onto this emergent landscape. Christina did not wait for all of the students to get started. There was learning to do. As the drums of a recent Powwow played from a student's phone, a few students helped Christina retrieve 12 laptops. "Music off", Christina commented. Christina signed out laptops to students using the scanner, dealt with requests for headphones, and managed group dynamics and issues that arose – *"show me your work", "I'm sorry, that is your group", "what do you need?"* Discussion started about Nurse Wilma who had been the guest speaker yesterday talking about human reproduction, the topic of the disclosure the class was currently working on. There were still artifacts from her talk on the board. As students were instructed to start integrating what they learned yesterday into their popplets, I walked around and taped 1-2 minute clips of Christina helping her students work at their PBL disclosure using popplet, clips that would be used for future uploads to Christina's CIE and for Christina's reflection on the experience. Students using popplet could see what others in their group were working on in punctuated real time, enhancing the connections in their social network with opportunities for built in peer and self-assessment, informal assessment. Christina was busy today as she needed to get several students reconnected with their group and started on the work from the last two disclosures they were responsible for. She paired up students to get them connected with what the groups had done so far and what their responsibilities were within each disclosure. Christina was both an effective and an affective relationship broker which was part of her facilitator identity.

After touching base with all of the groups and ensuring the web of relationships that were necessary to keep the learning moving forward were negotiated properly, Christina called me over to the lab desk. She was ready to start assessing some of the group work on disclosure 4 related to human reproduction and we agreed we would try to record this rich assessment making experience for others in the inquiry group to see. We started with the group by the window. They said they were ready and volunteered to go first. I got the impression from Christina that they had a few very strong group members. I set up the camera on a tripod and sat on the tables adjacent to the group. Christina came over to the group with the disclosure, a small blank notepad and a pen. Christina started a conversation about the disclosure and then directed her questions towards one of the group members. She would ask a question, jot down some notes as the student spoke; she would ask follow up questions and would also ask others in the group to ask questions of the group member or elaborate if they could. She then moved on to the second student in the group. This was a rich assessment making experience with lots of qualitative assessment for learning but it was also assessment as learning. As part of the assessment process she was modelling inquiry and group collaboration. She was being the culture broker, modelling how to play in the uncertainty of inquiry and how to take the existing ideas and diffract them into more complex ideas. This contextualized and cooperative assessment was the learning, at once how to assess someone's inquiry research and how to inquire. There were no rubrics, no checklists and a richer assessment experience I could not have had. It was the new ritual that filled the constructed void she had created (field notes, May 2, 2012).

Christina's assessment was some combination of assessment for, as, and of learning – she was going to use these informal notes to help come up with a formal summative grade at the end of the term. It blurred the dichotomous categories of formative and summative. It also blurred the fictionalized trichotomy – *for, as,* and *of* – that was really a dichotomy in practice, that which counted, the summative *of,* and that which usually did not count, the formative *for* and *as*. That is, for the most part, I did not come across teachers who could effectively define assessment *as* learning in a practical way so it often was lumped into assessment for learning or formative assessment. Worse yet, I continually saw around me many cases of formative assessment being conscripted, contorted in purpose and intention, for summative means – what Stobart (2008) calls mini-summative assessment; a reduction in the complexity of what otherwise might be rich assessment making experiences. It was not a dichotomy but rather largely a monopoly in practice in high school science. What was not for marks? Christina was not only filling the void with a more

complex form of assessment, she was creating a space for new forms of assessment. Assessment that was contextualized and helped students take risks, think creatively and critically, that reflected on the learning in a community. What I suspect is that Christina was utilizing sociocultural interaction to increase engagement and possibly a form of *preparation for future learning assessment* (PFL, Schwartz, Lindgren, and Lewis, 2009) that allowed students to learn during the assessment, in fact, it was a goal of PFLs that students could construct knowledge as they are assessed. Unfortunately, as Schwartz et al. (2009) point out, due to the heavy focus on assessments that utilize sequestered problem solving (SPS), there is little research on PFL assessments. What I do know is that for Christina, this type of assessment provided assessment making experiences that helped her move the culture of inquiry forward in her class and create an environment that allowed her to be a culture broker, a travel agent and tour guide, to acculturate her students to Western science while at the same time valuing the diversity of their identities and their contexts. I believe Christina's assessment practice was *assessment for inquiry* (J. McVittie, personal communication, September 4, 2011) a more authentic form of assessment that Janet, a former professor of mine, and I had long talked about as being required for inquiry in its broadest sense to be successful.

As the process continued and as I moved the camera between Christina and the student being conversed with, one of the newer members of the group seemed increasingly anxious. I had moved the camera very close to this new group member. This student kept looking at the camera and at Christina. Clutching at one's stomach and hunching over was a good indication that something was not right. The student got up quickly and left the room to go to the washroom. The topic was not a light one either – reproduction, pregnancy, nutrition, and foetal health – and it was very much in context. I wondered how close the contexts the group was inquiring into were in relation to this student's current context. Christina informed me that the student had recently moved to Shure Falls from a reserve and I suspect was not ready for this deeply relational type of informal formative assessment in context. I turned the camera off and put it away. It really was not capturing what I wanted anyway, the dynamic nature of the interaction, and I started to question the effect of capturing the process. I felt outside of the milieu, distant from the lived experience and I had been so absorbed by operating the camera that I really had not noticed as much as I should have. I reverted to field notes in the hope that this student could make it back into the process of this group interview. I felt like I had inadvertently stepped on one of this student's opportunities to become better connected to the web of relationships that already existed and that were being further

connected through this assessment. I wondered what this student would pull into his or her constructed identities from this assessment making experience.

¶ Reflecting further on this experience, I was intrigued by the complexity of the group's interactions and the notion of coordination dynamics (Kelso and Engstrøm as cited in Bloom, 2011). I had interrupted the oscillations and rhythms associated with the relational and temporal scales of the assessment making experience that had been happening. The bi-directionality of interaction that the artifacts captured by the camera implied itself a reduction in the complexity, the heterogeneity, and the non-linear coupling of the identities within the group which included Christina. It was my reconnection with the three dimensional narrative inquiry space as a researcher and the nature of narrative inquiry that allowed me to see that I also was an entity within the system, part of the heterogeneity and the oscillations and rhythms, part of the phenomena under study.

After checking to see if the student who had left was alright, Christina stepped back into the process of giving informal feedback to the group. Furthermore, she gave suggestions as to what could be improved on both in regards to the disclosure and in terms of their work within the group – what the relationship work was that they needed to do. Christina also used this process as a way to bring new students into a group, a more frequent occurrence at Shure Falls than at my school. It was also a way of highlighting the process and context of the group work and a summary of what was being worked on. This was not the formalized assessment for learning or assessment as learning that occurred in many other classrooms. I wondered if Christina saw her assessment practice as *assessment as relationship* as I did. In addition to using assessment to inform students about their learning, I saw her using assessment to create connections with and amongst students. Christina informed me that the notes she took would be used to inform her evaluation at some point. Rather than using marks or assessment of learning as the reward, "the object and reward of learning [in Christina's class was] continued capacity for growth" (Dewey, as cited in Schwartz et al., 2009, pg 35) through the construction of richer relationships.

The Diffractive Affect of Morning Stories: Whose Morning Story is Whose?

It was not long after my experience in Christina's class that I also started using group interviews as part of my own deformalization of assessment with my students. I too was shifting and constructing my own morning stories on an emergent inquiry landscape. I was in the process of constructing voids and pulling away much of the traditional assessment of learning in my class and replacing it with fewer and more challenging types of learning. I had stepped into open-ended

inquiry with my Physics 30 class and in addition to assessment tools to drive the inquiries forward, I was looking for a way to find out more about what students had learned in their inquiries. That spring, I started interviewing students in small groups (4-6 students) as they shared, in whatever format they wanted, what they learned related to the lived curriculum in our course and related to their real world contexts. These interviews, done in the inquiry community we construct throughout the term, are the single most rewarding assessment making experience I have ever had in my own classroom. It is an experience that I very much look forward to.

While I initially was quite excited about this unique assessment practice that I had constructed, I was quickly reminded as I started reading through transcripts that this shift in my identities, my morning story, was not solely my own. This shift in my identities was also not solely due to the experience I had in Christina's classroom, an experience of her morning story. That is, despite my desire to wholly own my emergence, it was not due to a single event but rather it had grown through a process of narrative reconstruction, a diffraction of similar and weighty narrative experiences that were now more coherently woven together such that I can remember them like they happened just yesterday. My shift started with several performance assessments in university Biology and university Physics. This was followed by what was largely a preparation for future learning "final exam" in one of my science methods courses. These experiences were then reinforced constructively through hearing about Beth's process of interviewing her students and then finally participating in Christina's PFL assessment practices in her classroom. Interestingly, Christina and Beth also had the same professor as I did for one of their science methods course. This was my morning story and through the interaction with others' morning stories, I was now able to view assessment as a relationship, able to enact an identity that facilitated a web of relationships connected through rich assessment making experiences that focused much less on marks and more on enabling curriculum making experiences designed to promote contextualized inquiry and hence lifelong learning.

The Diffractive Affect of Morning Stories: Seeing the Magic

While my morning story and hence emergence was retrospectively presented somewhat linearly, in a temporal nature, the organization and weaving of the narrative experiences that make up my identities is anything but linear as some experiences are weightier than others, richer experiences or narrative threads that were more densely woven with other's identities. It is this enmeshing of emergent inquiry landscapes that allows me to hold onto the competing stories, the competing identities I have within the existing landscapes I am part of. Joel was shifting as well; he

had his own morning stories and his own emergent inquiry landscape that was enmeshed through other's emergent inquiry landscapes being constructed in the group and within the traditional landscape of high school science. I had connected with Joel and his science department prior to starting the research to explain the research and the inquiry group I was trying to get started. I had been meeting with Joel and the rest of the inquiry group for several months before I was able to connect with Joel one on one to discuss his experiences so far. Prior to entering into this conversation, I reflected on what had been said after the introduction to the research.

Joel had stayed after the introduction and invitation to the research and inquiry group to talk about his frustration with the learning going on in his school and the fact that much of the extension into inquiry, extensions past traditional factual gavage, was in the form of generation of posters. This was clearly a tension for Joel. We discussed student apathy and about how he remembered a time when he was teaching when they would work on Rube Goldberg machines and do other inquiry-like labs. He also mentioned a PBL workshop that he attended (interim research text from a personal communication, November 1, 2011). It was this conversation, as well as comments Joel had made in the inquiry group meetings that drove the conversation I started with him.

Kevin: Why inquiry, why now? This is a question you and I have touched on. You've taught for 20 years, you said?

Joel: *This is 22 this year*.

Kevin: So why now? What are the factors that spurred you to inquiry now?

Joel: *Like I say, I've always kind of leaned towards it. I've always been the kind of teacher who asked the kids, "Okay, now what do we do with this? Where does this go?" And kids don't like those questions, especially if they've been sitting in their desk: "Okay, I've got to know this. Got to know this, got to know this," and then you're asking them something open-ended. Kids don't like that. But with inquiry, that's where you start, and then everything builds in the other way.*

I think as I've gotten older I've gotten less curriculum-driven and more student-driven, more concerned about the learning as opposed to the curriculum. I've been saying this for years and telling the kids that I know that in five years you aren't going to remember anything we've taken in this class. You might remember some of the stories, and the stupid things that happened, but you aren't going to remember what 1,2-Dicholroethane looks like, right? But again, if you can tie stuff to stories,

if you can tie stuff to kids' experience, then… I mean, that's what we were taught in education 100 years ago.

Kevin: Yeah, we've known it for a long time.

Joel: *We've known it for a long time. But you get into a school, you do what's easiest for survival, and then it's only… it's taken 20 years for me to say, "Okay, now I need to up my game a bit and see if there's a way that we can concentrate more on the learning and concentrate more on the excitement, and less on the trivia."* (taped conversation, Nov 3, 2011)

I had heard that Joel was "that kind of teacher" that he described, one that engaged his students in a deeper understanding of the material. In fact, as he explored inquiry with his students and shared those experiences with the inquiry group, I heard comments from others in the group about how his students were loving the inquiries they were involved with and that his class was "different" (field notes, October 26, 2011). I also saw the engagement and the new ritualizations in the clips of inquiry Joel had artifacted. The tension between content coverage, the traditional curriculum, and the uncertainty of inquiry for students was clearly a concern of Joel's. Joel's shift to a more holistic student-driven form of teaching fit with the renewed curriculum which, as Joel noted, required that we started with student questions in a learning context and the content was secondary, coming after context. By removing the content as the primary focus, Joel constructed a void and allowed student questions and context to fill that void, a deformalization of planning.

Interestingly, Joel understood the power of experience and story. I am unsure where that came from, perhaps experience. Joel had mentioned that he was an avid reader – I think he said he was a science nerd, interested in everything science. I wondered if the 100 years he was referring to was related to the section in Llewellyn's (2011) book related to inquiry and constructivism. It referenced Dewey and I suspect the idea of experience. Joel's shift, 20 years in the making, was focused on student learning and student engagement and less on reductionistic science content. Joel's concern about this shift not happening over the last 100 years, or over even the last 20 in his own career was not unique. Both Beth and Christina wondered why it had taken them so long to shift. While I knew many of the barriers to shifting, the reasons for why it took so long, I was more interested in the understanding Joel had about his own experiences, the understanding of his own shifting identities, and the experiences of his emergence onto an inquiry landscape – his morning story:

Kevin: When I was here we were talking about inquiry and the new curriculum amongst other teachers and you mentioned that the decrease in content in curriculum was intended to help us to get to some of the softer skills of science. Do you feel they are less valid skills to pursue?

Joel: *Part of this comes from my background, part of this comes from teaching for so long. You realize that you're pounding facts into the kids, and you know darn well that many of those facts are going to be gone in a month. And so you have to ask yourself, what can we do that's valid that will have a lasting impact? The province talks about building lifelong learners. Well, that's what inquiry's all about, is building lifelong learners. And you know, the kids aren't going to remember 10% of the facts that I teach in a chemistry class or in a Grade 10 science class.*

But if we do inquiry and do it well, the kids are going to learn a lot of stuff, and they are going to keep it, because it's theirs. You know, again, just going to back when I did that PBL workshop and Christina brought in her kids from, well, again, these are really edgy kids. These are kids who have not had success in the school system and the excitement that they exuded and the knowledge that they had…. We questioned them about a unit that they had done the previous semester, and they had it all. It was there. They may have not had all the trivia…

Kevin: And from what you've told me, not only was it there, they were very excited to share it.

Joel: *Oh, yeah. Yeah, and excited that we wanted to know what they knew. It's everything I believe about what science is.*

Kevin: So one of the best parts of that workshop then was seeing other teachers' experiences and other students' experiences?

Joel: *Oh, gosh, yeah. So they took you through the workshop to show that this is what inquiry looks like. They kind of lead you through an inquiry. But then again, to see the product at the end,* ***that was… that was magic*** [**emphatically**]. (taped conversation, Nov 3, 2011)

It was obvious that Joel's experience with the artifacts from Christina's students and the interaction with them was a narrative thread that helped Joel to reweave the threads of his own experiences. This particular one, however, "was magic"; it was weighty and significant, allowing him the opportunity to step through a liminal space and to work towards a new narrative coherence. Incidentally, it was Joel's description about pounding facts into kids that got me thinking about the

idea of factual gavage. I had participated some in that process throughout my career as well. That was not my intention going into education. I started out as a teacher focused on constructivism and on lifelong learning concerned about the environment and our connection to place. I guess partly it was survival and partly the landscape that was around me. The binder was handed to me in my first semester. I didn't use it except for the activities which were largely demonstrated or structured inquiry. Joel's noting of Christina's students as "having it all" even after the course was over and their excitement to share their experiences and artifacts was what I thought science should be. Joel felt the same. Christina had created lifelong learners.

> ¶ This interaction and intertwining of relationships amongst our landscapes, the relationships of relationships (Bloom, 2011), indicated that our identities were part of a complex system that was greater than the simple sum of our individual landscapes. Our landscapes were topologically enmeshed (Ricca, 2012) with each other, sharing in each other's narrative threads of experience in such a way that the boundaries of our landscapes were unclear and overlapping. It was the mutual interaction (Ricca, 2012), between Joel and Christina that, for me, highlighted the complex nature of the enmeshing of our emergent landscapes. It was this type of interaction, that between Joel's and Christina's experiences, which drew me to narrative inquiry as I felt that the "reflexivity in complex systems required a different approach to study than the usual separation of observer and observed" (Ricca, 2012, p. 37). It was only by being in the midst, in the milieu where continuity and interaction were evident, that we were able to share each other's morning stories as well as retell and relive them for others.

What Joel saw was the result of memorable experiences, a *rare* glimpse of it unfortunately as often "the work our children do might be memorisable (a version of control, prediction, and manipulation) but it is rarely especially *memorable*" (Jardine, Clifford, & Friesen, 2002, p. 87). At the start of Chapter 3 I wrote about the tension Christina held, a tension many of us held, regarding her CIE posts – *with my posts, do you think **they** will 'get it'?* What I can say to Christina is that speaking from all of the identities I hold, the identities that I see in Joel, and with the understanding that through the interaction of our experiences, through the enmeshing of our narratively woven identities, that **we** are essentially **they**, that **they** do get it.

I also wondered how Christina's students could be getting 50s and 60s when many students who we teach would be unable to share much of anything about their science learning in a similar context given the "modern" style of science education they are often exposed to. Clearly, the

provincial assessment was not representative of that which was memorable – 50 multiple choice with no constructed response. That is, many students certainly do not have the context and depth of understanding that Christina's students had yet they were often getting 80s and 90s. Somehow, I wondered if the sharing of inquiry experience at the PBL workshop should not be the stick with which we should be measuring student achievement ***if we must measure at all***. That is, it was a sharing of their learning, in a community that included their peers, members from the science community and other teachers. All that was missing were a few community members and students who were going to be stepping into the learning next (Meier, 2002). It showed their learning in the areas of skills, attitudes, STSE, and knowledge, including Indigenous knowledge and it was in context. These were the foundations of our provincial curriculum. This was a rich assessment making experience for these students, one that I am sure they valued more than the mark they received on their transcript.

Temporal Mo(u)rning Stories: Re-finding Narrative Diversity

I also wondered what it was that brought Joel to this view of science, a view that competed with the typical stories of high school science landscapes. As Joel and I inquired further into his past experiences with inquiry, it became evident that this experience with Christina's students was not the only weighty experience that he threaded his emerging identities with:

Kevin: Did you do inquiry in high school?

Joel: *In Grade 9 it was still the old physical science course, of course, but my Grade 9 teacher was just amazing, and he was one of these guys who could make things exciting. I expressed an interest in a couple of things and he said, "Well, why don't you come over the noon hour and we can do some stuff." And so when I took science in Grade 9 I would go on a regular basis over the noon hour and play with chemicals and stuff. And he showed me some things, and it was just, "Oh my, this is marvellous." And that wasn't for marks, it was just for fun. For me that was a transformative experience.*

Kevin: And it was not for marks.

Joel: *And it wasn't for marks and it got me hooked on science for life.* (taped conversation, November 3, 2011)

Joel's engagement in grade 9 was a deformalized science experience. The removal of marks and the focus on student context, the construction of a void, allowed for new ritualizations – play and

inquiry – which led in part to Joel's lifelong engagement in science. Joel, however, had other deformalized experiences surrounding education that influenced his shifting identities as a teacher:

Joel: *You know, I come to this whole thing with a little bit of a different view because we home schooled our kids until the end of Grade 8, and we never taught them a thing, literally. We tried teaching them a little bit of the math curriculum, but it was a dismal failure because the kids wouldn't sit at the table for more than… well, after four weeks they just completely rebelled. So we never, ever got through a math curriculum, and never even attempted anything else. But the kids were always doing activities, the kids were in a mix of kids of all ages and parents, so they had a very, very rich, I would say inquiry-based experience growing up. You know, we would go on family holidays, go to the museums, and the kids were actually interested in reading the captions.*

And so they learned that their education from K to 8, I think, was far richer than the average student's, just because the students learn that, "Well, this is important so this is for marks… What is for marks, sorry. Everything is for marks," whereas our kids learned to read for fun, and stayed reading for fun, their biggest disappointment coming to high school was they were bogged down with so many other things they didn't have time to read for fun. So I come to this, saying, "Inquiry is a very valid way of doing things." I've got to say in the twenty-odd years I've been teaching I haven't done a hell of a lot of it, at least not as far as all this goes.

Kevin: So you're more of a facilitator with your kids.

Joel: *Yeah. Yeah, but that can't be that here, that's bizarre. I got an email from one of my daughters in September, or end of August? There was that last lunar eclipse. We didn't get it here, but they got it in Europe and my daughter lives in Germany. And she just flipped me an email saying, "I just stayed up all night watching the lunar eclipse. Thanks Dad for taking us out to look at the stars and stuff when I was little."*

Kevin: Yeah. That's cool.

Joel: *Yeah. So I wasn't trying to teach them anything. I was just like, "This is great stuff. Come out and take a look."*

Kevin: So I mean, when you talk about the inquiries you're doing in Grade 10, I hear a lot about kind of creating a culture of inquiry and a culture that's different, and I can see you trying to be a facilitator in that.

Joel: *I want to facilitate the excitement is what I want to do, because this is just the coolest stuff in the world. Science is just absolutely marvellous. And I want to make the kids see that too. I want the kids to love science, and inquiry kind of lets me do that because we can go in different directions, and I don't have to say, "Okay, today we're on page 23 and tomorrow we're going to be on page 24."* (taped conversation, Nov 3, 2011)

Joel's experience with his own children's education, an experience I understand as somewhere between unschooling and home schooling, formed a large part of his shifting identities in his classroom from sage on the stage to guide on the side. Despite Joel's emergence onto inquiry landscapes, the tension between his *wished-we-could-enact* identities – a facilitator identity – and those that were enacted traditionally in his, and many of our classrooms, was still at the forefront of his experience – "*Yeah, Yeah, but that can't be that here, that's bizarre.*" The formalizations of traditional high school science landscapes often present barriers to inquiry; however, Joel's experience with the deformalization of school appeared to help Joel rearrange the threads of his experience to establish a facilitator identity which allowed him to start bringing forward a culture of inquiry in his classes. He was passionate about what he was teaching and wanted his students to be just as engaged through contexts students could engage in, in directions that students determined. It was their inquiries that they pursued. These experiences were significant threads of Joel's morning story, his experiences of his shifting identities on an emergent inquiry landscape.

What I still felt after leaving the conversation with Joel was a tension between the reductive structures of school and inquiry, a tension of wished-we-could-enact identities and enacted identities, and I was not sure how Joel was able to exist with this tension. It was at the last group inquiry meeting that I was woken to one of Joel's identities that I wanted to explore further (field notes, November 30, 2011).

Kevin: So here's what you said at the last inquiry group meeting. You said, "*The last few years I've been feeling very grandfatherly in class and I've gotten far, far more relaxed about stuff.*" Then you finished up with, "*All of this is calling us, this whole inquiry thing, I think, is calling to us to a basic attitude check. That's what's important here, not so much the nitty-gritty concepts but the broad skills, kids learning, and the broad applications for all things science-y.*"

Kevin: You used the word "grandfatherly" What qualities then, do you see yourself taking on? So, you're in the classroom and you're somehow different than before, not focused on content?

Joel: *It's looking out at that room and looking at those kids and saying, "Those kids all have parents. Those kids all have somebody who loves them at home, who loves them unconditionally." They aren't for me to look upon as, "Oh, well, they're just little carbon units that I'm going to fill with knowledge." They aren't. They each have their own individual story and their own individual ways of learning, and so my job as a teacher is not to teach them all individually, because that's impossible, but to arrange my teaching in such a way that I can meet as many needs as I can. That's what inquiry, I think, does. It allows these kids to learn in their own way because, yeah, I'm still going to talk about content in class, and that will meet some of the needs, but the inquiry will kind of hit a few more kids where they live in terms of, "Okay, now this makes sense. Now this stuff he's talking about makes sense." Or when we're doing stuff, then I can talk about it, and then they say, "Oh, now it makes sense"* (taped conversation, February 15, 2012).

Joel had brought forward a grandfather identity in his classroom but it was not all play. There was some play, some inquiry, but there was still some structured content, still some direct instruction but rather than at the start it was betwixt and between, in the context of inquiry. As Joel talked about his students and their individual stories and individual ways of learning, a diversity of identities in his room, I fell back to the stories I had read about debates between constructivists and direct instruction (Tobias & Duffy, 2009), and about different ways of knowing (Aikenhead & Michell, 2011). I had also read about Quaslametko and Yetko (Sterling, 1992), two Salishan grandmothers, sisters-in-law whose Native pedagogies reminded me of Joel's shifting identities. Rather than having either a facilitator or traditional sage on the stage identity in the classroom Joel appeared to hold both identities in a dynamic tension. Joel had an identity that resembled aspects of Quaslametko, the grandmother who worked with many children who was more authoritarian and in control, and valued structure, work and efficiency, a tenet of traditional high school science. Forming relationships were not part of this identity. Joel also had an identity that resembled aspects of Yetko who was a storyteller, an egalitarian who worked in relation with children in small groups with hands-on experiences and spontaneity (Sterling, 1992), a more holistic identity supportive of students inquiring in context.

Joel's tension in his classroom I suspect was in finding the balance between the canon and the flux (Ricca, 2012), between direct instruction and inquiry, between sage and facilitator, between Quaslametko and Yetko, and rather than choose one or get into debates about the validity of each, I wondered if he had decided that it would be more beneficial to recognize that his dual identities were "perhaps complementary, sometimes existing together, sometimes in conflict, and certainly

both of value" (Sterling, 2002, p. 169). As Joel, and others from our inquiry group, worked within the confines, structure, and culture of high school science, a landscape constructed for us, I wondered if instead of insisting on choosing one from the dichotomy it would be beneficial to hold onto both identities – themselves enmeshed on the same emergent inquiry landscape. While this shifting of identities was Joel's morning story, I was shocked to find out that there was another tension, one that I was largely oblivious to. Joel and I had spent a lot of time discussing inquiry and past experience. My conversations with Joel were not as open-ended as they were with Beth and Christina largely due to an artifact of my busied life and my inability to connect with a third participant in the depth that I had with Beth and Christina. I was at the end of the conversation with Joel and I was inquiring about pedagogical practices – structured labs, assessment or evaluation – that Joel might have given up in order to move towards inquiry.

Kevin: Did you feel you had to give anything up as part of the process over the last year?

Joel: *My pride.* [laughs]

Kevin: Really? You think so?

Joel: *Well, just going back, you know, I've been doing this for a long time. For me to step back and say, you know, I'd like to have a few of those years back to do it better and just realizing, yeah, okay. I can't be proud about it. Yeah, there were flaws, and there are things you can do better, and this is another one of those things that you can do better.*

Kevin: Were there things too that you really did like and thought were valuable that are gone?

Joel: *Oh, gosh. You know, again, you have to look at everything as a journey. So much of who we are now comes from who we were back then and the experiences we've gone through, good and bad. So, you know, for me I think it's unfortunate that it has taken me 22 years of teaching to get to this point because I've only seven or eight left, and you start thinking, "Aw, crap."*

I was taken aback (field notes, February 15, 2012). I had not thought of that. Within the realm of emergent landscapes and the morning metaphor I had chosen, I had perceived there to be only morning stories and stories of mo(u)rning. Frankly I was unsure why I had not seen until now what Joel was sharing. I had challenged many other teachers for their *stories of mourning*, most often highly fictionalized stories about perceived losses that focused on what the students were going to

lose out on if they were to shift their own identities in a way that would support inquiry and holistic teaching practices. These stories of mourning, these oppositions, were present regardless of the research I had shared showing that inquiry was both effective and affective in many areas of science education. Joel had shared with me a *mourning story,* an actual story of loss. As Joel was shifting towards a facilitator identity, more like Yetko, he had given up part of himself, some of his other identity that was more like Quaslametko, the one that he had experientially constructed over his 22 year journey. He was proud of it and he should be. It had purpose and was valuable. It had served him and some of his students well over the years. I was often envious of the abilities of other teachers with similar experience. They knew their content so well and they were able to tell stories about the content, about the history of the content. Students would often come to my class talking about the stories of the history of science from these teachers.

As I stepped away from this conversation, I wondered how many of the stories of mourning about what students would lose were instead stories of mourning about what teachers thought they themselves would lose. I suspected that many of these stories of mourning were fictionalized cover stories, stories designed to protect one's own narratively constructed identity and to allow them to continue to live out their existing stories to live by (Clandinin et al., 2006). They were stories which protected one's pride and possibly a fear of feeling regret. I realized now that we needed to be attentive not only to the morning stories but also to the mourning stories. Joel had helped to shed some light on my question: How does a teacher's understanding of their identities affect the emergence of an inquiry founded curriculum. Joel certainly understood his own identities. He knew about Quaslametko and Yetko and he knew he needed to let go of some of Quaslametko in order to share more of Yetko. He knew he needed to be more grandfatherly.

CHAPTER 5

JUSTIFICATION AND FUTURE WONDERS IN THE PERSONAL, PRACTICAL, AND SOCIAL OR THEORETICAL REALMS

As previously discussed, narrative inquiry provides us a way to continue wondering, to hold open the beginnings and the endings (Pinnegar, as cited in Clandinin et al., 2006), to hold open the possibility for all of us to relive our storied lives differently. As such, it is in this vein; however, sufficiently insufficient this "grand contraption" may be (Geertz, as cited in Clandinin & Connelly, 2000, p. 6), that I will be writing my "conclusion" to this inquiry into teachers' understandings of their identities and into the experiences which enable us on our emergent inquiry landscapes. Necessary in this summation, in this section on the "so what", is a revisitation of three key areas: the personal, the practical, and the social or theoretical.

Personal Justification and Future Wonders

Through attending to the mo(u)rning stories of Beth, Joel and Christina, I have been inextricably altered, expectedly so, as I am sure have they, and have new wonders that relate to my own ways of being in the classroom. That is, it is through their morning stories that I am afforded the opportunity to relive. First and foremost was my quick realization that there are others like me, others with stories of morning they wish to attempt to step into and morning stories that they have stepped into. These stories are enough for me to be satiated for now, nutrition to support my continually shifting identities as curricula continue to be renewed, debated, implemented, and experienced. This inquiry experience has allowed me to more easily face the identities from the grand narrative and their stories of mourning and accept them for what they are: othering stories and stories designed to protect the identities and the grand narratives from which our identities have been built. I have also come to a fuller understanding that I am at once emergent and a part of the grand narrative although I hope I am more emergent in the identities and sub-identities that I choose to bring forward with my students and my colleagues.

I also have new morning stories to share as a result of my interaction with Beth and Christina as I have, as a result of their morning stories in the area of assessment, moved further towards more authentic assessment associated with the open-ended inquiry students engage with in my courses. The process of assessment *for* inquiry in my classroom has moved from a fairly traditional assessment for learning and assessment of learning experience to a more authentic assessment of student inquiry. This more authentic assessment involves much assessment for and as learning along the length of their assessment, and preparation for future learning (PFL) assessments that are

now done in a community of peers. Furthermore, I have introduced inquiry interviews at the end of their inquiry where students present in groups of four or five to each other and to me. These interviews happen at the end of the semester as part of our final time period and form a significant portion of their final grade. While I once dreaded this time of year, the reduction of learning to a convergence of knowledge level objectives, I now look forward to it more than any other point in the year as it is the culmination of their inquiries, an example of the divergence and depth of the learning they have done together and often in facilitation with me. I truly treasure the conversations that I have had with so many of my students surrounding their inquiries. I learn so much more about my students than I ever have and have found a way to see students as big, up close, so that even those with language or culture barriers have an opportunity to show me how they were able to relate the course material to their lives and to their interests. It is truly science in real world contexts, a coming to knowing (Delandshire, 2002; Ermine, as cited in Aikenhead, 2002) in science.

As I come to realize the need for even more authenticity through my experience with students attending our professional development day, sitting in on Christina's PFL assessment with her students, and listening to Joel's retelling of Christina's morning story where her students presented to teachers during a PBL workshop, I have wonders about the context, nature, and purpose of the assessments we choose to involve ourselves with. I wonder if students need the opportunity to see their learning influence the learning environment for those students who are coming after them. Maybe they need the opportunity formally to influence me and other teachers. Possibly that is the reason for the engagement that I have seen with students in these settings, that one can alter one's surroundings. That is, as I inquire more with my students, I realize that it is their experiences, their morning stories about their first steps into inquiry as an emergent landscape that can help to shape my and other teachers' and students' experiences. As such, I wonder if, as Christina's morning story illustrated, we are never the "expert". Maybe we only build wisdom-in-action (Cajete as cited in Aikenhead & Elliott, 2010). Maybe we are simply on a continuous journey of coming to knowing or stated in the original Cree 'yipwakawatisiwin' ("wisdom in practice" Beaudet, as cited in Aikenhead & Elliott, 2010) about each other, and ourselves, in the context of our place, of our lives, and of the subject we are engaged with. Maybe that is the problem with the "modern" definition of "expert", there *is* an endpoint, a point where you are supposedly done learning. Maybe we need to view ourselves with a less reductionistic notion of time, possibly with a proleptic vision of time, possibly even an Indigenous view of time where time is cyclical. Maybe assessment – for, as, and of, learning – was exactly that, *a coming to knowing of each other, and ourselves, in the*

context of our place, our lives and the subject across the past, present, and future. Assessment put this way sounds very Deweyan – founded on interaction, place and continuity. As such, I believe my students need a venue to show their, and hence my, coming to knowing in a place that is more authentic than our classroom culture of inquiry. I wonder if my students and I could somehow publish our inquiry experiences, our morning stories, the contextualized inquiry experiences of students, in a journal. One possibility is the Accelerator, the journal of the Saskatchewan Science Teachers Society (SSTS). That will be the story of morning that I will be moving towards on my emergent inquiry landscape. I wonder with this story of morning what void I will need to construct in my own practice, what formalism there will be to deformalize in order to make room for that which requires more critical and creative thinking.

Practical Justification and Future Wonders

As I was pulled into new roles in my division and hence pulled further away from being in the midst of research, in the midst of inquiry, I happened upon Christina once again. We stopped and chatted about the upcoming school year. Christina was eager to share with me that she was ready to try some new things, ready to shift again (field notes, August 31, 2012). Christina loved change and loved growth. Her identities were complex; operating out of equilibrium (Bloom, 2011) and for Christina "creative action [was] not an exceptional state; creative action [was] the only state of action" (Ricca, 2012, p. 33). Her students were the beneficiaries of that complexity. I suspect she meant that she wanted to broaden her repertoire of inquiry in the contexts of scientific inquiry and technological problem solving. She was very comfortable with PBL in both guided and more open-ended forms and it allowed her and her students to explore the contexts of STSE decision making and cultural perspectives. Even though our inquiry group did not have the opportunity to meet as often – a prudent decision by our board given that the provincial government had cut our division funding and further curriculum renewal had been delayed – Christina and I were able to connect to share CIEs and to work on supports for renewed curricula. I had planned to step into her class to document more CIEs but the *business* of my new roles prevented that from happening.

Near the end of the second year of this research, I had contacted Christina by email to see if she wanted to be involved in a vetting of an all multiple choice provincial assessment for Biology which her students would inevitably, and regrettably in my mind, end up writing – an ongoing tension for her as she was not accredited. I thought she would be interested to at least be involved in the process even though she was more than critical about it, believing it did not really reflect the learning her students had done, was not engaging for her students, and that her students were

capable of more than the provincial exam could show: "*to sit down and have a talk with my students about the things that they've learned, they could tell me a whole lot of things. If I gave them a 50 question multiple choice test, I know I wouldn't get the same results from them"* (taped conversation, November 14th, 2011). When Christina did respond to my email, she mentioned that she was too busy to be away from the classroom again. Despite wanting to have somebody vetting the exam that could be critical of the types of questions that are typically on the provincial assessment, I was glad to see that she was prioritizing her students over the complexity reducing experience called the departmental exam. Christina; however, was very excited about recent news: *"I actually received my accreditation this winter…I am super pumped! That is a huge load off"* (personal communication, April 30th, 2013). As I reflected on Christina's email, I realized that this was an opportunity for her, a constructed void that I hoped would provide her with the time and freedom to play a bit more with her practice, something she had expressed a desire in doing at the beginning of the year. I wondered how she would story her newfound freedom; I wondered what story of morning she would put in place and was eager to hear her morning story, what she actually experienced at the end of the term without the formality of a departmental. I hope that as new curricula are rolled out in the following years that I will once again be able to step back into her classroom. I think we learned a lot about ourselves, the understandings of our identities, about assessment, and about science education in the process. I also hope that Christina saw that we are not on our own islands, and that it is useful to share our mo(u)rning stories as there are others, like Joel and I, that benefit tremendously from other's mo(u)rning stories, in this case, from Christina's wisdom-in-action.

Joel and I are still connected through various initiatives happening in the division associated with ongoing curriculum renewal and as such are still inquiring into inquiry together. After Joel shared his mourning story with me about the loss of identity associated with taking on more of a facilitator identity, more of a grandfather identity like Yetko, I wondered if the morning stories he had access to would be enough to sustain him through the challenging work of curriculum renewal or if in the intensity of the implementation if the wished-we-could-enact identities – facilitator identity and grandfather identity – would somehow get set aside. That is, he had his experience from grade 9 to draw from, a deformalization of curriculum and assessment, where he saw the success in constructing a void by removing the artifacts of marks and structured inquiry which led to more open-ended inquiry, play, and uncertainty. He had also experienced Christina's and Beth's morning stories, in addition to his own and other teachers' who were not part of the research, about

shifting their assessment practices through deformalizing their existing assessment, towards more holistic forms of assessment – interviews and final projects – and about their experiences engaging students with more guided and open-ended inquiry, their experiences with play and uncertainty. It was this "magic", the narrative threads of the past and the present, his own and others, that I believe helped Joel to find an engagement with science again, an engagement with play again, and helped him to step into the uncertain. I believe Joel saw an opportunity where he could start to story his classroom differently, a new story of morning, surrounding assessment but one that brought him much tension also:

Kevin: And so do you feel like there is a relationship between that excitement and evaluation? Like what's the relationship there?

Joel: *If the kids are excited about what they're doing, they will produce what they need to produce because they're actually interested in what the result is. And that's ultimately where it has to be, because if you look at real science, these guys are doing this because they're interested in what they're doing and they want to share it with others. And so that's what this is about. The only thing I haven't built into this last unit – and again, you go through it and you think, "Okay, now what can I change?" – is getting the kids to do some presenting in class. So I missed an opportunity with the egg drop where I could have had the kids with team spirit and all that kind of stuff present their little box and say what they did and why they did it and how they expected it to work, and then go on to the egg drop itself to make it all part of the egg drop festival, don't you know.*

Kevin: Do you think that would have helped with the culture?

Joel: *Yeah.*

Kevin: We're doing inquiry, so we share our inquiries?

Joel: *We share our inquiries. So again, I'm seeing that there were opportunities lost, and so you're always looking at ways to fix it.*

Kevin: So what's your next step inquiry-wise, then? Like where do you see yourself going? You talked about students sharing with the group. Is there anywhere else that you want to kind of explore in terms of inquiry?

Joel: *Oh, my Lord. Like I said, in the chemistry that I'm doing, like Chem 20, I put in little bits where I can. I'm still pretty tied to the curriculum.*

Kevin: Why do you think that is? Why chemistry? For Science 10 with the motion unit you were able to kind of let go?

Joel: *Yeah, because when you get into Grade 11 and 12 I'm still at that point where I think that my responsibility to the kids is have them be able to survive university or post-secondary. And so for them to have a good grounding at all in all of the things that I teach I see as being really valid. And so for me, the mindset change is a little harder, although of course I know that when I relax a bit, I have more fun. The kids have more fun. And lately I've been getting kind of the word back to me from kids who have gone on to take chemistry and they went on to take chemistry because it was so much fun in high school.*

And so they're going to go on and take chemistry not because they know all the facts and figures, but because they're excited about it. And so for the same reason I do it in Grade 10, I have to start seeing ways to do it in Grade 11 and Grade 12. And like I said, that's a little harder step for me, it's going to take a little bit more work and a little bit more planning because I still am concerned about… about the content. And I know I have to get a bit away from that "content is king" thing, but, yeah.

Kevin: Chemistry's a tough one.

Joel: *It is tougher.* (taped conversation, November 3, 2011)

I hope through the process of working to understand our own identities that Joel will be able to deformalize his practice further. I hope he will be able to construct a void for himself, a void even in Chemistry, a subject that Joel strongly identifies with, that allows him and his students to step away from the boredom he spoke of. I hope he is able, possibly in the area of assessment as he mentioned, to deformalize and step into the uncertainty, into the bounded chaos of guided and open-ended inquiry and is able to provide the enabling constraints that his science teacher was able to provide to him, that he was able to provide his own children. I hope that he can do the "bizarre" on the landscapes that he constructs for his students in a way similar to what he was able to do away from the landscape of school.

Kevin: So you're more of a facilitator with your kids.

Joel: *Yeah. Yeah,* ***but that can't be that here****, that's bizarre…I want to facilitate the excitement is what I want to do, because this is just the coolest stuff in the world.* (taped conversation, Nov 3, 2011).

Joel had the morning stories from emergent inquiry landscapes to work from, he had as Gee (as cited in Melville, 2008) explained, embodied experiences of change from experienced science teachers in the midst of practice and he had seen the engagement of his students. Joel had even given up part of his identity as sage on the stage in favour of that as facilitator, a grandfatherly identity. I wonder if this was enough for Joel to see that it really was not magic. It was real. It was possible. With that said, I do know firsthand the allure, the comfort of the grand narrative. Truth and efficiency were comfortable threads to fall back on especially when the landscape one was stepping onto was newly emergent, a renewed curriculum tout à coup, where some of the lily pads might be too far apart to take the next step. I hope our inquiry group can work to facilitate a few bridges between those lily pads that are so far apart.

As I have mentioned earlier in this thesis, Beth's stories were also extremely engaging especially in the areas of assessment and open-ended inquiry given her past history in Alberta (Riffel, 2012); however, her mo(u)rning stories were too large to share here. Despite spending much time with Beth in her classroom and in a graduate class in the first year of this research, we really did get disconnected from each other as the second year of this research passed. This was due to a number of factors including my *business* in my new roles and life changes for Beth which included taking graduate classes and working both at a high school and at a post-secondary technical school. Based on my experiences in her classroom, Beth was very strong at both guided and open-ended inquiry and her mo(u)rning stories, which we will use in the future to construct a separate research text, will be extremely useful to teachers in the province. We did connect to present at a conference and we spent a significant amount of time preparing to dynamically present Beth's experience in this research and her transition from participant to co-researcher. We were; however, disappointed with the turn out as only eight people were in attendance at our session and we suspect only 1 or 2 were science educators.

Social and Theoretical Justification and Future Wonders

While I believe that there are some transferable learnings to be taken from this research, I do hope that this inquiry conveyed an authenticity and plausibility (Clandinin & Connelly, 2000) that is recognizable to science educators. More than that, I hope that in its partialness it properly represented the complexity of the enmeshed identities of Christina, Joel and Beth and of course my own. It is my hope that this narrative inquiry can be appreciated not only for what is transferable but also for the wonders that are generated not only by me but by others as they revisit the mo(u)rning stories of this particular telling and retelling. Hopefully, this inquiry then, through our

mo(u)rning stories, can offer the possibility of reliving our and others' storied lives differently. As we step into curriculum renewal in Saskatchewan and as other jurisdictions attempt to infuse inquiry in its broadest sense – inquiry as a philosophy – into their curricula, I believe that it is important to be attentive to, and to share, the mo(u)rning stories of teachers. These teachers have found ways, often through deformalizations, to shift from newly found and formed identities and wished-we-could-enact identities to enacted identities on emergent inquiry landscapes.

I have debated with myself and with others as to the utility of the metaphor of mo(u)rning I have chosen to weave into this telling and retelling. At times I have felt that possibly the metaphor was solely for me and that it had only utility for me. That is, maybe it was a way for me to distinguish between conversations that pulled me back towards modernity – stories of mourning – and conversations that allowed me to imagine and construct emergent inquiry landscapes – stories of morning and mo(u)rning stories. That is, maybe I needed a language or a vocabulary to do the identity work I wanted to do that did not exist in "modern" high school science, in the reductionistic and behaviouristic view of learning that was so prevalent. Maybe I was working to construct a language of curriculum renewal, a critical step according to Melville (2008) in avoiding superficially adopted renewed curricula. Maybe identity work involved not only finding and constructing new coherent sets of identities through the reweaving the threads of experience – sometimes an active and sometimes a self-organizing process – but also the careful selection of which stories we would choose to attend to and hence construct. After all, it is the stories of experience, the narrative threads, and our narrative diversity, which give us agency and set up the enabling constraints and hence the possibilities for the construction of emergent landscapes and newly coherent sets of identities. In order to open up the possibility of emergent landscapes, it is important that we are conscious of the type of stories we attend to and hence a language is required to distinguish these stories. Likewise, the same argument, I believe, holds for my insistence on constructing a verb from a noun – *artifacting*. This too represents an attempt at a renewed curriculum language that seeks to avoid superficial adoption and to avoid slipping back into the familiar and "modern" view of curriculum as something we do to our students – "lesson planning".

As such, I believe that it is important to carefully reflect on the stories of mo(u)rning we choose to engage with, both hopeful and othering stories, fictionalized stories about inquiry landscapes from those who possibly have not yet experientially stepped into inquiry in its broadest sense in high school science. These fictionalized stories include stories of mo(u)rning from educators and from research done with more positivistic and post-positivistic research

methodologies. These stories of mo(u)rning appear to set the enabling constraints for what stories we actually choose to live out and for the experiences – our mo(u)rning stories – we will have as we construct our emergent landscapes and our stories to live by. As we do this identity work in order to construct emergent inquiry landscapes that will help students become more scientifically literate, I would content that there are different types of stories that we may choose to engage with or to disengage from. Certainly, as we did our identity work, I believe Joel, Beth, Christina, and I found it useful to step away from the stories of mourning, away from the stories that maintained existing identities and which served to create a tension for us as we stepped onto emergent inquiry landscapes. I believe we also found it useful to be an active listener for those telling mourning stories as they mourned the loss of parts of their identities. Last, I believe it was important that we encouraged and supported those who were trying to construct stories of morning and then helped them attend to the sharing, the telling and retelling, of their morning stories. As such, I believe, I have resolved for myself the debate as to the utility of the metaphor.

Although the focus of this telling and retelling has not been on the pipeline, I do recognize the desire and the need to teach the canon as we have a need for those in the pipeline. I do wonder, however, what all of our students, pipeline and non-pipeline (the majority) are losing by not engaging in the flux of inquiry, the very nature and purpose of science – Western and Indigenous. I wonder if, through the common ground (Aikenhead & Michell, 2011) of inquiry in context, we can generate an engagement with that context, with place, in all of our students and all of our schools and communities. As Christina, Beth, and Joel shared their mo(u)rning stories, their inquiry identities, their pedagogies in practice, and hence their stories to live by, they were able to pull forward a differentiation of learning and context such that they enhanced their students' identities in the process of acculturating them to science, both Western and Indigenous. It is my hope that we all can construct equally rich curriculum making experiences with our students such that we enable them to cross the borders around science – Western and Indigenous – and utilize *hybridized knowledge*, *secured collateral learning*, and *parallel collateral learning* (Aikenhead & Michell, 2011) as we try to understand our landscapes, our worlds and ourselves. It is my hope that as teachers step through liminal spaces in an attempt to story their lives differently, in an attempt to construct emergent inquiry landscapes through the deformalization of our practices, that we can fuzzy the borders of science, the existing landscape, for our students. It is my hope that we can help our students to also step through the liminal and story their lives in different ways, ways that value

and build on the identities they already have such that they can create their own emergent inquiry landscapes and become more scientifically literate.

As new curricula are released and as we step into professional development related to inquiry founded curricula, it is my hope that we can find the time, the 100 – 200 hours over two to three years – to help teachers become competent and confident in inquiry-based instruction (Duschl & Duncan, as cited in Duffy, 2009). With professional development time at a premium and while traditional professional development has been front loaded, largely focused on planning, I would contend that it would be unfortunate to spend the majority of our time with traditional artifacts and ritualizations such as UbD, unit plans and tables of specifications. I now know why it takes 100 – 200 hours to become comfortable and competent in inquiry. The 100 – 200 hours is, I believe, spent doing identity work, handling one's shifting narrative identities, finding new narrative coherence through narrative weaving and reweaving of new and old experiences. It is a time during which teachers can focus on the construction of stories of morning and the living, telling and retelling of mo(u)rning stories which offer the possibility of reliving in new ways more supportive of inquiry. Maybe many teachers are also attempting to find a balance and a resolution or narrative coherence amongst the tensions that exist between Quaslametko and Yetko, between the canon and the flux, and between the identities and sub-identities (Beijaard et al., 2004) that they are choosing to enact – sage on the stage, facilitator, grandfather, etc.

This work at finding narrative coherence, constructed on an emergent inquiry landscape, does, however, happen within the existing landscape formed largely from the sacred story of science and as such, is undoubtedly influenced by not only the identities on that landscape but also other social and political realities of curriculum implementation (Aikenhead, 2003). Facilitating the careful interplay of these two enmeshed landscapes is of particular importance if we desire our renewed provincial curricula, a humanistic curricula (Aikenhead, 2003), to be *affectively* implemented utilizing inquiry in its broadest sense. The enabling constraints we set up for sharing our experiences, our stories of morning and mo(u)rning stories, must be strategically facilitated such that the right mix of identities are located on nearby landscapes so as to avoid a preponderance of stories of mourning and hopefully to enable significant counterstories. This facilitation and the sharing of mo(u)rning stories is critical given the existing landscape in Saskatchewan, which has consisted of significant public challenges to similarly renewed curricula focused on constructivism and inquiry in the area of Mathematics. Some teachers and some of the public have vocally supported these public challenges, challenges that include a concerted effort by the Western

Initiative for Strengthening Education (WISE) in Math and by The Frontier Centre for Public Policy via Michael Zwaagstra, a former teacher and now research associate of the Frontier Centre. There are indications – rumours of teacher formed groups having lobbied the provincial government to rethink renewal – that similar challenges are in the early stages of forming in relation to our renewed high school science curriculum in Saskatchewan. It is these types of efforts, which for the most part focus on constructing a moral panic (Cohen, as cited in Rodwell, 2011), a significant story of mourning, which emotionally plays on the fictionalized losses that students will face in the absence of highly controlling, and modernistically enacted curricula often focused on factual gavage. These stories of mourning and the associated moral panic can be grabbed onto by the media and sensationally purported as a single story of renewal supportive of the grand narrative of modernity and its associated identities. This effort by the media to induce moral panic in Tasmania has been argued by Rodwell (2011) to be a significant factor in the downfall of Tasmania's Essential Learnings curriculum, which was also founded on constructivism and inquiry. As such, in order to avoid falling back into the tendrils of modernity, towards a superficial renewal, back into a single story about renewal in Saskatchewan, it is critical that our mo(u)rning stories, and the language associated with renewal, are significant and sufficiently shared amongst teachers and the public so that a diverse and weighty counterstory can be put forward in an effort to support all of our students in becoming more scientifically literate.

Professional development time cannot be spent without guiding principles and goals. However, I believe we need to be careful not to be confined by the historical artifacts and ritualizations of past landscapes. As such, I wonder if those responsible for planning professional development can facilitate the necessary time and space, a landscape, away from the grand narrative and away from the stories of mourning such that a deformalization of professional development can occur. It is these facilitated and constructed landscapes where, much like Christina, Beth and Joel, we become comfortable with deformalized professional development, professional development focused on the how as opposed to the what, that is, identity work involving the composing of stories of morning and artifacting of morning stories. It is on these *enmeshed* and emerging landscapes where we, often collectively, develop a comfort with uncertainty and with constructing voids, often through the deformalizing of planning and assessment. These deformalizations create a space on our emergent landscapes for new ritualizations and artifacts and hence new mo(u)rning stories. I certainly hope that it is those with mo(u)rning stories that drive the direction of professional development in science and not those with simply othering stories of mourning. Unfortunately, the

later tend to be the loudest; after all, they are still in the driver's seat of the dominant narrative. Maybe our goal should be to put forward enabling constraints that move us away from the stories of mourning about the barriers and pitfalls surrounding inquiry, assessment, differentiated instruction and learning contexts. Perhaps the enabling constraints for moving inquiry forward is in the process of understanding of our own identities and in the sharing of mo(u)rning stories, the experiences, artifacts and ritualizations associated with our shifting identities on emergent inquiry landscapes. I do understand the concerns, however, that the product of deformalized professional development, the sharing of mo(u)rning stories, is apparently nebulous when measured by the current stick, however, I will contend that the product of traditional professional development has shown often to produce that which is vacuous and like our inquiry group I will ask, **what is the alternative**? Maybe it is the stick with which we are measuring that is the problem. Certainly, this is an area for further exploration.

Maybe it is possible, with professional development related to renewed curricula that is back end loaded – as opposed to front end loaded like Ubd – to help science teachers explore their identities, help them find the hidden threads of experience, the experiences that remind them of the playfulness that brought them to science, that would allow them to step into the uncertain, into inquiry, the experiences that would help them construct new identities or bring forward wished-we-could-enact identities on emergent inquiry landscapes; in essence to help teachers construct their own mo(u)rning stories. A necessary step I believe would be to help teachers move away from identities which view planning for new curricula with an engineering or architect identity, an identity that fits with the positivistic subject matter identity of the grand narrative of high school science, one which focuses on planning an enacted curricula in the absence of students, which focuses on assessment devoid of community, and which largely follows Tyler's rational – even if it is in a backwards by design ordering (Ricca, 2012). Rather, I believe that the pre-planning of enacted curricula needs to provide a looser, more generalized structure, a set of enabling constraints to step into the midst of learners with followed by a process of collecting experiences and artifacts from those experiences.

I suspect then, an identity more akin to anthropologist and/or archaeologist would be a more useful place to start in regards to this back end loaded planning and professional development. Providing professional development to teachers to help with the investigation the past and present cultures of learning in their classroom would be extremely pertinent. The intent of the contextualized inquiry experience document was I believe exactly that. The CIE was a document to

capture the lived curriculum as the process of guided and open-ended inquiry cannot be pre-planned, rather, only enabling constraints can be put forward and then as the process unfolds we are able to collect and construct the experiences, narratives, and artifacts of our cultures of inquiry, of our emerging landscapes, in order to tell and retell the experience as it happened. In essence, I believe we need to become experts at *artifacting*, at constructing and sharing our mo(u)rning stories in order to offer the possibility for ourselves and others to relive our storied landscapes in different ways. This view of planning, a view supportive of divergent thought, uncertainty, inquiry and hence play as opposed to convergent thought, efficiency, and Truth, is a shift away from engineer/architect – away from Tyler and Wiggins and McTighe – and towards anthropologist/archaeologist – towards Geertz, Bateson, Dewey, and Clandinin and Connelly. It is a shift away from "the what" and towards "the how" – "*How do you share a philosophy*". Much like our renewed provincial curricula, teachers need support and guidance for a shift towards professional development founded on the philosophy of inquiry and hence narrative inquiry, with its roots in experience and anthropology might just be a pedagogy worth providing a space for.

I believe, through the experiences I have shared with Joel, Beth, and Christina, that it is possible to shift one's stories of morning to mo(u)rning stories, and hence shift ones identities. While these shifts are complex in the making emerging over years and even decades, they are possible, and necessary, to be made visible. Maybe by drawing on our past experiences, and the narrative threads of others, their mo(u)rning stories, we all may not need 100-200 hours of professional development required for teachers to be comfortable and confident in inquiry. Is it possible that the rich narrative diversity that allowed these three teachers to reconstruct their identities also exists in other teachers? If that diversity does not exist, can we share our diversity of experience? I wonder if the sharing of mo(u)rning stories will allows us, as it did with Joel, to find the diversity of narrative threads that we all have, to uncover them from underneath the thick narrative threads of the grand narrative, and to remember what it was like to play and inquire in science, in the uncertain. If we do not have these threads, I wonder what experiences can we provide ourselves as teachers to gain these threads of experience necessary to learn to play in science? Is it possible that we just need a little tug on one of our threads of experience, possibly just the right thread, to remind ourselves of the diversity of experience we have? That is, maybe the enmeshing of landscapes highlighted through the sharing of mo(u)rning stories can provide, in multiple ways, an increased narrative diversity. Through this increased diversity comes an increase in the narrative threads, our own and threads shared from others, necessary to reweave a new

narrative coherence that, I believe, allows possibly for a reliving that will more *affectively* move us towards new or shifted identities that we can enact in our classrooms.

¶ I wonder if it is the number of connections in the network, the number of connected threads of experience or the weightiness of the threads of experience that reduces the activation energy required to get to a new metastable point of a particular identity or set of identities and sub-identities.

Perhaps a deformalization of professional development may provide the space for teachers to step into the uncertainty of inquiry and to themselves construct voids in the areas of planning and assessment. That is, I believe that in order for shifted and reconstructed identities to emerge both the construction of a void, the removal of historical artifacts and ritualizations such as complete unit plans and tables of specifications, and the development of new more complex and dynamic artifacts and ritualizations – such as our inquiry group's CIEs – are required.

¶ I wonder if it is necessary to cycle through more highly disordered states of being, more highly entropic states, to allow chaos to run free for some time, in order to come to new and more complex states of being. That is, in the process of deformalization, teachers construct voids and step into uncertainty. How long does one have to live in the void with the uncertainty before we see new orders, before we see the self-assembly of something more organic and complex? In narrative terms, as we step through the liminal onto an emergent inquiry landscape with the associated narrative dissonance and with the threads of our experience partially or wholly unwound, how long do we stay dissonant before the threads self-assemble or are rewoven into a more complex narrative coherence? I wonder if emergence is possibly a continual cycling between order and chaos where each time self-assembly constructs more or less complex orders based on the experiential environment that surrounds the system.

It is my hope that we can move towards assessments, like Christina has, which are more contextual and relational and provide students with assessment making experiences that support their growing identities in their contexts and in their communities. Possibly introducing the term and practice of preparation for future learning or PFL assessments may help science teachers make the shift to assessment making experiences supportive of inquiry or assessment for inquiry. Of course, if one wishes to consider deformalizing the professional development experiences for existing high school science teachers, it is critical to recognize the difference between a pre-planned curriculum and that which is enacted as often the gap between the two is large and one wonders

about the utility of traditional planning especially since we rarely go back to update the plan with the context of the classroom. There is often no recursion and no growth associated with a pre-planned curriculum devoid of student context and hence devoid of inquiry in its broadest sense.

In working with our science inquiry group, with Joel, Beth, and Christina, and experiencing the telling and retelling of their CIEs, the parallel between our CIE artifacts and ritualizations and narrative inquiry continued to become further evident (field notes, December 3, 2012). As science educators, I think it may be prudent to consider narrative inquiry, with its storied and experiential focus, as a useful "professional development pedagogy" (Huber, Caine, Huber & Steeves, 2013) due to the potential that living, telling, retelling, and reliving offers to teachers during the process of identity making. It is my hope, as Huber, Caine, Huber and Steeves (2013) hoped, that as we "begin to imagine the future, and we see that through seeing narrative inquiry as holding potential for shaping extraordinary pedagogy [that] we can shift the practices and pedagogies within education, within teachers" (p. 236). Based on my experience with Joel and Christina, the emergence of their identities was a gradual process occurring across a diversity of experiences in a variety of contexts and developed in a recursive and non-linear fashion in the mutual interaction of others' identities. In order to explore the emergence of their identities, a methodology that spans the realms of the personal, social and temporal, a three dimensional narrative inquiry space, was essential to understand the complexity and enmeshed nature of their and our identities.

– identities which diffract and interfere, both constructively and destructively over great temporal distances due to their long wavelengths.

By taking the time to attend to teacher's mo(u)rning stories, including their artifacts, narratives, experiences, and ritualizations, I believe it is possible to lapse time, to expose the subtle features of the emergence of identities. It is in the process of attending, attempting to narratively understand our shifting identities, that we may find success in constructing emergent inquiry landscapes for ourselves and our students and hence a more holistic form of scientific literacy for all students. I believe it is the value of mo(u)rning stories that gives us reason "for engaging with others in narrative inquiry, that is, so we can, by slowing down lives, pause and look to see the narrative structures [and their complexity] that characterize ours' and others' lives" (Clandinin, 2006, p. 51) early in the construction of new landscapes. As we attend to this emergence, to teachers' mo(u)rning stories on emergent inquiry landscapes, in order to construct rich curriculum making experiences and assessment making experiences with all of our science students, it is not solely what we choose to do. Rather I believe it is what we choose not to do, the voids we construct

in the existing landscape, and which of our identities and sub-identities we decide to enact, to bring forward, within the voids we have constructed that will most positively influence the identities we help to shape. It is the deformalization of the grand narratives of science education that, I believe, enables the emergence of a new landscape, an emergent inquiry landscape as "when we reject the single story, when we realize there is never a single story about any place, we regain a kind of paradise" (Adichie, 2009).

I guess that is what I was looking for, stories other than the sacred story – the single story – of high school science. I was looking for other teachers' stories of morning and mo(u)rning stories, other teachers trying to shift their identities in ways similar to my own attempts at shifting my identities. I guess I was looking to increase my own narrative diversity as well the diversity within my community of peers in an attempt to penetrate the borders of the grand narrative that I perceive to be outside of my classroom door. Reflecting on this inquiry now, I see I was looking for other teachers who also were seeking a kind of paradise, a different way of being in the science classroom that avoided the complexity reduction and the boredom that Beth, Joel, Christina, and I all talked about experiencing with our students when we taught from the grand narrative. Maybe this research, my leave to do graduate work, and my seeking out of others' mo(u)rning stories, was my way of ensuring my own "*story to leave by*" (Clandinin, Downey, & Huber, 2009) – a story of leaving the teaching profession common in early career teachers – turned out to be a positive one. My story to leave by was composed of an enabling set of stories about emergent landscapes – landscapes that were starting to become densely woven and enmeshed. This enmeshing allowed me to further shift my own identities, to find a new narrative coherence that allowed me to live in less tension amongst the existing "modern" landscape of high school science. Maybe it was their stories, their narrative threads that allowed me to increase my own narrative diversity such that I could take another step towards shifting my identities, towards constructing my own morning stories. There is much risk in exploring new landscapes alone and constructing emergent inquiry landscapes was much easier for me with their mo(u)rning stories. Maybe mo(u)rning stories could also be described as *stories to relive with*, that is enabling stories about the narrative beginnings of our own and others' emergent landscapes. Sharing *stories to relive with* allows us the possibility to imagine new

stories of morning[1] and to construct our own mo(u)rning stories on the path to new stories to live by, to shifted and newly enacted landscapes and identities, and possibly even to successful counterstories.

¶ As I come to the end of this experiential exploration of the borderlands of narrative inquiry and complexity, and as I am struck by the depth and length of this particular telling and retelling, I could not help but delve into the complexity of narrative inquiry one more time. As a young scholar in the field of narrative inquiry, I spent much time attempting to ensure that wakefulness existed throughout this narrative inquiry into the lives of teachers – probably to a fault due to the tension of partialness of the representation of experiences I felt. I also spent much time deliberating on the question "what makes a good narrative inquiry" (Clandinin & Connelly, 2000, p. 185). While I agree with all of the descriptors used – apparency, verisimilitude, transferability, an invitational quality, authenticity, adequacy and plausibility – I too have gained an appreciation for what makes for a good narrative inquiry. As I inquired into Christina's, Joel's, and Beth's mo(u)rning stories, the wonders I had, and the wonders that diffracted through their experiences grew as did the depth and complexity of the emergent landscapes we explored. "The closer I looked, the bigger it got" (Mandlebrot, 2010) and as my own wonders grew, fractalled and diffracting due to the emergent landscape, "bottomless wonders sprung from simple rules" (Mandlebrot, 2010). I started to imagine a new way to envision what makes for a good narrative inquiry. A good narrative inquiry was one that, through the simple rule of a lived ontology of experience, generated dynamic and complex wonders in the living and telling and in the retelling and potential reliving, not only by the researcher but also by the participants and the reader. That is, a good narrative inquiry has a roughness of wonder and experience.

¶ While I am not insinuating that one could or should quantitatively measure narrative inquiry, I was struck by the ideas of Mandlebrot (2010). I was pulled into the idea

[1]After writing extensively on stories of morning and morning stories, I came across the idea of continuing to "imagine and improvise possible forward looking counterstories" (Huber, Caine, Huber, and Steeves, 2013) which shows similarities to stories of morning. I prefer the terms stories of morning and morning stories as I believe the connection with the morning connects it to the concept of change and agency as well as connecting it to liminality and emergence. Furthermore, envisioning these stories up against the grand narrative, as future counterstories, I believe, runs the risk that they will be defined based on the grand narrative, specifically to counter an 'ism' (Dewey, 1938) and hence could lack the creativity and playfulness that they may have had if they were defined on an emergent landscape that had carefully constructed voids in the grand narrative.

of roughness of fractals and it was that roughness that drew me to narrative inquiry. In fact, it was the discontinuities in the roughness of experience that struck me as I inquired and as I chose what to tell and retell about Christina's and Joel's experiences. It was those rough and discontinuous moments, those that I can still feel as if they had just happened, that determined what parts of the landscape to delve into and as I stepped further into the landscape, each wonder was similar in nature to the ones that came before it. Prior to stepping into narrative inquiry I had trouble coming up with rich questions to explore and now there are simply too many to possibly ever explore. That is, the closer I looked the more I realized that the emergent landscapes are still extremely poorly narrated. There is much inquiry left to do on the landscapes around me, "its boundary can be magnified infinitely and yet remain magnificently complicated" (Ted Talks, 2013)

¶ The secondary purpose of this telling and retelling as it relates to complexity, was my desire to illustrate the borderland space between narrative inquiry and complexity. The mutual interaction between Christina's and Joel's mo(u)rning stories, illustrated on a foundation of a lived ontology of experience, I believe helps us to understand the complexity of relationships in context while at the same time provides us with an emergent landscape from which to conjecture about complexity as it relates to educational inquiry. In the process of investigating how a teachers' understandings of their identities affects the emergence of an inquiry founded curriculum, I have come to a better understanding of our worlds, ourselves and hence of our identities as complex. Understanding our own identities means understanding emergence, which necessitates an understanding of the complex and hence organic nature of the growth of identities and sub-identities. This implies that we need to understand that identities themselves are recursively and nonlinearly constructed temporally from threads of experience woven and rewoven, enmeshed in a way that the pull on one thread of an identity very much influences other identities on the enmeshed landscapes we construct.

As I eagerly prepare to step back into the physics classroom after a planned ankle surgery, I will be sharing with my students an article about beauty in science and the discovery of the Higgs-Boson. My inquiry into this article is in parallel to the guided inquiry my students completed into the nature of science in physics while I was away. As I contemplate our next step as a class, I wonder if we, as high school science teachers, can shift collectively to parallel the thinking of Mathematician David Orrell who contends it may be time to consider "a shift in aesthetics, from

order and symmetry to something more complex, organic, and messy" (as cited in Everett-Green, 2013, p.1). As I prepare to move my students towards their first open-ended inquiry in our course, I too wonder that "maybe inside the elegant universe, perhaps, is something messy, struggling to make itself understood" (Everett-Green, 2012, p.1). Maybe I am simply moving further along in coming to know the role of Coyote, or what the Plains Cree call *Wesakechuk* (Aikenhead, personal communication, July 20, 2013). From the complex, organic and messy landscapes I stand on, along with Christina, Beth, Joel, and our students, I hope that we can shift from identities that equate beauty to positivistic truth and efficiency to identities that embrace beauty as an ontology of experience in all of its complexity. I hope these teachers' mo(u)rning stories, their struggles to be understood, help to shift others' identities as well. I hope that ~~they~~ we too will "get it" Christina and that we will awake from our stupor.

> The troubadour of knowledge, who is of both science and letters, has some chance of instituting the age of adulthood for which we hope. He is admittedly a rationalist, but he does not believe that all the requirements of reason are met by science. He tempers one with the other. Likewise, he never sees the social sciences as exhausting the content transmitted by the humanities – far from it. So, for him there is as much rigour in a myth or a work of literature as in a theorem or an experiment and, inversely, as much myth in these as in literature.
>
> Reborn, he knows, he takes pity.
>
> Finally, he can teach.
>
> (Serres, as cited in Doll, 2011, p. 237)

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APPENDIX

Check Your Understanding Answers

Question 1: highlight, inquiry, experience, curriculum, assessment, inquiry, wonder, teacher, experiences, liminal spaces, wondered, teacher, affect, inquiry, curriculum, experiences, assessment, inquiry, curriculum	**Bonus: 'a'** should be '**an**' on the 10th line. Total out of 18.