University of Alberta

Engaging Tension in the Science and Religion Classroom

by

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To my patient wife Lisa,
who continues to
encourage me to pursue
the dreams on the path
we are traveling together.

Abstract

This study researches student engagement with issues related to the interaction between science and religion. The researcher's background in teaching both science classes and religion classes and as a chaplain became part of the context for researching student tension between science and religion at the university. The genesis of this research specifically unfolded with questions in the researcher's own classroom practice and university experiences as he watched students grapple with questions about creation and evolution. From these questions and this context, the connection was made between the questions students were raising to educational hermeneutic frameworks that might affect student typological frameworks. As this research progressed, it developed into a quest to understand how science and religion typologies could be utilized in survey form as a tool to increase student understanding and classroom discussion. Thus, the purpose of the research project came to centre upon the creation of a workable survey instrument that would help students and teachers better understand the interactions between issues of science and religion.

Summary

Chapter One discusses the researcher's personal background and also his location of inquiry is discussed. This background chapter includes past religious and teaching experiences, discoveries in interpretation, and seeks to situate the research by interconnecting science and religion, and education. Chapter Two includes a short history of science and religion to provide background to the reader. This chapter also looks at the points of tension between science and religion from Galileo to the present. In Chapter Three, this thesis surveys the academic literature in science and religion through the lens of Ian Barbour's four typologies – Conflict, Independence, Dialogue, and Integration. Chapter Four discusses the educational research literature and speculates how this literature relates to the typologies and research questions raised in Chapter Three. Here research assumptions, scope, sample, methodology, method, and research paradigms are explained. This chapter also explains the survey and questions for students in CHRTC 350 at University of Alberta. Chapter Five presents research findings both from the Pilot Project that was utilized as secondary data from Denis Lamoureux research, and the primary MEd survey/questions filled out by students of CHRTC 350. Chapter Five also shares student stories from their responses to the survey/questions. Finally, Chapter Six concludes the thesis by summarizing the first five chapters and exploring how the survey could be used in a classroom setting in regard to engaging students, diffusing conflict, encouraging open mindedness, exploring new perspectives and pursuing intelligent classroom discussion. Chapter six also considers future research.

The exploratory nature of this research has opened new research questions including: what contributes to the loss of wonder students experience - does our hermeneutical approach to texts and life make a difference? With this question in mind, the research finalizes setting up the survey as a classroom tool and points forward to research beyond engaging classroom tension. It is understood that improvements and development can enhance and fine-tune; however, as they are, the survey/questions seem to offer sufficient explanatory power for teachers within

questions raised to begin this research. If used in a classroom setting, the survey offers teachers a tool to help students explore science and religion in healthy ways and also enhance fruitful discussions illuminating how students see the world.

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(	The class was tense as one student explained his opposition to the viewpoint being taught. In an exasperated voice he expressed, “The universe cannot be that old. I was taught that it was created 6000 years ago.” This statement led to another student getting up and, in what appeared to be a caustic and a mocking tone, said, “Anyone who doesn’t believe in evolution is worse than a Neanderthal.” To further add to the confusion, another voice said, “How could anyone believe in God?!” Around these strong statements were looks of bewilderment, anger, and apathy. One person summed it up, “Obviously we are never going to agree on anything, lets just talk about something else. What does this have to do with science anyway?”

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While this occurrence might not be a regular scenario for the average high school or university classroom, similar situations have happened to me in conversations with students over my years of teaching junior high school and working as a chaplain at the University of Alberta. I have experienced some very tense moments in the classroom, group setting, and office. These experiences have been the ‘genesis’ of my current interest in how students build up resistances to the scientific and religious concepts that we teach, specifically evolutionary biology and its relationship to belief in a creation. I am interested in how a person’s worldview and religious upbringing and the tensions present are due to encountering teaching about evolution. I am also asking disputants with faith backgrounds, What if evolution were true? Would that truth exclude those who are religious and believe in God or would that enhance their beliefs? What sorts of religious beliefs would be strengthened and which ones would have to be reframed, revised, or discarded?

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Science and faith seem as hotly debated and discussed as ever before in human history. Headlines in newspapers, blogs, and websites defend science as a worldview without need of religious input, while making metaphysical claims that cannot be empirically proven; others shout loudly as to the importance of their religious beliefs and rarely engage in presenting plausible arguments.

Historically, there never seems to be a dull interchange between those observing and explaining the world they see and those pointing to and encouraging others to look to that which is unseen. Whether trying to relate metaphysics and physics or differentiated into Kantian terms noumena and phenomena, few people in this world remain untouched by these subject areas in some shape or form. Although multiple combinations of viewpoints as to the many topics that relate to science and also to religious faith exist, when referring to their interactions with each other, thankfully our options decrease significantly due to academic research that has broken down the options into typological categories.

Reflection on how my own life experience and narrative have shaped me has been a rewarding and yet emotionally taxing experience. I would liken it to a roller coaster, but this metaphor is too limiting and doesn't do justice to the hermeneutical (interpretive) spiral of my own movement. There is not just an up and down movement to my narrative and it isn't just going round and round each turn repeating itself – that would be too linear. Rather, each high and low seems to point me forward, backward, or right to my present situatedness while at the same time it has movement that provides a changing scenery, new tracks, and hopefully academic growth; in David Smith's words - growth in wisdom.

Some new ways of seeing what has happened on my teaching journey have begun to work their way into how I view the world and the realm of teaching. I have begun to ascertain that I am located where I am because of an ongoing search for wonder that weaves itself like a thread throughout my story. In those moments in teaching, when I saw blank stares come across the faces of my students as I tried to articulate a concept, I began to wonder… where did their curiosity and sense of the awe of life retreat? Where did the wonder for discovery and learning go? I could look into the window of a grade four classroom down the hallway and see eyes lit up

by amazement and a thirst to know the answer, hands shooting up in response to questions.

Although the teacher of that classroom was incredibly lively and personable with her own sense of the joy of learning yet, I have met many other teachers of similar passion teaching with their heart, soul, and mind engaged, while having the same sense of the "ho-hum" from their students. It didn't matter if I was teaching science, religion, or trying to intertwine the two areas, I saw apathy and a deflation of excitement to engage the world and its many marvels in my own classroom.

Over a period of time these visions began to affect my own enthusiasm for teaching. Although I still had a personal passion for scientific and religious subjects, I would enter the classroom with less assurance of being able to communicate that same joy for learning to the students through the lessons. I began to examine my own teaching abilities and style of communication and to search out ways to improve what I was doing in the classroom. These renewed efforts also seemed to produce few glimmers of hope; yet, overall something began to happen that eventually moved me into a different vocation – still teaching, but out of a classroom setting.

While teaching formal lessons in both science and religion classes were meeting less of a reception from students, my morning devotions or open question and dialogue times were becoming more engaged by students. Just talking to them about my life and how I saw the world was spurring a flurry of questions often straight from the realms of science and religion. What I thought to be apathy towards these areas of curriculum was actually due more to the formal nature of what I had to teach than the fact that they didn't want to know about science and religion.

When I began to realize that hidden beneath what looked like indifference to science and religion was a hunger to know more and an inquisitiveness to seek those streams of learning, I decided to pursue the religious side of knowledge. I began a journey that has brought me to this present moment but should be explained in more detail as that journey reveals and leads to my present moment.

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Both science and religion have been for me places of valleys and mountains, highs, lows and plateaus, which have moved me to experience wonder and also to wonder about my experiences. Prior encounters led me to a different metaphor than a roller coaster; a new metaphor seemed to choose me – the labyrinth. Figuratively speaking, a labyrinth has deep places and places near to the surface; it is dark and illuminated; it can be straight or crooked, wide or narrow, even or uneven. It has movement, and yet often I can't see the direction or progress of that movement; I can only see that I am going somewhere and that the journey is eventful, risky, frightening, enjoyable, and even adventurous as I imagine what going through a labyrinth would be like. Smells and sights keep me moving, at times forward, other times to review something inquisitively like a certain marking on the wall or something like a pool or waterfall stops me in my tracks to gasp in amazement.

That sense of curiosity and wonder weaves itself like a thread throughout my previewing of prior events. Specifically, the term wonder frames for me a place of thought, feeling, and action like an intersection of two caverns between exploring science and religion. Both have evoked wonder and amazement at the beauty of those experiences in learning and yet paradoxically have been troubling and difficult as I saw and continue to see that, for many, learning has become mere drudgery. Thus, a labyrinth characterizes for me a sense of exploration of both the heights and depths of human experiences as a lover of science and as an adventurer on the faith journey. In particular, I am coming from a Christian background (although a term liable to misunderstanding or caricature), with Jesus in this labyrinth as a "fellow traveler". This Jesus, as John Caputo (2008) refers to, is the one who deconstructs me and continually steps with me not merely as a comforter but "troubler" of my own preconceptions and conceptual framework.

My research inquiry also connects to the idea of being in a story and part of a community with others both at a microscopic and macroscopic level, locally, and globally. It could be illustrated by the first book and movie of the *Lord of the Rings*, the *Fellowship of the Ring*, when the Fellowship is in the Mines of Moria. In movie

form, it is well visualized where the Fellowship of nine are in a labyrinthine environment and yet know that they are moving through it to a destination. While travelling through each crevice and past each precipice, they experience many heights and depths of emotion, facing their own fears and seeing within and among themselves a surprising internal courage that they do not necessarily recognize, especially seen in the hobbits Frodo, Sam, Pippin, and Merry led by the wise wizard, Gandalf.

Throughout my story I see several stopping points or reminder stones that have been part of walking the labyrinth of my life in education. They include my Kinesiology and Bachelor of Education degrees, my first and second years of teaching junior high, my decision to go from teaching science and religion to focusing on a religious path by working with youth in a church, to finishing a Master of Divinity degree in the United States, and then coming back to Canada and moving to Edmonton to work with students as a university chaplain. Presently, it is seeing a connection between the wonder of science and religion, through the eyes of university students, as I interact with them and this topic becomes part of the ongoing conversation.

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My first experiences in education are definitely a stopping point (critical juncture) to look back upon. As a first year junior high teacher, I experienced a tremendous amount of stress in starting the path of teaching.

There was no pressure to become a teacher, rather a sense of compulsion to learn and share what I was learning. It was no accident of circumstance: my mother was also a teacher and her hunger to know things was communicated to me from my earliest recollection. Until deciding to do my Bachelor of Education, I had been planning to become a chiropractor or physiotherapist, yet always in the background was the thought of teaching and the classroom setting. Initially a backup to my other dreams, teaching became the focus and passion of my life. I had experienced good science teachers and good religion teachers, and that was where I could see

possibilities for future vocation. The learning experiences in education weren't necessarily as stimulating as I had hoped, but I knew the practicum was ahead. That entry point into the reality of teaching almost turned me to another path but with encouragement and coaching through some tough practice teaching experiences, I finished still with the sense of excitement as to the path ahead.

I entered the classroom with a naïveté and enthusiasm that was soon to be tempered and even shaken. Twenty-four years old and thinking I could change the world! The walls of my own inexperience and misperceptions began to rise up in front of me obstructing my way and pointing me to new thoughts and ideas and practice and a huge desire to grow and develop better pedagogy. That the paths were blocked or clogged might be the best way to say it - I was coming face-to-face with my own weaknesses and inadequacies as a teacher and a person.

After months of my first year had gone by, I began to ask what is good teaching and what was the point of curriculum that couldn't be carried out in a way where there was time to truly reflect upon what was taught and what I was being taught by the students? I was both grappling with time restraints, the pressure to teach to the test, and the real or perceived lack of flexibility to capitalize on the teachable moments that would happen. I felt I had to rush through topics because of what was looming next in the curriculum.

After several years of trying to teach junior high students, it began to dawn on me that the moments when I saw the lights go on in the faces of my students were when we talked about their lives, specifically about what was happening to them in a religious or spiritual way. Both in science period and during religious teaching, I saw the epiphanies. These were not so much in the formal moments but in the informal "sidetracks" student questions would lead me to. The more these sidetracks happened, the more I became interested in pursuing religious questions, as the science questions had been more of my focus up to that point of my life. Thus, my quest took another turn as the path of my interests in religion and science seemed to be going in different directions so I chose the religious path for a few years and became a youth pastor. The move was both professional and geographical: we moved from Windsor out west to Calgary.

After I had moved west to become a youth pastor, I experienced some of the joys and struggles that come with focusing specifically on helping people develop spiritually. I found through this practice that much of my theory had limitations without a strong link to praxis, and in my praxis I couldn't dislocate either theorizing or acting; they needed to remain together. Like an ancient Hebrew mindset (or more broadly Ancient Near Eastern), the truth of what you believe is seen in what you do. In the New Testament, James said, "Faith without works is dead" (James 2:14-17).

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A teacher by calling, I was able to utilize what I knew in approaching students and apply it to working with youth in a less formal setting. The studies we developed or I joined made room for the dialogue I had experienced in the classroom, but without the time constraints of the other subject areas. I deeply engaged, enjoyed, and worked to understand where the young people were coming from and to hear their dreams and aspirations.

However, an interesting thing happened as I sometimes went back into a lecture mode, what some say is typical to teaching – disengagement, yawns, and even bored looks indicated a desire to get out the door! As with teaching science, I now experienced the same thing with the spiritual or religious path, watching the light go out of the eyes and the sense of wonder diminish. It couldn't just be blamed on the students being too entertainment-oriented. More seemed to be going on as I still had many one-on-one times with students who displayed their desire to engage and seek after those questions of life they were wondering about.

So, after some years having worked as a teacher and a youth director, I came to a chasm that stopped me in my tracks. I had to rethink what I was doing with my life as a teacher and a pastor (I think of the scene where the narrow path breaks off and the hobbits have to jump to the other side to escape the Balrog). I had eagerly worn the role of teacher as part of my identity since graduating with my Bachelor of Education. Yet, in that identity, I began to realize some of the modernistic notions I

had acquired on my journey through being educated in a nineties conceptual framework and through my own conservative religious readings that sometimes had less to do with a radical rabbi from first century Nazareth and more to do with my own cultural narrative and assumptions. The desire to explain, analyze, and dissect ideas, issues, or practices, was deeply embedded in what could be described as forms of rationalism related to conceptual issues, and empiricism in relationship to experimentation. It was a "science" of interpretation that I needed to explore and further deconstruct because this was a detrimental aspect behind what people are learning.

At this chasm or crossroads I began to again reflect on what I was seeing. I had a personal desire to finish graduate studies in Theology that I had started part-time, and this seemed like a juncture where I needed to learn more. We packed up our family and moved to Huntersville, North Carolina, where several theologians I wanted to engage were situated and teaching classes I eagerly wanted to be part of. I was also pursuing my own need to rekindle the sense of wonder for myself and for my teaching. I found more questions I wanted to answer that students had raised during our discussions, and I needed to figure out more about the role of interpretation as it related to religious and scientific studies.

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During graduate studies at seminary in Charlotte, North Carolina, I studied with the professors/theologians mentioned above, who deeply engaged me intellectually sharing strong religious viewpoints yet, at the same time, were humble and willing to concede their frail humanity and scope of knowledge. This concession was attractive and appealed to me, and what appeared to be part of this sense of fragility of opinion was their understanding of religious hermeneutics as they held their interpretations with clear measures of tentativeness.

Several courses contained interactions with religion and science, as the interpretation of the earliest biblical texts could not be engaged without that interplay. At this time, I began to recognize various approaches to science and

religion, which further enhanced my own side studies and the desire to know more about them stoked a new level of interest. From this point of tension, I started to see that some of my professors believed the earth was between 6000 and 10,000 years old because of their understanding of the religious text and contrary to the viewpoint of scientific inquiry.

At the time, I didn't realize how much of what I was learning would settle into who I would become, but now I see much of it surfacing today in this active reflective process. Their understanding of interpreting texts has in some ways been passed to me and, as I read others in the field of hermeneutics more specifically related to education, I can see the commonalities and why what I am reading now has resonated with me. Rather than simply stay in my comfort zone, I continue to deconstruct and challenge my own beliefs, even as they were so graciously taught to me in my Master of Divinity classes. I see much to continue to internally dialogue and think through that will carry me through my academic travels, and I can also see where some of these assumptions might have had a temporary merit in my own learning. Yet some must inevitably be reshaped and reworked to help me go beyond the gap in front of me that looks like it is roughly traversable while further along it seems to open partially into a new tunnel. This has been some of the journey of the last few years through my labyrinthine location.

I arrive at the current place in my own inquiry because of questions I have at the present moment that come from five years of working with students in the university setting – metaphorically testing waters, climbing steep inclines, and crossing pits in the floor. My religious and science background beliefs have both been tested because of a Canadian context that differs from my formative religious training in a conservative Reformed denomination and also from Charlotte in the United States where much that was taught seemed so related to the context.

One example comes from a lecture in theology where much that was taught was more broadly related to a world context relating to Eastern Orthodox, Roman Catholic, and other main denominations but examples of how this related to the South immediately highlights differences in the Canadian religious situation. The professor's application pointed to a decline in religion, which was seen in how few,

at that moment, attended mid-week prayer meetings. It was possible that there might have been some truth to this statement as it related to that context but having grown up in a city where few if any churches ever had a mid-week prayer meeting, I could not relate what he was saying to my own conceptual framework and religious background.

I am being stretched in my search for wonder in the university setting, as I meet people from all over the globe, from different religious backgrounds, and who interpret their lives in many different ways. Rather than being a liability, I am seeing more and more how this is actually a new opening to grow in wisdom, especially because I believe that wonder and truth lead to freedom. I look forward to the years ahead of careful, yet a joyful and purposeful treading through my labyrinth. I trust that I will learn to glean benefit from a broad scope of thinkers to develop paths for education as none of the categories have all of the truth in this fallible human venture.

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To gain a background from which to develop my inquiry, I spent time reading major educational theorists through the graduate course offerings. Some influences that point to where I came to use the labyrinth metaphor are David Smith (whose work led me to H. G. Gadamer), and most recently John Caputo. Their hermeneutical writings have helped personally challenge me to think beyond my own cultural and religious background. Their insightful perspectives have been like one of those mining headlights that make the path through the labyrinth one of greater clarity and sight. The process has not been easy, and has challenged ideas and insights, especially when "faith and conviction are at stake" (Dwayne Donald paper comments 2010- Feb-6).

I think my background of interpreting religious texts is part of why I find myself located in this academic space, because of their lifelong ethical implications I am spending much of my life working to understand and apply. I see benefit in various educational approaches and agree with Gage (1989) who said, "Educational

research is no mere spectator sport, no mere intellectual game, no mere path to academic tenure and higher pay, not just a way to make a good living and even to become a big shot. It has ethical obligations (p.10).

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In researching the issue of science and religion and specifically the issue of creation and evolution, I have found an often-troubling confusion over what other people actually express in conversation and writing. When someone uses the word creationist or evolutionist in the media, there is an implicit assumption that everyone understands what is being said. But we must have a shared language before we discuss this area.

We all have categories we work with whether we are academics, students, and teachers or just an interested learner in a topic. “Categories are the foundational concepts that direct the way we look at the world and think about it” (Lamoureux, 2008, p. 1). While they are helpful as heuristic frameworks, they are a place to work from, not something static and unchanging. The common misconception is that it is evolution or creation, and science or religion, both either/or dichotomies. As Lamoureux (2008) says, “Today the origin of the universe and life is often seen in black-and-white categories” (p. 1). Therefore, when I use the word creationist I am referring to someone who believes that the world is a product of a Creator. When I use the word evolutionist I am referring to a scientific theory describing natural processes (Lamoureux, 2008).

For the purposes of this thesis, science will be defined as the branch of knowledge exploring nature through the process of observing and collecting data from the physical world, then verifying it, looking at it for patterns and empirical results to support a hypothesis, seeking to test, falsify and then repeat experimentation, if necessary. For a definition of religion, I have found few as comprehensive as Clouser (2004) but to simplify, for this thesis, religion will be defined to mean: what a person believes to be of ultimate value, and that which defines where he/she find and what gives purpose and passion to their life; whether

formally through church, mosque, or temple, or informally in nature, possession(s), or another person. While many other definitions are available that would not be as comprehensive and include the scope of the above definition, by this one we could all be religious to some degree or another. The last term that should be defined for this thesis is science and religion. When the terms science and religion are used together, I will be speaking of a developing field of study that looks at the relationship between each academic discipline unless I am referring to them as classroom subjects.

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Having written about my experiences in teaching science and religion, the questions they have raised for me, and the revelation of ongoing interpretive discoveries, and the importance of categories, I would now like to further explicate the relationship between science, religion, and tension in the classroom. This thesis will consist of chapters including a short background to science and religion, a literature review, methods and methodology, my Pilot Project questionnaire, my Master's survey/questions research results, and will conclude with future considerations of wonder and education.

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To understand some of the tensions that might be part of the classroom setting in either the context of science or religion, one must have a basic grasp of the historical background involved in the interaction that has occurred between them. Before we look in more detail at the paradigms or typologies people use to view aspects of learning in these fields, it will help to see how those prior to us have engaged and enacted upon explicating their own viewpoints. These viewpoints were not without major political and religious implications; as well, some of the unwelcome warring between these parties has continued with us to the present day.

Without going into a long side excursion on the issue of hermeneutics, it is important that I mention at the outset that I am assuming an historical interpretive lens as a way to understand how scientific and religious actions influenced the world. Whether those involved understood these influences or not is less certain; but, from a historical distance looking back, we can begin to grapple with historical mindsets that we may be perpetuating today that contribute to the tension between science and religion.

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Interpreting history is a tricky art and science; fraught with the peril of imposing our own viewpoints and situation back upon those who went before us. It is easy to judge the actions and thinking of those who cannot defend themselves and who haven't had the impact of further historical, religious, and scientific developments to refine their perspective. When a figure like Galileo comes on the scene, larger than life, we are tempted to either co-opt him as our own bandwagon

leader to promote science or to vilify him as a dead white male in a position of privilege who could not help us in any way forward in the 21-century discussion of science and religion. Our interpretations of texts and events have built-in assumptions that, if not part of our awareness, can lead us to theorize about the past as merely a mirror image of things we want to lobby against, set up as straw-men (persons), or codified as icons or flashlights to successful futures.

To state at the outset of this short history as a backdrop, I will argue that we don't need to read religious writings, such as Jesus' words, from our scientific paradigm. However, we must locate these 'words' in their history, as we must with any ancient people and writing. To the best of our abilities, we must "eat" these words (Kott, 1974) and work to think like the people we are considering – such as the Hebrews involved in writing biblical text did in their context. I think this dissonance that sometimes led to misinterpretation was part of the issue with those who were wrestling with the scientific issues being raised by Copernicus and Galileo. They weren't interpreting with a two book's model (Book of God's Words, and Book of God's Works); rather, they were viewing issues through either one or the other or were conflating the two together.

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From where does the tension between science and religion emerge? For centuries, there have been debates over many aspects of Jesus' teaching and especially with the Old Testament prior to his coming. But the issues are not 'scientific' until Galileo's day. As Morvillo (2010) says,

> [F]or most of recorded history, there was no distinct separation between the two disciplines. This may come as a shock to many of us living in this modern society, for example in the United States, where the separation of church and state, and the notion that science is somehow the antithesis of religion, is the norm. But in the past science represented a way of glorifying and understanding God. Science was often done by religious clerics. (p. 6)

Rather, there were theological and philosophical and hermeneutical difficulties

ad infinitum wrestled with over the centuries. Yet, ironically, the common biblical view today often assumes the science of that day reflected by Galileo when he said, "the word firmament is literally very appropriate for the stellar sphere and everything above the planetary orbs, which is totally still and motionless according to this arrangement [Copernican astronomy]" (Finocchiaro, 1989, p. 118). There was, for Galileo and others, a hard surface above called a firmament. Above this firmament, there were waters. This perspective was carried forward from the time of the ancient Greeks and was commonly derived from a face value reading of Genesis (Walton, 2010). Whether this mistake was and is merely hermeneutical related to the actual presence of an ancient science in the Bible is still to be seen. That said, the question for me remains, in light of what we know, would Jesus tell us that we should get our science from the Bible; or, does the Bible exist to offer messages of wisdom and faith?

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During the time of Copernicus and Galileo, tension increased between science and religion because the interpretation of the day was that the Earth was the center of the universe. Texts in the Bible were interpreted from that framework as well, and there was little reason to dispute this belief. Of course, Copernicus and Galileo (among others) changed everything by beginning to ask questions and make observations that disputed this understanding and calling into question a hermeneutical history and educational paradigm that had reigned for centuries.

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Nicolaus Copernicus (1473-1543) was deeply committed to his religious beliefs and a serious student of science. Contrary to what is sometimes said in popular myths, there was little outcry to his book *De revolutionibus orbium caelestium* (*On the Revolution of the Heavenly Spheres)*, published in 1543. As historian Ronald Numbers (1986) recounts, "Indeed, various churchmen, including

a bishop and a cardinal, urged Copernicus to publish his book, which appeared with a dedication to Pope Paul III. Had Copernicus lived beyond its publication in 1543, it is highly improbable that he would have felt any hostility or suffered any persecution" (p. 344). In that work, Copernicus taught that the sun was the stationary center of the universe. He sensed that Ptolemaic astronomy was too complex and lacked beauty, so he set about reworking it and changing it to what became the heliocentric model.

Interestingly, one well-known religious figure of the day, Martin Luther, who taught about the importance of freedom and grace as a gift from God, rejected Copernicus' new model saying, "The fool will turn the whole science of Astronomy upside down" (Armitage, 1951, p. 90). Ironically, while not liking the theory, what Luther said in passing was exactly what happened to Luther himself on the religious front. That major struggle with the Catholic Church resulted in the Reformation. Also, in the realm of science, Luther's words came true, and this theory eventually turned the geocentric world upside down. While the religious implications were already being recognized at this point, these religious implications would become issues of natural philosophy (science), as Aristotle and the Bible were both used to buttress the "fact" of a geocentric universe. However, the tension was not nearly as evident as when Galileo emerged on the scene.

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Galileo Galilei (1564-1642) was a scholar in his own right (mathematics), as Copernicus (canon law and astronomy) had been. But it was Galileo, a much more outspoken personality, who created a stir in the realm of science and religion. The Protestant Reformation (1517) had disputed indulgences and church authority and the Roman Catholic Church was in a defensive posture trying not to step into another hornet's nest. To this point, Aristotle's teachings had been integrated into Catholic theology and the fact that Galileo actively questioned someone like Aristotle became part of the issue and tension.

Galileo doesn't publish in the scholarly standard of Latin, rather he publishes

in Italian. As a result, his writings become widespread and cause a stir among the people. The discovery of the telescope in 1609 brings the conflict to a boiling point. Galileo famously points this telescope at the heavens and starts to see that things are moving, contradicting Aristotle's theory that the heavens don't change. Religion and natural philosophy (what we would call science) not only begin to move, they begin to collide.

The collision is more than the case of a simplistic Biblical view saying one thing and Galileo's telescope seeing things differently. Catholic scholars had made Aristotle's approach their own; thus, their understood science blocked the science Galileo was proposing. Science was thus religion and became associated with their religious office. As Ronald Numbers (1986) summarizes,

> By the beginning of the thirteenth century, virtually all of the works of Aristotle had become available in Europe, and from this point onward we see a persistent effort to integrate Aristotelian natural philosophy, or science, with Christian theology. In the end, Christianity took its basic categories of thought, its physical principles, and much of its metaphysics and cosmology from Aristotle. By means of its power to organize and interpret human experience, Aristotelianism conquered Christendom. (p. 342)

Through this time period we see the religious and scientific coming into much closer proximity as the tension between them is amplified. Numbers (1986) explains the situation:

> When Galileo burst on the scene in 1610, he came equipped not only with telescopic observations that could be used to support the heliocentric theory, but also with liberal arguments about how to interpret biblical passages that seemed to teach the fixity of the earth. Galileo argued that God spoke through both scripture and the "book of nature," that the two could not truly conflict, and that in physical matters authority should rest with reason and sense. Challenged by demonstrative scientific proof, any scriptural passage to the contrary would have to be reinterpreted. Galileo was flirting with danger, not

only by entering the domain of the theologians, but also by defending hermeneutic principles clearly at odds with the spirit of the Council of Trent. (p. 346)

The issue for Galileo at the time was not directly about his going against biblical claims but rather was "from ambiguous scientific evidence provoking an intramural dispute within Catholicism over the proper principles of scriptural interpretation a dispute won by the conservatives at Galileo's expense. Galileo never questioned the authority of scripture, merely the principles by which it was to be interpreted" (Numbers, 1986, p. 346).

Galileo took what became called the two-book approach: first, the book of God's works and, second, the book of God's words. Many Christians have adopted this 'duet' over the last few centuries as scientific discoveries have raised more questions about the biblical data. Although the Biblical text itself at that time was re-examined and slowly re-interpreted to incorporate a heliocentric universe, the challenge had only begun. In the Enlightenment that followed, all texts began to be questioned in light of discoveries happening in science. Adjusting a few texts to stay abreast with clearly demonstrated new realities in astronomy is one type of shift, and the interpreter claims a mistake with the earlier interpretation and moves on. With the coming of Darwin's theory of evolution, those who claim to follow Jesus would face a bigger challenge from biology that continues into our own situation. What would Jesus say to this development that enters directly into questioning the early formative chapters of Genesis that have been interpreted with much uniformity until that moment in time?

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The start of the nineteenth century brings a time of highest tension - a period when many are struggling with changes happening in science and among those of religious faith. Following what could be called a Cartesian desire for certainty (Smith, 2006, p. 128), many were going back to their texts and scrutinizing them in

light of the scientific discoveries that continued to appear. At the same time there were books being published popularizing the idea that science and religion were at war with one another, including one written in 1875 by Dr. John William Draper called *History of the Conflict Between Science and Religion*. Another book that was circulating in 1896 was by Andrew Dickson White *History of the Warfare of Science with Theology in Christendom* (Livingstone, 1984, p. 1). The idea of a death-struggle between science and religion had captured the popular mind and was carried over into the issue of evolutionary science and evangelical religion (Livingstone, p. 2). These books created a stir for those of Christian faith who were being told they had to choose between evolution and creation.

Yet the actual case was more nuanced. Even among those with academic credentials who were deemed evangelical, people like Asa Gray (a Congregationalist) and B.B. Warfield (a conservative Reformed theologian) were not opposed per se to evolution. Livingstone (1984) contends that propaganda and ignorance played a significant part in developing popular viewpoint that religion and science were enemies (p. 2). It seems propaganda still rules the day – whether from a fundamental young earth creationist viewpoint or atheism pitted against religion. How do we work through this ongoing tension?

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I believe life is a pedagogical process. I suspect even the historical struggle and tension between science and religion had some merit at the time that we can learn from, yet the tensions I currently see are evident. In my experience, some students would give up their religious faith or even cynically dismiss science because they are presented with this dichotomy – science or religion, evolution or creation. This interaction with students brings me to close this chapter with where I am today and why this issue is important to me.

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There is no end in sight to the struggle and tension over creation and

evolution. Even now a new dogma is developing in both atheist and fundamental creationist circles. For example, an ABC Prime Time 2004 US poll shows 87% believed in a six-day creation and young earth (Lamoureux, class notes, p. 163). The difficulty is that, for many, the natural "common sense" reading of the Bible points to a young earth. It is difficult to not read it that way, as I was taught to do early in life. The current scientific lenses we wear are subtly and deeply ingrained and we lack the hermeneutical categories to fairly treat the ancient text. It doesn't help when book after book is published in faith circles defending this view and sometimes rashly barking out against science and evolutionary thinking. As Numbers (1987) says, "In 1964 one historian predicted, "[A] renaissance of the [creationist] movement is most unlikely. And so it seemed. But even as these words were penned, a major revival was under way, led by a Texas engineer, Henry M. Morris (b. 1918)" (p. 150)

Morris' mission in life was to speak against evolution and spread the young earth creationist message. I have read some of his books and books by others in the same movement. On one level, readers can see zeal and passion for faith that might even be commendable except that they include their way of reading Genesis as one litmus test for their form of orthodoxy (this perspective showed up in discussions in CHRTC 350 class as well). This scientifically simplistic method worked for me when I didn't know anyone else involved in science and when I knew very little biology, but as time went on I met many others with different viewpoints and traditions who still professed faith. At the time, it was easier to disregard them as having departed the faith; but, the longer I studied and read and the more I met genuine people who held all sorts of opinions and I realized I had bought into a dichotomy that blocked me from growing in my education. Thus, this issue comes close to home for me when I meet students in a similar dilemma, caught in the dichotomy.

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In my journey beyond young earth creationism, I began to also meet people who were polar opposites of my old position but who thought through the same

dichotomy-oriented lens as atheists. Because I had previously thought this way myself, it was surprising to see it from the other angle and I began to realize as an educator and chaplain that this approach was an equally unhealthy way of viewing the interactions between science and religion. The positivism this viewpoint expressed - that knowledge only comes through logic and science, became for me another reason to pursue further education and to seek ways to understand how curriculum could be developed to help students move from a black and white way of thinking.

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While science and religion have been involved in challenge, debate, and conflict for centuries, as an academic field, science and religion has exploded with writing and specific interest in recent years. As Drees (2006) says,

> The beginning of 'science and religion' as a specific discourse in Anglo-American academic life can be dated at 1966, the year Ian Barbour published his Issues in *Religion and Science* and Ralph Burhoe started the journal *Zygon: Journal of Religion and Science*".(para 1)

One landmark book for the field was also Ian Barbour's (1990) *Religion in an Age of Science* (pp. 4-29) where he outlined four frameworks other scholars have built upon and continued to reference – conflict, independence, dialogue, and integration. To give us a basis for further discussion lets look at them briefly. The *conflict* typology views science and religion deeply at odds and in conflict and believes that only one-viewpoint accords with the evidence present in empirical study. Those who hold to scientific materialism and those who hold to a biblical literalism, as Barbour says,

> Both believe that there are serious conflicts between contemporary science and classical religious beliefs. Both seek knowledge with a sure foundation –

> that of logic and sense data, in the one case, that of infallible scripture, in the other. They both claim that science and theology make rival literal statements about the same domain, the history of nature, so that one must choose between them. (p. 4)

Barbour's second grouping *independence* has representatives who see value in both religion and science, but only as they remain distinct from each other, not entering into the different realms of inquiry (Weiss, 2009). The independence typology tries to avoid connections between science and religion by viewing "the two enterprises as totally independent and autonomous" and "each has its own distinctive domain and its characteristic methods that can be justified on its own terms" (Barbour, 1990, p. 10).

Barbour's (1990) third category he called *dialogue*. This typology has been explained to move beyond questions of boundaries and methods of science and religion, as the independence typology tends to focus on. The interactions would be less direct and there is less a dividing line between them, rather they are trying to find room for commonalities. Influence from science to religion or religion to science is not out of the question for this typology, rather scholars like Steven Bishop (2000) are open to affecting each other's perspectives.

The fourth perspective as to how science and faith could interact is called *integration*. Barbour (1990) believes "some sort of integration is possible between theology and the content of science" (p. 23). Within this perspective, three distinct versions include natural theology, theology of nature, and a systematic synthesis.

These helpful categories are useful for clarification and guidance, and I explain them in more detail in the following chapter. As James K.A. Smith (2000) says about his own use of interpretive models, "They must not be understood as definitive, airtight boxes that encapsulate and frame each thinker, let alone a "tradition". They are intended to function as heuristic devices that are not definitive but are nevertheless helpful in ascertaining differences and contrasts" (p. 24). Thus, looking at the literature beyond the educational context can inform and enrich our understanding of what sort of curriculum, planned and lived, would benefit

teachers.

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The academic literature covering the interaction between science and religion is a fascinating array of deeply held convictions and viewpoints. From my findings, the current thought ranges in breadth from the passionately negative towards science or religion to a position of denial of the issue altogether. With such a wide continuum of thinking, surely it begs the question as to how it is possible to navigate within such a diverse subject area. Brooke (1999) says something that provides clarity as to how I am approaching the academic literature:

> There is no such thing as *the* relationship between science and religion. It is what different individuals and communities have made of it in a plethora of different contexts. Not only has the problematic interface between them shifted over time, but there is also a high degree of artificiality in abstracting the science and the religion of earlier centuries to see how they were related. (p. 231)

Although the field of science and religion is a vast domain in itself, there are key scholars who were first on the scene in North America and whose writings form the basis for much of what has followed. These scholars include Ian Barbour (1990), John Haught (1995), Arthur Peacocke (1981), and John Polkinghorne (1998). While Canadian input is harder to find, Denis Lamoureux (2008) from the University of Alberta has been cited various times and found to be in the midst of this discussion and is a resource in trying to understand our Canadian context. These scholars work with various frameworks to help provide focus to their research, but they bear certain similarities to each other.

One key starting point was Ian Barbour's landmark book *Religion in an Age of Science* (p. 4-29) where he outlined four frameworks that other scholars have built upon and referenced ever since. For this reason, I chose Barbour instead of John Haught (1995) who has adapted Barbour's framework and contributed some

interesting nuances to Barbour's four categories. Haught (1995) has also contributed to the science and religion discussion about typologies and I appreciate what he has tried to do especially with the fourth category of complementarity, where he argues that religion upholds science. Rather than go further into this detailed discussion I have chosen to stay with Barbour's categories for the purposes of this thesis.

Even as I recognize limitations to my approach, to organize the literature I have reviewed, I frame my references with Barbour's (1990) four typologies for understanding the interactions between science and religion. While utilizing these typologies, I have kept in mind the danger of oversimplifying a given scholar's viewpoint. It should be assumed that there are often overlapping typologies within a given scholar's perspective even as I put their statements within one of the categories.

The four typologies of Barbour's (1990) framework of science and religion are conflict, independence, dialogue, and integration.(

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The conflict typology views science and religion deeply at odds and in conflict and believes that only one-viewpoint accords with the evidence present in empirical study. Those who hold to scientific materialism or those who hold to a biblical literalism, as Barbour (1990) says,

> Both believe that there are serious conflicts between contemporary science and classical religious beliefs. Both seek knowledge with a sure foundation – that of logic and sense data, in the one case, that of infallible scripture, in the other. They both claim that science and theology make rival literal statements about the same domain, the history of nature, so that one must choose between them. (p. 4)

Historically, this conflict is represented by the struggles of Galileo and Copernicus with the Catholic Church, has had an ongoing place during the

Enlightenment, and now has come to the forefront of the media in the current resurgence of atheism and religion pitted against one another. Statements such as the following abound, whether from the theist or the atheist:

> Science has swept God from the public arena, and relegated him to the margins of our culture. He hangs on in its backwaters – but only temporarily. It is only a matter of time before the relentless advance of science finally drives God from the human mind, and the world will be a better place. (McGrath, 2005, p. 116)

A current popular representative of the conflict typology is Richard Dawkins (1997). A scholar of many achievements, Dawkins has entered into numerous written and public animated debates, that while entertaining, only leaves room for one perspective – science over religion. He is among a growing group of thinkers who take a conflict approach to religion and science within the current cultural climate that is developing a further polarization between atheism and theism (McGrath, 2005, p. 117). Involved in the academic literature, Collins (1995) represents this stance when he says, "The point of this article is that when scriptures are taken literally and they produce nonsense, then science should be given preference" (p. 15). So when there is a choice to be made between religion and science, in this approach, science takes priority (Edwords, 1980).

This priority is also reflected in the title and content of Sundberg's (2003) research of students' conceptions of evolution and Sundberg's goal to challenge their "naïve" viewpoints (p. 1). He doesn't allow for alternative conceptions, because he finds that, "These beliefs, which often seem common sense and are reinforced by the media, are particularly resistant to modification — regardless of the pedagogy employed"(Sundberg, p. 9). The tone of conflict employed by the popular media is sometimes even found within scholarly articles, detected in Randy Moore who says about creationism, "this educational malpractice has undermined science" (2007, p. 185). Although my preliminary research has discovered many who continue to pit religion and science against one another as enemies (E.G. in Edwords, 1980), these

are not the only voices in the literature. The typology of independence also has its followers who articulate another way of viewing the subject.

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Barbour (1990) calls his second grouping *independence*, which has representatives who see value in both religion and science but only as they remain distinct from each other, not entering into the different realms of inquiry (Weiss, 2009). The independence typology tries to avoid connections between science and religion by viewing "the two enterprises as totally independent and autonomous" noting that "each has its own distinctive domain and its characteristic methods that can be justified on its own terms" (Barbour, p. 10).

This type of thinking is reflected in mainstream schooling where courses are offered in which each of these two subject areas is studied as a distinct field of knowledge. The goal is, as Barbour (1990) says, to "keep off each other's turf" (p. 10). One major representative of this viewpoint is American paleontologist, and also historian of science Stephen Jay Gould. Gould (1997) writes from an independence orientation, calling it, "non-overlapping magisteria" (pp. 16-22). Gould's perspective leaves room for both of these realms of life to work within their own spheres of knowledge, without interfering with each other (p. 16-22).

Within this grouping are also some who could still be categorized as overlapping with the first typology. Sutera (2000), while giving a case for the evolution of the whale, certainly shows elements of being in the grouping of conflict when he says, "This is the power of using mutually reinforcing, independent lines of evidence. I hope that it will become a major weapon to strike down groundless anti-evolutionist objections and to support evolutionary thinking in the general public" (Sutera, 2000, p. 39).

While using words like "strike down" and "groundless" are strongly confrontational, his appeal to evidence also reflects those who approach science and religion as independent areas of study. The difference between the two groups is that those who are in the category of independence don't attack religion because it

has its own jurisdiction. Sutera (2000) is a case in point (p. 33) because he confronts creationists who are anti-evolution, but keeps his research from specifically tackling religion which is different from the scholars mentioned in the prior section who are directly engaged in the conflict such as Dawkins (1997) and Moore (2007).

Scotchmoor and Thanukos (2007) contribute to the independence typology in the literature by writing about how students develop an understanding of evolution (pp. 225-244). They recognize the teaching environment includes "vast conceptual ecologies in the classroom" and that students come from many different backgrounds that affect their understanding of science (Scotchmoor & Thanukos, p. 230). There is little evidence in their research article that specifically reflects the category of independence except for one telling statement in their closing remarks that refers to the tension they feel in their teaching and in developing their web site: "We purposefully elected to maintain a practical and scientific perspective for the site in order to avoid diluting accurate science and sound pedagogy with the 'controversy' over evolution which dominates public discussions of this topic" (Scotchmoor & Thanukos, 2007, p. 242). This stated apprehension and need to avoid diluting science teaching with evolutionary controversy, illustrates the challenges that many scholars face and reflects that they want to keep religion and science separate from one another.

Audi (2009) also appears to depict the independence perspective, by seeing the significance of both areas for inquiry and understanding when he concedes:

> A science teacher may also preface certain examination questions with such phrases as 'according to the theory of evolution'. This need not be presented as expressing suspended judgment on the theory, but it allows students for whom the theory is religiously unacceptable to succeed on their exams without feeling that they are asserting religiously offensive falsehoods. (pp. 44-45)

Audi (2009) makes clear that adding this phrase to questions is not a concession to any lack of evidence for evolution; rather, doing this concedes the fact that students'

religious backgrounds may affect how they perceive the scientific evidence (p.45). This way of thinking reflects both the idea of science and religion as independent realms and enters the next category of dialogue. Audi concludes his discussion of whether evolution can be religiously neutral by this qualification,

> The appropriate neutrality toward religion, both in science education and in politics, is entirely compatible with a sense of the historical importance of religion and of its position in contemporary culture. It is also compatible with profound religious faith on one side or, on the other, deep dislike of religion. Good teaching in secular institutions calls on us to transcend commitments to either of these positions, especially in teaching the young. (p. 46)

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Although many seem hesitant to allow religion and science to interact, others are less reticent to engage Barbour's (1990) third category that he calls *dialogue*. The dialogue typology can be described as "moving beyond the Independence thesis … involving boundary questions and methods of the two fields" (p. 16). Dialogue includes indirect interactions between science and religion, having a more permeable boundary between the two. Those scholars who hold to the typology that science and religion need to be in dialogue are open in allowing for either area to influence the other. Steven Bishop (2000) says dialogue is "the most common contemporary approach," which he represents graphically with the two realms as circles and arrows pointing to and from each area (p. 52). Those who reflect this typology includes authors like physicist/theologian John Polkinghorne (1998) who has written many books that emphasize both his theological and scientific knowledge in dialogue, as well as Arthur Peacocke (1981), Stuart Glennan (2009), philosopher Robert Audi (2009), and Denis Lamoureux (2008).

Glennan's (2009) perspective contributes interesting observations to how this third typology works. Although he concedes much to Gould's non-overlapping magisteria (NOMA), Glennan also says,

> Whatever the intellectual merits of the non-overlapping magisteria principle, many religious people have beliefs and attitudes that conflict with it. When a student makes faith-based claims about the natural world—including claims about the earth's or human origins, human cognitive mechanisms, and the like—the science educator must be prepared to judge whether such claims are or are not supported by scientific evidence. And when that evidence goes against these claims, the educator must be prepared to say that they are very likely wrong—even if such an assertion contradicts a student's deeply held religious beliefs. (p. 811)

Telling students that they could be wrong about core beliefs would not be an easy task for a science teacher, but it would be profitable for students to have instructors who are aware of their religious issues. Although teachers don't need to necessarily inform students about beliefs and worldview, teachers would be there to help them see that many other worldviews might not have yet been considered (Glennan, 2009, p. 812). Students could also be gently shown that people within their own traditions have viewpoints that might not be exactly the same as their own. Although this knowledge about other's beliefs could be disconcerting, this awareness appears to be of even greater need in a world where many cultures and religions are now in daily contact. Understanding other cultures and worldviews would also affect teacher development, as universities would need to think about these sorts of issues and how to help shape educators who have this awareness. Glennan (2009) raises some good questions for continued reflection that also exemplify the dialogue perspective:

1. Is a reliance on faith inconsistent with scientific commitments to evidence?

2. Is a belief in a God or Gods contrary to a scientific commitment to naturalism?

3. Does a commitment to the truth and importance of sacred texts violate

scientific canons of evidence?

4. Do developments in science—particular those in psychology and neuroscience threaten to undermine religious doctrines about freedom of the will and the divine nature of the soul.

5. Do scientific explanations of the origins of moral behavior undermine the moral teachings of religions? (p. 799)

While Glennan does attempt to work through these questions in a preliminary way, from my perspective of his article, he doesn't cross into the last of Barbour's categories – integration. He says,

> While we cannot ask whether science and religion writ large are compatible or incompatible, independent or engaged, and so on, we can ask more specific questions about the relationship between various scientific and religious presuppositions, beliefs, theories and practices. (Glennan, 2009, p. 799)

Glennan (2009) indicates that a relationship exists between these areas but doesn't move to integrate them. His closing comments indicate where he is positioned:

> As science educators face the challenge of confronting their student's ill-supported claims, it is comforting to think that at least some theologians will come to their aid. If we are to believe Paul Tillich, faith-based beliefs about nature and history are misguided not only as science but also as theology. What looks to the scientist like epistemic foolishness may look to the theologian like idolatry. (p. 811)

Glennan distinguishes the two different viewpoints that scholars of religion and science take in looking at the claims of science. His words as to the possibility of future conversation give a clear indication of his commitment to continue the dialogue albeit short of integration.

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To this point, I have reviewed the first three typologies in order of how they appear in Barbour (1990) from conflict, to independence, and then dialogue. I conclude with the last category in which I see much promise – if complemented by independence and dialogue. The fourth perspective as to how science and faith should interact is called *integration*. Barbour describes integration by noting that "some sort of integration is possible between theology and the content of science" (p. 23). Within this perspective lay three distinct versions - natural theology, theology of nature, and a systematic synthesis. While each has its nuances and direction and contribute to the discussion, for my purpose I focus on the general idea of integrating science and religion.

It is clear, from their ordering, that Barbour wants to take the discussion in a definite progression and he has done so through other writings. Haught (1995) takes Barbour's categories even further by adding a stage he calls confirmation. This stage aims higher than integration, and Haught believes pave the way for scientific assumptions and "nourishes the whole scientific enterprise" (p. 9). Because I think integration allows room for Haught's revision, because integration does not preclude this nourishing of the enterprise, I will not elaborate on this nuance. Between Barbour, Haught, and Peacocke, we see movement towards an engagement between science and religion that allows for input from each discipline and a merging of perspective and support.

One author with a more integrationist approach is William Cobern (1994), taking a cultural constructivist approach to teaching. Cobern states, "Science instruction, especially when it is about a highly controversial concept like evolution, must not ignore cultural significance" (p. 584). He raises the issue of how students learn and leans towards an integrative approach because he wants to consider religious aspects part of the picture of learning even as it relates to science. He adds, "Nowhere in science is the overlap between scientific ideas and other ideas in society more clear than with the theory of evolution and origins" (Cobern, 1994, p. 584).

Further, Cobern (1994) raises the problem of scientism and how those involved in science need to be aware of their own biases - including the claims of intellectual certainty over other disciplines (p. 585). I have placed Cobern in the integrative typology because I see in his article a willingness to allow other disciplines, including religion, to influence and become part of the academic discussion. His desire to not indoctrinate, even with solid scientific knowledge applies to integration as well, as his openness, liberality, and humility leave room for bringing together aspects that fit together (Cobern, 1994, p. 589). From my viewpoint, it is commendable to see, with echoes of Polanyi (1974), that Cobern recognizes the limitations of science yet upholds evolution as "science's best reckoning of reality" in a way that leaves room for development and growth (p. 586).

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If there are noticeable gaps in the literature, these exist in the Canadian context as it relates to science and religious education and especially with typological frameworks. There are notable exceptions in science education, as mentioned earlier; these include Moore, Wiles, Asghar, Alters, Scotchmoor, and Thanukos (McGill). Denis Lamoureux is the Canadian with whom I am most familiar, who is also part of breaching this literary gap. His approach has integrative implications for science and religion. As an example, he elaborates on misunderstandings about Charles Darwin that many have raised, by pointing out that,

> Regrettably, both secularists and numerous evangelical Christians have painted a dark and sinister picture of the religious implications of Charles Darwin's theory of biological evolution. This has led to a cultural myth that sees him as one of the modern apostles of unbelief. However, the primary historical literature reveals that Darwin was thinking theologically throughout his career and that his reflections were sophisticated.

(Lamoureux, 2004, p. 1)

Thus, Lamoureux shows that views of Darwin have affected how educators and people, in general, integrate science and religion. While Lamoureux also incorporates elements of the second and third typologies into his work, much of his writing seeks to integrate theological insight into scientific endeavours (Lamoureux, personal communication, October 31, 2009). He states a possible agenda for future interaction by boldly asserting, “The time has come to let the historical record speak in order to move beyond the ill-informed myths of Charles Darwin’s religious beliefs and the misunderstood theological implications of the theory of biological evolution” (Lamoureux, 2004, p. 9). He believes that, at times, people have claimed Charles Darwin's beliefs were atheistic and thus link evolution to a conflict viewpoint: however, Lamoureux sees Darwin's religious beliefs were more nuanced and concludes his historical survey of Darwin's life, “Therefore, Darwin throughout his professional career never did embrace an atheistic or dysteleological view of biological evolution” (p. 8).

Thus, if Lamoureux had his druthers, the conversation would be open and focused on clearing away misconceptions, such as those related to Darwin, that prevent scientific understanding and put barriers between people who should be interacting, especially in communities of faith and in science classrooms. Using this type of typology survey in learning contexts, with statements about evolution and Darwin included, could help clear up major misconceptions that are likely contributing to a conflict dichotomy or various misunderstandings. Gathering student viewpoints ahead of time is also one example where knowing more specifically where students are situated in their own understanding of Darwin could give further knowledge to teachers about whether students are open to the integration typology. Taking this type of survey could help clarify if this understanding of Darwin is widespread and would give the researcher a chance to address these viewpoints in a classroom setting.

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Recently, I have discovered other noteworthy researchers in science education outside of the U.S. context including Reiss (2009), and Fysh (1998) (Australia) and also Tonie Stolberg (2010) (United Kingdom) who seem open to an integrationist perspective. These thinkers reinforce my desire to do further research, despite the seeming lack of interest in journals of science and religion to address these issues from an educational perspective.

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The literature pertaining to typologies of science and religion is a vast and developing field. My literature review has attempted to look at a certain breadth of the field, conceding the fact that with so much literature available that much will be left undone. Yet narrowing the search to the area of education has shown me there is still much to be done in regards to practical pedagogy. That while there is a proliferation of scholarly publications in the area of theory; there is still a dearth of research in the field related Canadian content and to praxis.

As a way to enter into the field, I started with Ian Barbour as a pioneer in the field (along with John Haught, Arthur Peacocke, and John Polkinghorne), who introduced me to the categories of science and religion. Denis Lamoureux's work has deeply interested me in the Canadian setting and understanding Tonie Stolberg's input is still a work in progress. Especially needed is research that integrates the fields and introduces science and religion into the classroom setting.

While others have expanded on the number of typologies, I have intentionally stayed with the standard four typologies as I felt it was unnecessary to overcomplicate my research for application to a classroom setting. These four give a sufficient framework for teachers to accomplish the goals of engaging classroom tension over issues of science and religion, promoting open-minded dialogue with students, and exploring new perspectives (See Chapter Six).

In Chapter Four I will look more specifically at the educational literature and how I see it relating with the field of science and religion along with how my research in typologies is an attempt to bridge the perceived gap between these fields.

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It was fascinating to read through the academic literature about science and religion, starting with the broader science and religion writings to those from an educational context. In doing so, I have seen that much of the information asks questions across a variety of theoretical concerns; however, few specifically apply this broad knowledge to the lives of students and the work of teachers. Even fewer studies look at how students approach science and religion from a typological perspective. Here is where I saw my work moving specifically: I wanted to begin to research the perceived gap by producing a survey that would help teachers and students better understand the views they hold in relationship to science and religion as they enter into the science, religion, or science and religion classroom.

Thus, through creating a survey, I hoped to address specifically where students are situated in the four typologies and how knowing more about themselves they can be better prepared to interact and learn in the classroom. I also hoped this survey would give teachers a pedagogical aide by helping them better understand their student's preconceptions related to science and religion.

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Before I could conduct the survey, I realized that I needed to understand better how to frame my study within the area of curriculum studies and the educational influences informing my research. Reflecting upon the educational literature in curriculum studies has helped me see that what I thought initially was a narrower field, one only concerned with 'curriculum as thing', is actually an "epistemologically generous" place of study with much to contribute to my research in the tensions between science and religion (denHeyer, Class lecture, July 5 2010). Entering into the academic discussion about science and religion has led me on a

journey past what I can now see were modernistic assumptions in my early teaching days towards grappling with the impulses of post-modernism or what some call hyper-modernism (Armitage, 2000).

In many ways, I was at a crossroads in my own development as a teacher. The idealism of the beginning years of teaching was quickly being replaced with a developing cynicism or even personal despair. This state became more "norm-al" as the weeks passed, as I watched the tension that occurred in the classroom and in myself increase, especially when my own favourite areas of faith and science came up for discussion. I was likely in the place where I believed of myself what Britzman (2003) calls the *myth of the expert* or the idea of *the teacher as all knowing*, expecting to be the person with answers for my students (p. 227).

Even in a more uniformly religious school setting that included many viewpoints and, at such an early stage in my vocational pursuits, I was challenged to navigate with students through controversial discussions. At the time, my abilities to lead students through these hot topic areas was immature and junior high students are not necessarily known for tact; yet, upon reflection, I think something else was happening within this tension. Rather than spurring them towards a thirst to know more, there was a diminishing of the sense of wonder for life and learning. Looking back, I wonder if I was projecting my own loss of wonder onto my students, or if we shared a mutual sense of tension and loss (Smith, 2003, p. 44).

In the next phase of my journey, I shifted from classroom teaching and entered several years of searching more deeply into the religious aspects of life as a university chaplain. After several years in this new realm, I was encouraged to pursue further studies in secondary education by several professors and also sensed something within compelling me towards going further into educational studies. Actually, reading Pinar (2004) challenged me to reconceptualize my own concept that traditional curriculum work was "focused on the schools" rather than seeing the political implications embedded in any attempt at developing or working with curriculum (p. 121).

Having entered into graduate studies in education, I now am encountering educational theorists who have become catalysts at this crossroad in my life –

metaphorically, a crossroad in a labyrinth that has both science and religion entering from several paths, with many other less-explored subject areas also intersecting it. A labyrinth to represent assumptions I am unearthing from my own cultural story. A crossroad also is an intersection of a major shift from my earlier modernistic views, that I have seen begin to fragment or disintegrate along the way, with a new synthesis developing by engaging with aspects of postmodernism, psychoanalytics, hermeneutics, phenomenology, autobiography, action research, and narrative inquiry.

Each of these scholarly influences has helped form my curricular map and inform my research in science, religion, tension, and wonder. These influences range from scholars like David Smith and David Jardine, who emphasize a hermeneutical approach to pedagogy with insights gleaned from postmodernism, to a reconceptualist like William Pinar who was not afraid to challenge the status quo of traditional and conceptual-empirical perspectives. Also phenomenologists like Max van Manen have helped me reevaluate how I viewed experiences in learning. At present, I was also influenced and challenged by Kent denHeyer's (2009) use of throughlines as ways to a curriculum wisdom approach, as well as the importance of understanding the assumptions we bring to our research and 'curriculum as encounter' rather than 'curriculum as thing' (p. 34).

While scholars involved in autobiography (Cynthia Chambers), narrative inquiry (Jean Clandinin), action research (Terry Carson), and critical theory (Jacques Lacan) have also influenced my curricular map, I will focus on those who take a hermeneutic approach. Through recounting the insights of those curriculum scholars who have been the most influential in my educational journey, I will attempt to describe my movement from modernism to postmodernism as it connects to my research in the tension between science and religion and the loss of wonder.

David Smith describes my own experiences well on my educational journey, as to my movement from modernism to postmodernism; "The vivifying quality of such teaching gets blocked if teaching is understood primarily as an act of implementation, with the curriculum as a settled commodity emerging out of a

settled anterior logic headed for a settled posterior conclusion" (denHeyer quoting Smith, Class lecture, July 13 2010). In my earlier days of teaching, I thought that if I just had the binder and instructions, I could teach anything – use the input (curriculum) and get an output of a settled conclusion – knowledge distributed. Tyler (1949) would have represented my own prior understanding when he says, "All aspects of the educational program are really means to accomplish basic educational purposes" (p. 3). I realize now that I had experienced a culture story influenced by modernism that "operates out of a unique and deep prejudice in the Western tradition which is the assumption that concepts, formulations, ideas etc. refer eventually to something fixable, enclosable and nameable once and for all as reality" (Smith, 1999, p. 4). Realizing I could not control what students learned was a big step for me to move away from the traditionalist paradigm and modernist notions to a reconceptualist understanding of teaching.

Awareness has further been revealed to me of my prior dependence on the manifest curriculum, teaching the assumed and current grand cultural narrative. This dependence allowed me to not have to think too deeply, living with realist claims that got me off the hook from envisioning new possibilities (denHeyer, Class lecture, July 7, 2010). I am coming to an emergent realization that I was teaching a hidden curriculum through both my non-verbal cues and preconceptions of curriculum and that I was supporting the perspective that I was merely there to disseminate lesson plans. This disconnect showed that I was more involved in what Smith (1999) refers to as an impulse of splitting theory from practice (p. 4). The hidden curriculum was my modernistic way of following, "The objectification of others into formalized, manipulable, theoretical categories" which ends up severing the self from others (Smith, pp. 4-5).

David Jardine was also a helpful guide to working beyond some of my modernistic notions, especially his call to restore life to its original difficulty (citing Caputo, 1987, p. 1) and his challenge to allow ambiguity in education. He explains that the task of our hermeneutical educational endeavour "is to recollect the contours and textures of the life we are already living, a life that is not secured by the methods we can wield to render such a life our object" (Jardine, 1992, p. 116).

Related to the classroom, discussion on science and religion could easily shut down helpful open-ended learning possibilities if we are too methodologically driven. Although respect for other's viewpoints should be constantly held in view, classrooms situations also need allowance for expression that don't fit within the predominating culture story. Students who want to "try out" new ideas should not be shut down with realist claims that bring the conversation to an end.

This allowance for expression was not how I saw things in my earlier years of teaching as the feeling of a loss of class control was the paramount desire that often kept me from going far down the road to explore the various religious and scientific perspectives students would share. I ask myself now why I felt I had to be a referee or moderator rather than a facilitator, allowing for students to express their views, no matter how strange they might initially have appeared. There was a self-inflicted pressure to cut off what I perceived as rabbit trails and side roads that would not be productive for helping students change their immediate behaviour in the name of efficiency (Tyler, 1949, p. 66). I now see that I was being influenced by an economically-driven, behaviourist-based, and efficiency-oriented view of curriculum (Smith, 2003).

Another aspect of Jardine's (1992) thought that has helped me understand my educational experience in relationship to the issue of religious and scientific viewpoints is his note,

> [H]ermeneutics links up essentially rather than accidentally with education, with the emergence or bringing forth of human life. But let us play out the paradoxical biblical image here and not ignore it. At its birth, the living Word was told *there was no room*. The living Word had to be born right out in the middle of things, and it is such a birth that made it not only part of what already was but also a heralding of the new, of renewal, the possibility of life. (p. 120)

Notice how Jardine treats the realm of religion not as ethereal and separate, but actually connected to the world through the Word, whether understood

historically or symbolically. This approach speaks to the divide I see in science and religion as realms of inquiry. Those who treat science and religion as in conflict would find instruction here that reaches for a holistic and embracing response to those things we dislike, disagree with, or simply don't understand. Following Jardine, I believe interpreting and integrating life experiences is unavoidable whether it is to trying to understand the mysteries of science or the mysteries of religion.

While Jardine has been a guide to research in my specific subject area, he has also penetrated more deeply what has been part of my identity as a teacher. When he states, "this perception of being out of control without technical knowledge, of being 'left behind', leads precisely to the anxiety that drives us to a relentlessly pursue it, since it is precisely technical knowledge that offers us the promise of relative control", he has held a mirror in front of me (Jardine, 1992, p. 122). I have begun to wonder if my own systematizing of information reflected by the impulse of "dividing and subdividing human life into the smallest manipulable and controllable bits" was as much a way to steer through my own confusion, as it was a pursuit of learning and teaching (Jardine, p. 122). This insight would also expose a modernistic desire for life to be rational and self-contained.

The shift from modernism to postmodernism also is a shift towards the allowance of the experience of story as having more validity in my educational approach. Max van Manen (1997) notes: "The narrative power of story is that sometimes it can be more compelling, more moving, more physically and emotionally stirring than lived-life itself" (p. 129). This understanding of the power of story and experience was much less apparent in my earlier teaching experiences, because I was more cognitively oriented at the time. Having children and developing communication skills in other contexts showed me pragmatically how drawn people are to story. van Manen reinforced this academic point, especially as it relates to students. Thus, the contribution of postmodernism was for me a bringing together of the importance of thought and experience, the rational and the sensory. I see more and more that a renewed vision of education would move towards integration, a unity and diversity not in competition but in harmony.

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In moving towards this vision of integration and complementarity, I continue to apply these insights into my current research on the tensions between science and religion and to possible future research that looks more specifically at the recovery of wonder. The hermeneutical approach has opened new possibilities for me in moving beyond the crossroad. It has given me ways to express what I have been thinking about for some time in my roles as a chaplain and sessional university instructor.

Among other things, William Pinar's comments about the need to suspend the intolerance of other points of view, was to me significant in taking steps forward. The academic picture he paints is attractive: "One may remain a traditionalist while sympathetically studying the work of a reconceptualist. One's own point of view may well be enriched" (Pinar, 1978, p. 127). Maybe for me this approach means that the labyrinthine crossroad metaphor now becomes a unified path? No longer for me are science and religion subjects simply crossing paths and then heading in separate directions. I would argue that, through a complementary/integrative typology many scholars of science and religion are now proposing, science and religion (among other subjects) could become fellow travelers on parallel paths, having their own realms of inquiry yet in a harmony of interplay that doesn't require them to veer off into their own separate realms (Barbour, 2000, p. 38).

The modernist oriented perspective I held for so long would not hold up to questions of the world that was before me and is now ahead of me. I have come to recognize that it is too simplistic to think I can truly see things as they are, and so the benefit of this journey is a deflation of any dogmatism that accompanied me as an explicit or a hidden curriculum. Looking at this curricular movement gives me a new sense of gratitude and positive response. I do not want to live with the indictment on my head that I didn't try to help people understand, that the world can still be a place of wonder, and that even the tension can lead us forward into a

future of new hopes and possibilities. I assume this position not with a false sense of guilt that somehow it is all about me; rather, I actually care myself about this world and about the loss of awe that I see. There is much to hope for. As Tolkien through the character Sam says,

> It's like in the great stories, Mr. Frodo. The ones that really mattered. Full of darkness and danger they were. And sometimes you didn't want to know the end. Because how could the end be happy? How could the world go back to the way it was when so much bad had happened? Those were the stories that stayed with you. That meant something. Even if you were too small to understand why… Folk in those stories had lots of chances of turning back only they didn't. Because they were holding on to something. . .There's some good in this world, Mr. Frodo. And it's worth fighting for. (Jackson, 2002)

Jardine (1990) says it well for where I currently am now situated,

> We in education may be especially responsible for the questions we do not ask, standing as we do at the cusp of the emergence of new life in our midst, able to bring forth these questions, but perhaps unwilling to speak of our real indebtedness to 'this precious Earth' without embarrassment. The integrated curriculum has, as its roots, the potential to open up these questions we may have thus far refused to ask. Turning away from these questions may involve abandoning our children to an all-too-certain future. (p. 118)

The further I research science and religion, the more I see deeper implications at stake than what we are teaching in the classroom. Yet, I also realize that in the classroom and through the curriculum we are presenting, we set a trajectory that has much more to do with where we are globally than I might have initially thought. Thus, my research assumptions have been affected deeply by interaction with the educational literature, as it should reflect in what follows.

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My research questions and assumptions emerge from my interests in science and in religion as they have been sharpened by my education research inquiry. My work as a chaplain also motivates me further to try to understand how these two areas relate and how this relationship can be beneficial in our approach to education. As mentioned earlier in this thesis, I have encountered students in a deep state of confusion because of comments made about their faith in a classroom and students who are wrestling with evolution and how it connects to their religious beliefs. I have also witnessed disrespect and conflict over this issue and have faced dogmatism that was both disconcerting and counterproductive to educational endeavours. Thus, through a typological lens and survey, I wanted to research how students viewed the impact of science on religious beliefs and religious beliefs on science. I also wanted to understand further what role teachers play in this current challenge and how we can make a positive contribution to modeling healthy dialogue during those moments when questions like those dealing with evolution, come up in the classroom.

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The first assumption I brought into my research is that science and religion play complementary, not conflicting roles, in education. Although they are also distinct fields of study, there are areas of overlap, which must be understood if a teacher is to thoughtfully engage students. I see the need for teachers to be cognizant of the preconceptions that some students might be taking with them into science or religion reflecting a warfare model. If they are aware and prepared beforehand, they can turn moments of challenge from students into possible areas of fruitful growth in how to talk respectfully with those they differ with, even if it is their teacher (Nelson & Harper, 2006).

A second assumption that informed my research is that teaching about the theory of evolution in all its complexities does not have to presume an antireligious bias. Charles Darwin was religious and from my viewpoint there is no reason to think that there is not teleology, or purpose, behind evolutionary development. Even

if students have been raised to think evolution is against their faith, they can be shown that this is not necessarily the case; and, even if they still maintain that stance it would be instructive for students to learn how others think about the subject, as evolutionary thought pervades our Alberta curriculum as well as education throughout the global context.

A third assumption that I brought to my study is that students often experience a framework of science and religion that assumes a conflict dichotomy and not complementarity or integration. This framework neither helps further their personal or academic growth nor contributes to the development of a healthy viewpoint in the upcoming leadership in our society where issues of science and religion are out in public view and conversation. Thus, for the betterment of human society, we need to work through how we are going to interact with others around us and how through a classroom education we could begin to shift this negative conception to a healthier diversity for the ongoing societal conversation.

A fourth assumption is that students who have a warfare conception of science and religion can overcome this mindset and can become open to the compatibility of science and religion. When such compatibility is formed, the environment of education will be enhanced and others who also have the same challenge or struggle will see the possibilities of alternate conceptions. Thus, I come to my research with the openness to see change while also recognizing that this issue is not easily resolved for many people and might remain a lifelong tension for them and many in our world.

A fifth assumption is that the teacher's role is an important component in trying to bring about positive change for students as they deal with a world of religious and scientific ideals and ideas. I don't presume a Lockean idea that students are a *tabula rasa* and teachers "write upon" or simply "pour their ideas into" these eager "receptacles". For some, openness to each discipline may be more of a possibility because they have less experience and understanding of the issues but every student brings their own thoughts and opinions and the teacher is one voice among many, albeit having a "captive" audience. A sense of well being in the classroom could look like students being able to voice their thoughts and teachers

able to teach their subject area in an open-minded way allowing for a respectful forum of dialogue. While this sense might be idealistic and might only happen in a perfect world, I would like to see steps in a direction that lead to some positive changes in the here and now.

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When I was starting my research, I began with these types of questions: *Does pitting science vs. religion or vice versa promote the good that can come from learning about both areas?* Although the answer seems initially to be an obvious no, I want to look at whether even becoming aware of one's conflict-oriented approach could provide benefit to student experiences of science and religion. I want to remain open to the possibility that even here positive outcomes are possible and it sometimes takes a strong issue to produce a response or even a backlash that can jolt people out of a dogmatic slumber and begin to review and respond to ideas that produce a passionately negative response (akin to Kant's response to Hume).

Another question I was asking because of growing up hearing the biblical creation story is, *Why is evolution a controversial aspect of this conversation?* I have my own personal experience in wrestling with evolution and also have talked with others who have experienced difficulties. I have noticed that the lack of a teleology or purpose was more often the issue rather than the mechanisms themselves. Having met people who espouse a complementary perspective has helped me break through what could be described as a dead-end path for learning and growth in wisdom not having to inevitably live in a dichotomy.

With this question, I have wondered: *How can evolution be taught in a diverse religious environment?* I asked this question because I saw in the literature some resistance from religious communities to teaching evolution, especially in the United States and private schools in Canada. Because evolution is a core part of the Alberta curriculum, I am interested in how evolution could be taught in religious contexts or in classrooms that have students with religious backgrounds. Simply taking an

approach that might say that students have to learn for exams but don't have to personally engage the subject seems possible but is this sound pedagogy?

A follow up is the question *Are students currently developing more resistance to evolutionary teaching?* I have heard stories of students who have changed their minds as to evolution and their faith, and I would like to hear their stories as to what this looked like for them and how and why things changed. It would be interesting to hear from people of different backgrounds and how they navigated through what they had been taught from their own traditions and what they were hearing in the classroom.

Can teachers be part of a positive response to the resistance? The role of the teacher in teaching science and religion surely has a large part to play in developing a new pathway of learning. Is this happening already? If so, in what ways can teachers be part of bringing change? *Will a complementary or dialogical approach improve the well being of our learning community?*

Physicist and theologian John Polkinghorne (1998) summarized my own position to this point when he says, "If differing disciplines, such as science and theology, both have insights to offer concerning a question (the nature of man (sic), for example) then each is to be listened to with respect to its appropriate level of discourse" (p. 25).

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In summary, from approaching this research study, my questions have narrowed to: What typologies (frameworks) do students bring into classrooms? Can we sort through these frameworks using a specified survey and follow-up questions? Can teachers be part of positive change that promotes well-being in the educational community by using a survey to assess student viewpoints before teaching in this subject area?

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It was fascinating to read through the literature about science and religion as an academic discipline, starting with the broader science and religion writings to those that are in an educational context. My reading suggests that, although much of the available information asks many questions about a variety of theoretical concerns, fewer questions are related specifically to applying this broad knowledge to the lives of students and the work of the teacher. Even fewer studies look at how students approach science and religion from a typological perspective. As a result, I see my work moving specifically to begin to research the perceived gap by producing a survey to help teachers and students know what viewpoints that they hold in relationship to science and religion as they enter into the science, religion, or science and religion classroom.

Through creating a survey, I wanted to address specifically where students are situated in the four typologies and discover how knowing about themselves can better prepare them to interact and learn in the classroom. I also hope this survey would give teachers a pedagogical aide and help them better understand their students' preconceptions related to science and religion.

My desire to do further research in education relates to a similar perspective by science education researcher Tonie Stolberg (2010) who comments in an endnote that even journals on science and religion like Zygon "rarely carries studies in pedagogy" (p. 198). Because I am not specifically studying pedagogy itself, I take that statement a step further and ask why these journals rarely address the educational concerns for teachers and students in this subject area? Having searched various journals, I have noticed a dearth in studies of science and religion relating to how teachers and students approach the subject. I would like to see this academic conversation move from theory to praxis by using a survey that includes statements in areas of science like evolution that cross between the two disciplines to help students make sense of their own views.

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Recognizing that science and religion are large fields to attempt to understand, I am limiting my scope of study to the area of science and religion in a university classroom. While narrowing my research focus, I still made myself aware of the wider field in general, yet looking for other research that pertains more specifically to education. Because a specific class that bridges science and religion exists at the University of Alberta, I chose it to be the area of focus for my survey, hoping to be able to extrapolate results that would benefit secondary and post-secondary education. In this Master's Thesis, I have chosen to do one post-class survey with follow-up questions because I believed this would provide ample data towards piloting a workable survey instrument, towards writing my thesis, and ultimately towards making a humble contribution to this massive area. I wanted to integrate the process of developing and reflecting upon this survey as part of my thesis, because I believe it might be a tool that could help assess where students are coming from prior to taking classes in science, religion, or science and religion. I am aware that my attempt is simply a beginning at wading into a large area of study and yet I think it is full of future possibilities.

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I chose a science and religion classroom as a good place to start this research because students in that class would already be aware of the typologies and could answer the survey with that knowledge as well as inform me about the clarity of the survey statements. A further strength in choosing a group who is aware of the field of science and religion is that the group members could answer with more understanding whether the statements they were asked were understood in a way intended by the researcher. The weakness might be that those less versed in the subject area might have more difficulty with the statements. On the other hand, the student with less knowledge may have less of a preconceived notion of what the statements mean or less knowledge and thus give responses less cluttered by their own philosophical considerations. They could, at the least, I believed note whether

the survey instrument makes sense and can be answered without confusion. Although these are all possibilities, I think the usefulness of doing the survey outweighs the difficulties as these hurdles can be overcome through careful honing questions to be really clear and geared for anyone with a high school education and beyond.

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In trying to explain why my methodology was appropriate, I look back at several researchers who have influenced my qualitative interpretive approach.

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Among various research paradigms a variety of approaches and questions are raised. A question many have asked of research, including W.A. Firestone (1987) is whether qualitative and quantitative methods can be rhetorically different and yet complementary as methodologies (p. 16). Quantitative studies tend to be more positivistic in paradigm, while qualitative studies are more phenomenological based. For the qualitative work, Firestone mentions that it was "frankly exploratory" as it can give more description of detail, attending to deeper perspectives yet sometimes lack description. For the quantitative work, Firestone noticed procedure was de-emphasized because while it can show patterns across many situations it can still be too abstract. His research showed that together both qualitative and quantitative methods give a well-rounded picture of research method compatibility (Firestone, 1987).

This research method compatibility appears true to what I experienced through reading qualitative (Lamoureux, 2004) and quantitative studies (Stolberg, 2010) and (Sundberg, 2003). I have gleaned benefit from both perspectives. I can see that, like the title of Gage's article, there is meaning in each method. While my study is more qualitative in approach, it does have some quantitative elements such as in doing my survey.

Gage (1989) gave me a background on the history of research on teaching, leading to 1989, and the paradigms vying for place in education. He shows how antinaturalists, interpretivists, and critical theorists challenged quantitative research, each having a perspective about how to bring change. He postulates three possible future outcomes from his vantage point in 1989 – one where the positivism of the day has been defeated and quantitative research disappears, another where each approach was working towards a harmonious future, and a third that nothing has changed and paradigm wars continue.

As difficult as it would be, allowing each approach to offer its strengths is commendable rather than continuing a research war. Gage's (1989) bottom line that each must continue to look out for the welfare of students, working for the common good is something to rally upon while we continue to seek out ways to "generate theories that fit together" (1989, p. 10). Such understanding informed my research, and I hope to see a new awareness in students' lives through asking questions as to the relationship between science and religion. The survey itself could be seen as enhancing their welfare, as they become cognizant of other people's perspectives just in the act of completing it, an intervention of sorts.

Another aspect of understanding methodology is to ask the question: Should qualitative be pitted against quantitative research? Not according to Ercikan and Roth (2006), who would like to see an integrated approach through a continuum not a dichotomy. Polarization promotes a certain type of data collection instead of seeking answers to good questions. Instead, researchers need to distinguish the nature of the data and have both aspects represented. All good research needs clarity of perception, philosophy, natural sciences, and classification (Ercikan & Roth, 2006).

To move beyond the dichotomy, Ercikan and Roth (2006) suggest an integrative framework that serves society, putting research questions first to generate knowledge. They encourage investigators to join expertise and work together that focuses on meaning, implementation and methodologies. A polarization occurs in science vs. religion where both could contribute, but either one or the other is left out of research either by fundamental theists or atheists. I am

seeing a trend where both disciplines contribute and influence the research. It was helpful to see those involved in research methodology also working to engage barriers in their field.

One researcher who helped me understand my own location of inquiry was Berliner (2002), who explains how some in the political realm are mixing up the methods and goals or process of science and thus causing issues for educational research. He believes there is a flawed dichotomy at work, explaining that our understanding of hard and soft science is part of the problem. He argues that hard science is not nearly as difficult to do as "soft" sciences, including educational research, where variables such as context are always changing (p. 18). Berliner's beliefs parallel my research: people dichotomize science and religion as if one is purely about faith and the other totally about facts. When looked at closely, scientists have aspects of their work that requires "faith" relating to their assumptions and frameworks and religious professionals must recognize that they are connected to the material world and should thus engage and interact with science.

Another element that needs to be considered in conducting research is the personal background of the researcher. Peshkin (2000) has shown me the importance of a self-reflective approach that is careful to understand the tenuous nature and personal subjectivity of the researcher. As an example, he spent months working with his "incipient field of study" and developed an "evolving conceptual text" that works with the idea of searching for meaning through the interconnectedness of other's actions or circumstances. His research pointed me to the need not to be hasty in how I set out to conduct my study. This study influenced him to have a heightened sensitivity to the native community's thoughts and needs and likewise reminds me of the same need in how I work with the students I am surveying and interviewing. Several other insights stood out for me from Peshkin in my preparation for conducting surveys and interviews: interpretation in research requires logic, intuition, and imagination; interpersonal skills are vital to conducting research; self-awareness of one's own fallibility is extremely important in building credibility with other people.

Hostetler (2005) rounds out those who have influenced my methodology by pointing to the big picture question - what is good educational research (p. 17)? He asks educators to consider how their research connects to human wellbeing. He is concerned that research can be too narrowly framed and thus misses this connection, not just as to the ethics but also in helping our world. This consideration of human wellbeing provided impetus for my engaging student viewpoints through surveying them with the bigger purpose of learning to dialogue about science and religion. He thinks about what actually is the good life and how to find agreement within diversity. He influenced me asking: Can we see conflicting opinions as ways to grow as people? Does my research have practical consequences?

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In setting out to assess where students are coming from in their understanding of the interactions of science and religion, I created a specific survey based upon the four typologies from Ian Barbour (1990) as outlined in my earlier literature review – Conflict, Independence, Dialogue, and Integration. I believe this framework was a good starting point to narrow down what students have gleaned from their classroom experience, and where they have moved after this type of class. The purpose of the survey is to test whether we can gauge where students presently are situated in their understanding of science and religion, and whether their responses can discernibly be categorized to make the survey a useful instrument. It would be interesting to know if students recognize that their views have changed. A future possibility would be to do a pre- and post-class situation with this survey tool to test how views change over a semester of taking a science and religion course or simply using it as a pre-class instrument to shape discussion, curriculum, and open-minded thinking.

I wanted to broadly assess through the survey, the student locations in this area of study and then find out more specifically what their experiences were in the classroom through several open-ended questions as it relates to their initial and after class locations and preconceptions. A good base of student responses might provide enough of their experiences with science and religion to begin to explain

which typology they were coming from to begin to assess if the survey was effective. If there was a lack of data and interviews seemed necessary to help shape the categories, I would follow up a sample of students and discuss not only their survey responses, but also how they read the survey, to see if there are ways to improve it as a research assessment tool. I would choose to follow up those who reflect as wide a range of the typologies as possible in order to gain insight about each category and why they chose what they chose.

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Part of the process of the research was trying to detect whether the survey accomplished its purpose by including clarification questions and opportunity to comment on the survey, to clarify how the statements were understood, and if they were understood as intended. I chose declarative statements that attempted to locate a person's response clearly into one of the four typologies. My hypothesis was that, by choosing five of the declarative statements to represent their viewpoint, it gave enough data to see a pattern of commitment to a specific typology. Since the categories of independence, dialogue, and integration are less easily demarcated from each other, it was possible that there would not be one typology that stood out with a majority of statements chosen.

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I chose to use four declarative statements for each of the four typologies. I thought these would help discern which typology participants are closest to. The questions to be used to assess a conflict perspective were:

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1) Matter is the only reality of the universe.

2) Evolution and creation cannot coexist as true understandings of how the world came to be.

3) Blind chance produced conditions favorable to the appearance of intelligent life in the universe.
4) Acceptance of evolution requires the rejection of all forms of belief in a God or gods.

The statements were aiming to unearth assumptions the students have about science and religion, in this case pitting the two against each other. A conflict perspective is shown by using words like: is the only reality, cannot coexist, entirely a matter of chance, and requires the rejection.

The questions to be used for an independence perspective are:

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1) Science and religion should remain in their own realms of inquiry.
2) Scientific and religious assertions do not compete and serve different functions in human life.
3) The religious meaning of creation stories is unrelated to the scientific enterprise.
4) The results of scientific experimentation are not affected by religious beliefs.

Each statement tries to offer the person filling out the survey a choice to make commitments to the idea that science and religion do not overlap and must stay completely apart in their own realms. Words chosen like: in own realms, two kinds of language, unrelated, and not affected are indicative of realms that don't meet or overlap.

The questions to be used for a dialogue perspective are:

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1) Science and Religion should be able to correspond in the search for truth.
2) Science has questions it cannot answer without religion.
3) Science can contribute to religion and religion can contribute to science.
4) Science and religion can each provide some concepts that help in understanding each other.

Each question tries to give statements from differing perspectives that would have someone make a commitment to a dialogue perspective, showing the links between the two areas with words like: should be able to correspond, cannot answer by itself, valuable contribution to each field, some concepts that help.

The questions for an integration perspective are:

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1) Science and religion essentially address the same issues.
2) Evolution and creation can co-exist as concepts.
3) Science without religion lacks ethics, religion without science lacks data.
4) Religion and science inform and uphold each other.

Each question moves someone to take a stance that has science and religion not just close and linked but show a deep connection between the two – words chosen like essentially the same, equally true, each lacking without the other, and inform and uphold.

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(The purpose of the survey was to help clarify in which typology the participants situate themselves most closely; but, as a further way of clarifying, I decided to include open-ended questions as a way to gain more data.(I chose three open-ended questions:

1) What were your preconceptions of this topic?
2) How have your views changed while thinking about this topic?
3) How important is this issue?

These questions were chosen to help provide clarity to participants' survey responses, in cases where scores showed a balance or close amount of responses in several typologies. Answers gleaned from the first question could indicate

movement from one typology to another or that language would help clarify between typologies on survey results that may be close - where several typologies stand out as higher values.

The second question offers a space for participants to clarify their views before and after the class. The change itself could also indicate more clearly what typology they hold now as it related to their prior thinking. While their preconceptions can't be assessed in an actual before and after situation, it can show where they are presently and would be interesting to follow up in future research if the survey proves to be a useful way to verify viewpoints.

The third question can help assess how important the subject area is to students and whether further research is feasible. It also could help me know how important this type of information received from the survey would be for teachers to know before teaching a class, as they will have data that would show how committed someone is to a position about the subject matter. While these questions may provide data that goes beyond what I initially sought to find out about the survey, it should help clarify where the survey may be unclear, and it could be interesting as to future research possibilities.

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Carrying out this survey and questions followed several steps. First, Dr. Lamoureux, the professor of CHRTC 350 *Science and Religion: Christian Perspectives* at University of Alberta, sent an email to all students in the class (64) about the science and religion survey and questions, with a few weeks to go before final exam (from that point he was not involved). He ensured that this was my research and not part of the actual course. I then sent surveys to students by blind copy to participate in survey upon consent to proceed as early in April as possible.

The completion of the survey by participants implied their consent to participate in the study. If interviews were to be conducted after survey completion, consent forms were there for signing before interview. I set a timeline of when to stop receiving responses, initially at end of May 2010; then, because a few were still coming, I waited and received them in June so that responses were fresh as to

course content, also to give them enough time to reflect on content and not to have to do it during the pressure of exams, should they have chosen to delay responding. I continued to receive and send surveys out as students responded collecting data as they came in, storing data, and printing out data kept in personal safe area.

After the final exam (April 19, 2010) I sent another request to participate in the survey, in case students had put aside the survey until after exams. This reminder would give them a final opportunity to be involved and would ensure that I have as many involved as possible out of a good sample size class. (Future class opportunities of this size database would not be available again for several semesters and would go beyond Master's timeline but could be opportunity for future research if this study goes well.) After this timeframe, five students decided to participate in the research. I collected data on my personal email and a USB drive that only I have access to, storing all print copies in a safe and confidential area. Students were not contacted as a group, so they didn't know who else was involved in survey.

All confidentiality of data was regarded with utmost care, thus students could not consult each other as they filled out surveys – surveys were sent to each participant individually. The goal was to provide a survey and questions to as many students as wished to participate out of those enrolled in the course. I asked them not to consult with others and to provide only their own answers as to their classroom experiences. Their consent to the study assumed that their data would be their own. Although this was the case, it is understood that during classroom sessions they may have dialogued among themselves on the types of questions being surveyed as part of the pedagogic process of the course.

Upon receipt of information I attempted to go through the data in as timely a manner possible after receiving of the surveys. The data collected was organized into which of the four typologies students most represented; and, the open-ended questions further aided in putting them within groupings. After the data was collected, I asked my thesis advisor to test my understanding and interpretation of the data. By having him check the responses to the questions to these close cases I

could see whether I had fairly put them in a category based on question responses or on interview responses.

Mathison (1988) offers important reasons to involve others in interpreting the data - not to try and find data converging on one single proposition, rather to pull together strands that may be contradictory and make sense of their inconsistencies (p. 17). Those who provided interpretive checks helped prevent me from trying to read into the data what I might be hoping to see there, thus protecting from my biases.

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I believe this type of survey can further the research promoting teacher and student awareness of issues and viewpoints in science and religion. Simply using the survey could help teachers better understand some of the issues present in classrooms. Teachers could see from their own survey results how diverse their classroom demographics are and how many students might hold a conflict typology. Such information could help teachers be more prepared for student responses to questions that intersect areas of science and religion, especially in subject areas like evolution and creation. Being able to have advanced knowledge could help teachers to have a more open environment, and to defuse issues ahead of time for times of discussion. Also, some questions could be a springboard for fruitful debate concerning certain controversial areas of conversation such as survival of the fittest or if there is a purpose to the world. Science and religion are both large areas of a person's view of life and surveying students could give insight into what areas are sensitive, what areas are "settled" for students, and which students are resistant to science or religious teaching.

In a certain sense, use of this survey could be seen as a type of educational intervention or pedagogical tool, because students will be made aware of what a teacher thinks is important as well as that people in their class differ with them on areas they may have taken for granted. Having a survey of this type could also prove valuable for a teacher trying to understand student viewpoints and gain insight into

figuring out how students understand topic areas. Such a survey could also be used before and after class units or sections of course offerings to see if students have changed in their orientation towards science and religion. Finally, this survey might serve as a base point for future research.

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This study has itself evolved from my initial questions through my literature review and into my narrowed down set of survey questions. Reading the academic literature helped me see many areas of opportunity for research in science and religion as related to the field of education. My initial plans have been focused and clarified for the current moment where I have developed and provided a specific instrument that could help assess where students' viewpoints are and how teaching affects those viewpoints, especially in area of evolution and creation. If this survey study can become a beginning point for other research interests in education, it will have accomplished one of my hopes – awareness of the frameworks of what we think and believe about science and religion - two valuable areas of knowledge in education.

In Chapter Five I share my research findings and begin to explore their implications for future research.

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Through a Pilot Project conducted by Dr. Denis Lamoureux, professor of CHRTC 350 - *Science & Religion: Christian Perspectives* (outlined in Section one following), I was exposed to the area of typologies of science and religion. I took CHRTC 350 as one aspect of a reading course in theology for graduate credit as CHRTC 501.

Part of my class work was to collaborate with Dr. Lamoureux to prepare a questionnaire that could help provide information as to whether it would be profitable to work further on this subject for my Master's thesis. When I read the data collected from former students of CHRTC 350, I was interested to read about the changes that had occurred in their viewpoints from before the class to after they were finished. By working with four of Denis' former students and looking in more depth at their viewpoints and academic journey, I concluded that these students experienced interesting and beneficial encounters, prompting me to do further research in the next offering of that class. Setting up this Pilot Project questionnaire and reading the students' shift in perspective aided my decision to research more specifically student perspectives on the interactions between science and religion in CHRTRC 350, Winter 2010. By including the stories from these former students, I believe analogously this research will be of benefit to teachers who are trying to better understand their students.

The first section of this chapter will outline the questions, student experiences, and observations I made for the Pilot Project from interactions with former students of Denis Lamoureux in CHRTC 350. Section Two will go through the data of my own research survey and questions in science and religion class, CHRTC 350 Winter 2010. I close with concluding summary comments that reflect the opinion that my Master's project survey achieved its goals of producing a usable survey for classrooms.

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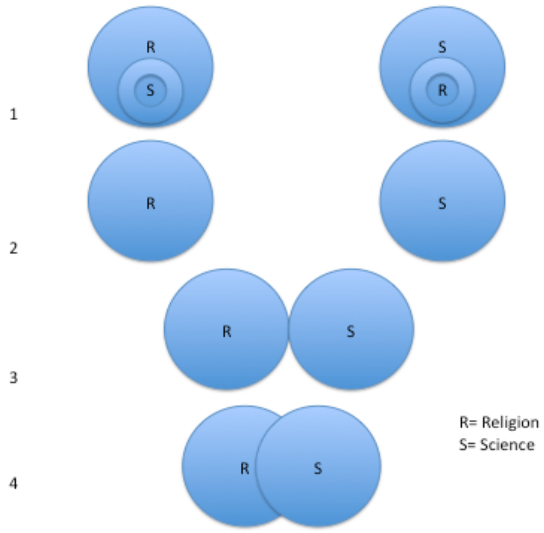
The questions posed to the former students of the science and religion class included (also see Appendix):

1. Can you remember any defining moments in CHRTC 350?

2. What were your preconceptions of the class?

3. Did you make any changes to your views while in the class? If so, what were they?

4. Which diagram below best represents where you started the class, where you ended class, and where you are now? (Note: 4 diagrams were given that represent the four science and religion typologies of Ian Barbour)



Choose R/S
(OR) S/R

5. Describe your thought process (anecdotes) as it happened in class.

6. Is there something we need to ask? (If there are any notes you made in the class that would help provide insight into any of the questions, please include them with a date if possible.)

I helped formulate these questions in consultation with Lamoureux for his research and to provide insight for developing his classroom teaching. We are both interested in how students work through the dissonance they experience when their views of science/religion and creation/evolution are challenged. In the remaining section of this chapter, I will review student data and attempt to analyze and develop insights that flow from their stories.

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(Each of the four students who responded to the survey answered the questions in ample detail. Rather than simply repeat what they wrote, I will select key points as they relate to where they came from, defining moments in the class, and their views of the tension they experienced as it relates to evolution and religion.

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The first student responded by writing that he initially saw science and religion at the start of class in dialogue and then he "moved" to a more integrated understanding of science and religion by the end of the lectures (from position three to four on the diagram – see appendix). He had a positive view of the course, which had been recommended to him by friends. This person started the course as a young earth creationist (world is 6000 years old) in high school and then after taking classes in University began to move towards a theistic evolutionist position (God created through evolution), although willingly admitting that he didn't initially see the implications for the rest of Genesis as they did after taking the class.

Quoting from this student's survey, "I still don't understand the implications. But I am more informed!" Quite an interesting comment was, "For me, the most unsettling part of the course didn't have to do with the "evolution vs. creation" question, per se, but my understanding of the Bible as the Word of God. I'm still unsettled. But I appreciate the depths of the Bible and its richness more than ever." Other written responses showed that the course also had helped him break down

his preconceptions about the Bible, clarified the relationship between Catholics and Protestants, outlined the two-source theory of Genesis, and explained the two books model (*God's Works* and *God's Word* attributed to Francis Bacon). It was interesting to read how much this course taught this student about the categories used in science and religion and how important the course was in giving him an avenue to deal with the questions that were previously troubling him.

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The second student data showed a shift from one typology to another – from one end of the spectrum to the other. At the beginning of class, the student explained, "I was a combination of 1 (religion over science) and 2 (Independence) and ended up at 4 (Integration)." To the question of defining moments in the class this student says, "The whole thing was pretty much a defining moment!" To the question about views and evolution: he started the class,

> [S]omewhere between a YEC'er (young earth creationist) and someone who had compartmentalized religion and science to make sense of it all. I was never in very close contact with the evidence of evolution, but understood that there was no way that all these educated, intelligent scientists could be completely wrong. But I didn't want to lose my faith either, so I tended to ignore the conflict and believe both. By the end of the class I was and continue to be an evolutionary creationist.

Other highlights of the story include the student's wrestling with the Adam and Eve question, and another comment stands out, "everything I learned, starting from the first class onward, felt more like I was being reminded of something I already knew, but had forgotten." The concluding statements expressed relief and developed a logical position "on which I could hang all my previous suspicions that there was something wrong with the dichotomy."

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The third student began and ended the class an atheist and remained in the typology of science over religion. Although this typology remained unchanged, the student made some of the most interesting comments as they related to the importance of what people say about their beliefs and their attitudes to others. As to defining moments, he said in his survey,

> I felt the most engaged in this course out of any course I have ever had in grade school, or university…. I felt comfortable being able to share my point of view, because I felt safe. In this setting, I did not feel as most Atheists are made to feel that it is inappropriate to discuss and critique religion, beliefs, or personal convictions. I felt valued, not just by Lamoureux, but by my classmates as well. If I had matured in this atmosphere, I think I probably would not have rejected faith as an epistemology, and Christianity and religion as a belief system and worldview.

This student repeated some of the same things others said about enjoying the course and how it helped him refine his views. In this case it didn't persuade the person to change:

> I tell my story, and I make the argument that faith is an unreliable epistemology. It illustrates a pastoral problem that is caused by disrespectful interfaith dialogue. As mentioned before, if we had taken this class, I think the disrespectful interfaith dialogue would not have happened and I may have retained my faith. At a crucial time in the development of my worldview, a Young Earth Creationist (YEC) ridiculed me for accepting the evidence and science of evolutionary biology that had been presented to us in a high school biology class. While I was the top student in the biology class, I knew he was wrong to have faith that evolution was false. I concluded that religious leaders had led him astray.

The last statements include comments about what he at the time perceived as authoritarian parents and the disrespect experienced by other Christians that was the basis for rejecting a religious upbringing.

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For this next student, I need to fully quote the first paragraphs of his questionnaire response as to defining moments because it illustrates much of what I am interested in researching as to the learning process and the search for truth and wonder:

> I can recall several [defining moments] First, there were moments in the class itself, when I discovered – the idea of hermeneutics, the firmament (ancient science in the Bible!), Darwin's views (not an atheist!?), the faith that underlies science (reality is intelligible), "teleological evolution" as a possibility, the Galileo affair (and what's happening now with evolution as a recycling of this), Psalm 19 factor (greatly convicting for me). A new world opened as I learned about these things. Second, deep processing took place in my walks home after class. After completing the course I wrote, "I remember walking home after class on several occasions crying, because of what I had learned and the implications (Jan 8/00)." Third, there were moments related to the person of Denis. I believe I experienced divine presence in moments of his teaching. Also, reading his comments on my midterm and essay, and a visit with him to discuss the class inspired new visions of possibility in my life.

As can be seen in this anecdotal snapshot, this person moved from a science over religion (Position One in the diagram) to integration of science and religion position four. Starting as an atheist, with a firm commitment to dysteleological (no purpose) evolution, this student moved to become a believer in Jesus with a fully theistic worldview. How did this happen? "As soon as my "evolution or God"

dichotomy was destroyed (which happened early in the course), my atheism crumbled and the question of God's existence became paramount."

The next comments are also insightful:

> I think transformative learning theory describes well the intense process of personal change that begin in the course, and has resulted in a reframing of my identity and re-visioning of my future. Through the course, I was enabled to critically examine my underlying assumptions and explore new possibilities. But stepping aside from theory for a moment, I now recognize that my most powerful learning experience in the class was based on a very personal and rather simple fact: it was there I met Jesus for the first time.

In our conversations, Lamoureux indicated that these stories are snapshots of many others that he has heard anecdotally from students over the years that this class has been taught. What can be seen by each student's stories of her/his tensions with science and religion and evolution and creation, was that more was happening in the course than the mere learning or sharing of information. Students are being challenged to think in ways that I think models what a university education can be.

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(Chapter Four of this thesis outlined my methodology and method and this chapter (Five) began by outlining a secondary research Pilot Project that contributed to my current research. My Master's research was more explicitly focused on developing a new survey and working to perfect the questions on the survey. Rather than use the same questionnaire from the prior secondary research project, which gave students categories to express their viewpoints, I chose to create a different type of survey that included questions that would be less specific and leading and would allow for students to place themselves in a typology in a more implicit way. Because typologies are constructs, and not set realities, and have

overlapping criteria, I wanted to see what type of interplay the students would have interacting with the four standard typologies. Rather than have students place themselves into the typologies, I hoped to bypass some of their current knowledge of typologies with possible misunderstandings and allow for my own placement of their choice of statements into the corresponding typologies.

The following is my interaction with the data that I received and reviewed from the survey questionnaire emailed to students who consented to participate in the research – starting in April 2010.

After sending out a survey and questions to those who responded to the invitation to join this research, I had a chance to review the data, my research process, and which typologies students adhered to after taking CHRTC 350. Although I hoped to get a larger response from the 60+ students that were sent email invitations by Denis Lamoureux of CHRTC 350, those who did respond provided ample data to begin to qualitatively explore what this small sample thought about the interactions between science and religion and to pilot test my survey.

During future research, I would likely need to take into consideration any drawbacks learned during this first attempt, such as taking the surveys after the class was finished. Timing the survey and responses prior to the class as part of the introduction of the course would help get before-and-after responses that could more quantitatively assess if the course material was helping students in gaining a wider perspective on their viewpoints of science and religion. Reading through the stories woven into the responses was an enlightening process and provided useful insights into the science and religion dichotomy that many young people have grown up with and what happens as they encounter other perspectives.

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Ample opportunity was provided for students to comment on the survey itself, but most respondents didn't comment on the wording of the questions or

express confusion as to the survey's clarity. Although this lack of comment by students about the survey doesn't verify whether the survey needs enhancement in specificity or complexity, it does qualitatively suggest that the survey contained enough clarity for students to make the choices needed to complete the survey. No students complained about survey questions being ambiguous or needing further tweaking in this regard. Students seemed able to answer all questions easily and understand those concepts about science and religion embedded within the work. For now, these questions seemed to work well as a way to explicate deeper student beliefs about science and religion; however, a possibility exists that more questions would add further depth to the data. I will consider this possibility in Chapter Six.

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(Survey responses were collected by email from April to September 2010. Several students commented that they put the survey aside planning to do it and then forgot about it until mid-summer after I had I sent out two email reminders prior to September. One survey was sent to me in September 2010. The timeframe was given for this research as a way to be close enough in correlation to the class and student memory and also due to constraints of this Masters Thesis timeline. Because my purpose in this study was to pilot study a survey rather than use that survey to collect data, I did not aggressively seek additional surveys from students when I decided that the input from students I had received was sufficient to the task of creating a survey.

The above caveat stated, information from each student did provide insight about the topic – and it seems fruitful for me to outline what such data might mean. In part, this allows me to also pilot test my own (or any researcher's) ability to "pilot test" my own analysis of the data. Hence, for each student, I will first look at where the students' were prior to the CHRTC 350 course and where they describe themselves afterwards and how, as a group, these students' five choices of statements best described how they thought science and religion related to their

responses to the questions and, finally, how important this question seemed to them.

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(For this student “Despite growing up in a religious family, religion and science were never discussed in a sense of coexistence. Instead, they were described as separate entities.” The CHRTC 350 classroom was her first interaction with science and religion as two connected fields of study. By the end of the semester, this perspective had shifted to “Science and religion benefit each other. They do not conflict antagonistically.”

The written responses reveal that this student’s thought leans towards science and religion were independent of one another: this revelation is reflected in two of the five choices (#8, #9). Yet, two responses reflected an integration typology (#6, #13) with a final one as dialogue (#3) all see science and religion in greater harmony and relationship. Thus, while a shift in perspective occurs through the class, it appears Student #1 is still between typologies, as reflected in the words “However, because of common misconceptions and prejudices, science and religion are still widely at odds with each other.“ Although no actual typological absolutes exist that can categorize a person, this survey and questions do suggest a shift in perspective happening towards a more reciprocal relationship between science and religion.

This student thought the issue of science and religion is “important” and indicated that both scientists and religionists need to be made more aware of how each can be mutually beneficial to the other.

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Prior to taking this course, Student #2 reflected a conflict typology and “thought that evolution was bad and that as a Christian, I should not believe it or study it.” He expressed concern that his teachers would be required to teach

evolution and that growing up "I remember learning about evolution in my Catholic high school and thinking my teachers were such bad Christians for promoting it." After taking the course, this student said, "I have come to realize that it is possible to believe in God as the Creator and recognize that evolutionary processes do exist; it doesn't have to be one or the other. I also still believe that it is not essential for my faith to know HOW God created, I just know that that He IS the Creator (capitals are in the original)."

The five statements this student chose reflect closely what he wrote in his responses to the questions and shows a movement in typological understanding. He answered with two statements that point strongly to integration (#2 and #5) and three that see science and religion in dialogue (#3, #4, #12). He thinks of "science and religion upholding each other," "evolution and creation co-existing," that "each can contribute to the other," and that "science has questions it cannot answer without religion."

The importance of this subject and the impact it had on the student can be seen in that he thinks "both topics are very important" and that "the two topics can complement each other and do not need to be in opposition."

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Student #3 articulates that his perspective was earlier influenced by a conflict typology orientation when he was going to a Christian school where "religious tradition trumped scientific discovery." It was university that began to "challenge this belief system." He had explored other literature in the area of science and religion and by the time he came to CHRTC 350 he writes, "I already held the belief of an evolutionary creationist." The experience of the class helped him develop categories and a framework for his thinking and he said he needed "a more solid explanation of why the dichotomy was false."

In his choice of five statements, I see a reflection of his interactions with the tension between science and religion. Student #3 chose three statements (#3, 4,

#16) that point to a dialogue typological orientation – science and religion should be able to correspond and contribute and provide some concepts that help in understanding each other. He chose one statement with an independence typology that "religious and scientific assertions don't compete but serve different functions." He also chose one statement that, according to my survey designation, comes from an integrationist typology – "Evolution and creation can co-exist as concepts."

This student thinks the issue of science and religion is extremely important "especially for church kids who grow up with Genesis 1-11 being their science textbooks because once they hit the 'real world' (sic), that belief system is severely rocked." He expresses passionately that "Christian kids" need to be scientifically literate and aware of the dichotomy they have been taught growing up and that it is possible to hold to "scientific and religious truths at the same time."

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This student expressed that, before taking CHRTC 350, he "thought religion was all the sort of things that are learned in church", a view that saw science and religion in a dichotomy or polarized in conflict against each other. The statements that he highlights as best describing what he thinks now about science and religion and his responses to the three questions further emphasize the shift he displays in his life.

Student #4 chose two statements from an integration typology (#2 and #5), two statements with a dialogue typological leaning (#3 and #16), as well as one statement categorized for the survey as independent (#9). The integration statements he chose were that "religion and science inform and uphold each other" and "evolution and creation can co-exist as concepts." Both statements correspond to the written response that says, "[W]e need to make sure we use them both and not just shut our minds to one or the other" and also in that "they can both complement each other." When the student says, "I now see science as observations of nature using whatever means that we have available to us." and "Religion is

talking about the stuff that science can't talk about." I see reflections of his dialogue survey choices – that science and religion should be able to correspond and that they can provide -5A ,((emphasis added) concepts that help in understanding each other. It also could be reflected in the independent statement he chose that "The religious meaning of creation stories is unrelated to the scientific enterprise." In commenting below this statement as to survey clarity, the student reiterates, "Not sure what enterprise means, but I think creation stories are theologically concordant, but not scientifically concordant" which points me to the possibility that this statement needs rephrasing.

When explaining how important science and religion is to him he says it is "extremely important" and that "[I]nstead of having robots in our churches that just believe whatever they are told to believe, we need to have thinking people that use all the tools that are available to them." He then highlights his leanings to the dialogue typology when he says, "The idea of this middle ground instead of only 2 sides is important to promote(8<.D546 , (emphasis added) on the issues and to make sure people are not just shutting down their minds to important ideas."

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This student explained that she came from a Catholic family, is in process of becoming a schoolteacher, and is entering the Catholic school system with the background that science and religion are compatible. "I can honestly say that I always saw a coexistence between religion and science and never once really questioned one over the other. My understanding of religion was founded on my understanding of science." While this person believes science and religion can coexist, CHRTC 350 still challenged this person's viewpoints and highlighted some tensions they were still working through as stated, "there were certainly times where I caught myself questioning what I had always accepted as truth. I do think that if you are open-minded, there will always be challenges to your preexisting ideas, but when these ideas are challenged, deliberated over and then reaccepted as truth, this leaves the inquirer with a greater sense of confidence in that idea."

The typological statements that best described this student's thoughts about science and religion were integration (#2 and #5), dialogue (# 4 and #12), and independence (#11). The integration statements included "science and religion inform and uphold each other" and "creation and evolution can co-exist as concepts." The dialogue statements were "science can contribute to religion, and religion can contribute to science" and "science has questions it cannot answer without religion." The independence statement chosen was "The results of scientific experimentation are not affected by religious beliefs." These statements reflect the written responses and show that a process of discovery is happening even when this person has strong views on the subject. This student displays self-awareness of her views when she says, "I am certain there were times, where either science or religion took precedence, due to a potential lack of knowledge on a certain subject."

This student wrote a lengthy response to the question about how important this issue is and said, "I have come to believe that it is one of the greatest popular issues" and that it is "incredibly important." The student expressed the need for theologians themselves to talk more about this issue as "We have theologians saying one thing while the CCC (Catholic Church Catechism) is sticking to another." This student sees a need for the Catholic Church to stay engaged in the conversation and be aware of what is happening in secular world. The concluding statement summarizes this person's desire to see change in how people see relationship of science and religion: "It is hoped that I will find the opportunity to teach religion as I enter the schools January 2011, so that I can show my students a world that is rarely encountered at the High School level."

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The initial Pilot Project interactions with former students from CHRTC 350 at the University of Alberta were a good starting point to explore whether I wanted to do further research in this science and religion class and if I wanted to research using the typologies as a source for understanding student's viewpoints. Because the questionnaire results of this secondary study conducted as research assistant

for Dr. Denis Lamoureux provided much food for further thought and research, I then endeavoured to prepare a more implicit survey and broader questions that would unearth student assumptions or hidden curriculum without directly asking them. Using statements that reflected but didn't specify the four typologies of Conflict, Independence, Dialogue, and Integration, I sought to explore the possible usefulness that the survey and questions might provide for teachers seeking to understand their students' viewpoints without pushing them prematurely into a typology. By collecting the research from the five students involved in the survey and questions, I wanted to review my survey process, interact with their responses, and write about their experiences of the tension between science and religion and how this related to these typologies. All said and done I think that the survey worked: the students had enough time to fill it out and it was sufficiently able to differentiate between different beliefs and insights that students had. I spent time on what they told me in the open-ended aspect because I wanted to see if their answers on the survey matched what they said about it. There survey and question results matched up well and proved to my mind that the survey was successful. Further research could be done on a larger scale, like in a class, but for this Master of Education research that sought to build and pilot test a survey instrument the results were beneficial.

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In Section One, I reviewed the student responses from four former students of science and religion and I noticed a variety of viewpoints that were expressed that displayed the tension that students had with the concepts of creation and evolution. All had moved out of a conflict position, opinions were mixed as to how faith and science overlapped, but all showed a change in their stance. One moved from Young earth creationism to evolutionary creationism, another moved from science over religion to integration, a third stayed a friendly atheist, and the last former student moved from an atheistic viewpoint to evolutionary creationism and they no longer remained an atheist. While so many other factors would need to be

researched, this sample encouraged me to do more work in this area with a different approach.

In Section Two, the data analysis of the survey and questions was reviewed from five CHRTC 350 student participants. Each student expressed to holding a prior position that was different from when they had completed the course. Their choice of which phrases best expressed their viewpoint matched what they wrote in their responses to the questions. The descriptive phrases were used so that I could use a common base for categorization rather than their own frameworks. From this I gathered that the survey and questions had sufficient clarity, as there were very few questions asked about the survey statements, and I also gathered enough data to see movement in their typological viewpoints. Student #1 shifted from seeing science and religion as separate entities to viewing each area as mutually beneficial. Student #2 started in a conflict typology and ended with a complementarity perspective. Student #3 came from conflict typology to a position stating that he wanted to see people of faith become more aware of the realm of science. Student #4's background was also the conflict typology that emphasized the dichotomy between science and religion, but moved to a place that he thought the two should be in dialogue. Student #5 began in a place that she saw science and religion coexisting but admitted to being challenged to think more deeply about her assumptions.

In the final chapter of this thesis I will attempt to tie together some of the strands from the prior chapters and make some concluding comments in light of the possibility of future research.

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Undertaking a thesis in a cross-disciplinary subject area that interconnects science, religion, and education has been an enriching and stretching experience. It has helped me: 1) explore more deeply my own teaching background, 2) re-evaluate my overall educational philosophy, 3) research students' stories and the 'text' behind their learning tensions, 4) review my own framework of science and religion, 5) create a classroom survey, and 6) reflect upon how knowing students' conceptions of science and religion typologies may impact classroom teaching. I conclude this research study by summarizing the various elements of this journey and by articulating how using a survey to understand student typologies could practically impact the classroom environment and future research in the search for wonder and joy in lifelong learning.

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Reflecting this past year on my junior high school teaching experiences was personally challenging, helping me to recognize some of my educational biases and what questions to explore through research. Having to teach both science classes and religion classes to grade seven and eight students was practically important because it gave me real classroom practice, beyond theory and my ideals. Through my teaching, I ended up facing my inadequacy as a teacher in both subject areas, which pointed me to the research presented in this thesis. In the classroom, I quickly recognized that I had not sufficiently studied either area to do a better than adequate job of developing young inquisitive students. Even more apparent than a deficiency of information was the realization that I lacked a framework broad enough to engage my students' questions and the tensions they felt between science and faith.

While taking graduate course work and reflecting on my teaching experiences in Education, I also rediscovered hermeneutics as a wider discipline than my prior, preconceived notion that this type of interpretation was only related to theological study. I found that hermeneutics doesn't merely apply to religious beliefs and texts, but it is an interpretive grid that serves as a conceptual framework that contributes to sound pedagogy across the curriculum disciplines. Coursework helped me realize that, when I was teaching junior high school, my interpretive and pedagogical capacities were, at the time, being challenged as a display of underdeveloped skills. I described this journey in a prior thesis chapter (Chapter One) as a labyrinth because I believe and realized that the learning process never stops in a person's life. I began to see that behind the questions students were asking was a deeper 'text' through which they were asking their questions: they felt the conflict of what they were being taught at home rubbed shoulders with other philosophies and viewpoints.

Early in my teaching path I was still untested and inexperienced and much of what I wanted to do as a teacher was unexamined in seeming blissful ignorance. Then I began teaching in my own classroom. At the time my location on the educational path was being revealed to me, beyond the idealism - there was a sense of darkness, fogginess, rough terrain, and a re-examining of assumptions and biases that were "below the surface" in my thinking. To say this sense was unsettling is an understatement, and it made me question whether I was in the right vocation and my sense of life purpose. Why did my teaching seem to fall on deaf ears? In my naïveté I thought, "Didn't they want to hear the well-planned lessons and lectures that I was so tirelessly and diligently preparing?"

In retrospect, I came to see that my "labyrinthine journey" brought me into experience with students who, both in science and religion, had displayed a loss of enthusiasm and wonder for learning. Also, I saw them become more engaged when controversial topics like evolution and creation were discussed and then with this burst of interest spent, they would slip back into apathy as we returned to the

standard textbook curriculum. This flip-flop from apathy to engagement nagged away at me week after week, month after month. My own inadequacies intertwined with new questions rising to the surface of my consciousness. Why did students listen so carefully during our morning devotions and then shut right off after we began our official school day instruction?

By the time I had finished my second year of teaching, these questions had become situated as a permanent fixture of my reflective process and begged to be resolved. Not only did I realize that I couldn't remain a teaching generalist, having taught all the subjects except for French and Music, I also realized my key interests were being directed towards trying to resolve the religious questions that arose from teaching science - the interacting of two types of 'texts' and worldviews. This broadening of interests led me into a new corridor of the educational path, into the role of a minister to youth.

As a youth minister/pastor I found an opportunity to explore my science and religious interests coincidentally with coordinating learning and social activities for junior and senior high school students. My new environment challenged me to engage written texts and the texts of student's lives. I read voraciously, through the resources on hand in the theological library, but also by adding books to my growing collection while engaging students one-on-one to hear their stories. My study didn't accomplish as much as I had hoped and I further encountered a larger impasse between science and religion, between the written story and the story of lives; not just in my own mind proliferating with questions but also in the multitude of books that weren't giving the answers that I was searching for (naïve as that may sound).

Finally, after several years in this pastoral role, while also sporadically taking theological graduate courses, I came to a crossroads. I had an internal desire and the encouragement of others that urged me to do full-time graduate education in theology - hoping this venture would bring some resolution to the growing list of unresolved questions. Further, at this time I had additional student conversations on this topic, which only reinforced this desire to additional vocational study,

including a long talk with a student who introduced me to the writings of a science and religion professor (Denis Lamoureux) that I would eventually meet after my graduate studies - introduced later in this chapter. Thus, I chose to do more graduate work at seminary to pursue these new goals.

In seminary, I examined in greater detail the original languages of biblical texts, especially those writings concurrent with the subject of faith and creation. I read assigned and unassigned texts, theological commentaries as well as scientific literature, seeking answers to my questions. Though a fascinating and insight building time, I was also somewhat frustrated to discover less clarity than I had hoped, ironically even more questions without specific answers were brought to my attention. Useful as it was to find out the various standpoints on creation and evolution that secularists and people of faith adhered to over the centuries and into this scientific era, the addition of new choices didn't sit well with me because I was working to formulate a hermeneutical stance that would better assist my own teaching approach. It became apparent to me then that, while my hermeneutical framework and skills were to a certain degree being fine-tuned, more work would be needed in my understanding of the relationship between pedagogy and interpretation – the externally visible and the internally hidden texts. I finished seminary with a more broadly developed framework and worldview for the work that was to follow as a university chaplain. Having taken up my post at the university, I wanted to continue to develop my hermeneutical and pedagogical abilities as a resource to the many student conversations and to my university teaching. Yet, it was also at the University, that I recognized the same questions were still lingering and the conversations were increasing in complexity, leading me closer to my present research.

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One academic catalyst for my research was the tension I felt related to my past and present chaplaincy work - hearing the stories of students wrestling with evolution and creation and different views of the world relating to science and

religion. These stories also reflected some of my own personal struggles expressed by what one author's book is titled *When Life and Beliefs Collide* (James, 2002). Science being the aspect of life mentioned in the title and beliefs being my own religious faith and both aspects reflect that students were asking me to help them with the same questions in their own "collisions". They were in dis-ease in the intersecting texts of upbringing and new vistas of learning at the university – a worldview opening up before them that was foreign to their own life stories.

I have met many students since 2005 through the chaplaincy, and I have been surprised and amazed by how many have asked me questions about how science and faith can fit together. Most students attached a high level of importance to this question and all had their own ways of wrestling with the issue, which resulted in a variety of responses worth noting.

One response was to simply dichotomize science and religion (or creation and evolution) into different mental compartments and for the sake of academic survival, to move ahead with assignments without trying to integrate the two areas. Others voiced their awareness of opposing views to their own so they simply learned, for example, their evolutionary biology, to receive a grade and then chose to forget about what they learned as soon as the course was over as it didn't fit paradigms carried forward from their childhood. A few sincerely felt the tension as an ongoing issue because after high school the tension only intensified as they entered university's deeper challenges. Many times I have heard these students note that, in their faith communities, their questions were pushed aside or acknowledged but then never further addressed. Their conversations were instrumental in my own reexamination and further study of this controversial area. I wanted to engage their stories and see the interplay of their 'texts' in a new context.

The relationship of God and evolution is especially volatile for evangelical Christian students I have met. For several years I, like many others, had also said that the issue of evolution is peripheral to faith, but the incessant questions and my own conscience finally provoked my need to do the necessary research and develop

an informed opinion. I realized I needed to peruse the academic literature and learn what scholars were saying about the issue of God, evolution, creation, and the relationship between science and religion. Thus, I decided to pursue this study in the Faculty of Education under the topic area of engaging tension in the science classroom.

While I began my own Master of Education studies, I met Dr. Denis Lamoureux. Lamoureux was addressing the questions I was hearing students ask and his name had come up for me among people I knew as early as 1997. At that time (1997), I was shown a chart of the continuum of beliefs related to creation and evolution (see Appendix Five) that came from his university lecture and I found the material interesting; however, I had not yet entered the chaplaincy where those questions were in abundance and where that chart would have become an issue.

When I arrived at the University of Alberta (2005), it didn't take long for me to meet students who wanted to talk to me about CHRTC 350 and what this chart represented. When I discovered I could take a science and religion course as part of my graduate work for my Masters of Education, I enrolled and put myself in a situation similar to some of my students - forced to wrestle with my own questions about science and religion. The teaching I experienced in this classroom also contributed to the design and data of my pilot research project: it was particularly instrumental to how I set up the survey/questions for my research. It gave me an insider's view about what students were learning and, as a chaplain, complemented my ongoing work with students and contributed to my educational philosophy.

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Several elements from this study contributed to my current educational philosophy. These included the importance of clarity in teaching science and religious categories or frameworks, as well as recognizing the importance of understanding science and religious typologies for education. Further, I was also introduced to the significance of a hermeneutical approach to education (from David

Smith) that would help me grapple more deeply with my questions. This background learning led me to research and write about the historical background of science and religion to situate readers in the field (Chapter Two). While developing my own understanding of curriculum inquiry, the historical background of science and religion, the various typologies that are standard in the field, and research methods, I found that a survey with some open-ended questions would be a good instrument for the exploratory nature of this study and to unearth student assumptions.

First, the importance of categories became clear through reading student responses because it gave them resources to engage their assumptions, the unwritten 'texts' that were background noise from their histories. Pertinent comments were regularly interspersed in the data, mentioning that through the process of learning about frameworks and the definitions of science and religion, students experienced a new set of lenses to navigate through confusing information. Reference to how these categories provided clarification was part of each student's response thus reinforcing the importance of clarity as one of my own tenets of education. That being said, I also noticed from their responses something having categories did for students. Many had never had to engage the tension they had recognized in the field, thus it was also important that they gave up simplistic notions related to their understanding. Embracing the tension while gaining classroom navigational tools seemed to be the perfect combination for learning to take place.

Second, learning about the typologies of science and religion – conflict, independence, dialogue, and integration (see Chapter Three for further explanation of these typologies from Barbour) narrowed a vast field and contributed to my pragmatic educational philosophy. Recognizing that the typologies are a broad framework for students and teachers gave me the connecting point for application to the classroom. As I read the science/religion literature, I had not noticed much interaction with the educational sphere; the typologies helped form a bridge

between science/religion and education. My own experience of typologies alleviated confusion and tension and helped me recognize the possible need for teachers to engage their students and provide some boundaries. Thus, I had the idea to develop a typological survey.

Third, researching the historical background of the tensions between science and religion was instrumental for Chapter Two of this thesis, where I hoped to give enough background to provide a bridge for readers of this thesis without overwhelming people with information. Reading past difficulties and interpretive shifts in the stories of our scientific and religious forbearers reinforced my thinking that wonder and truth can lead to educational freedom. Although Galileo's motto was the distinction between "the book of God's work and book of God's words," I noticed less of a chasm (see Chapter Two), in what he wrote, between science and religion than there is today. Scientists of his day were explicitly informed by religious beliefs and the religious leaders of the day were aware of scientific developments. There was a delight displayed in their writing about both science and religion.

To be fair to the current North American context, I do see in some situations an openness to the compatibility of science and religion, but with the popularizers of science, such as Richard Dawkins, and the popularizers of religion, such as Ken Ham, putting their views out in the viral world of the Internet and blogosphere, there appears to be confusion in and through the popular media. Ronald Numbers' (2010) book *Galileo Goes to Jail and Other Myths about Science and Religion* will likely help dispel some myths that rule the airwaves and publishing realms; yet, as I receive daily Google updates, I continue to read authors, pundits, bloggers, and media gurus who continue to propagate mythical misinformation.

Finally, setting up the Pilot Project questionnaire showed me the benefits of developing a questionnaire that might help to discover how student experiences and beliefs could be assessed prior to or in process of classroom instruction; also encouraging me towards an educational awareness of the hidden curriculum. The

data collected was enlightening and reinforced my desire to use a similar but adapted measure for my own research project. What I didn't want to do was narrowly ask questions; instead, I hoped to use a more open-ended approach. I realized that directly asking questions had benefits but, to reveal deeper assumptions, my survey would have to be less direct and more open-ended. When my research instructor and thesis supervisor suggested using a survey consisting of descriptive statements, I realized I had discovered a way to glean information from students in a more indirect manner that might allow an expanded level of responsiveness that would students move beyond their own categories of understanding, which included the science/religion typologies they had learned in class.

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Throughout this research while reading student data, I have noticed a confused tension present in the frameworks students expressed before they took the class - something I had also experienced. Reading published scholarship and also perusing the popular media, I noticed a similar difficulty with the definitions given to terms science and religion also reflected in the student responses. My literature review revealed that in both popular and academic sources there are no standardized definitions for science or religion (it is an ongoing debate), which can add to difficulties for student engagement and learning.

The lack of accepted definition can also create situations in the classroom where people are talking from a different viewpoint and using different meanings for the same terms. For students in CHRTC 350, one of the greatest resources for clarifying the confusion was working through categories and definitions of science and religion; one student voiced, "The class gave me categories to help me think." For myself, in personally learning the continuum of definitions being used, taken from a broad range of sources, I was also helped to come up with my own sense of what these key terms meant for my study. With this tool in hand, it was easier to navigate the deluge of articles hotly debating whether science and religion are

compatible.

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Looking back at the process of developing this thesis and survey, what stands out for me are the stories I was able to read from the former and recent students from CHRTC 350 *Science and Religion: Christian Perspectives*. The stories served the purpose of giving me a glimpse into students' lives and into their implicit approaches to interpretation. While many hermeneutical questions remain for future research, I realize that their stories satisfied some of the initial questions that were raised in this thesis (Chapter Four). Hearing their stories interacting with my typological survey/questions opened new ways of thinking that have influenced my educational understanding – what were the assumptions behind their challenges, what texts were in the background 'noise' of their thinking?

The subject of evolution and creation was part of my earlier research questions; but, as students told their stories, my thinking has also 'evolved' and I realized that there were deeper questions I wanted to ask beyond and below, 'could evolution and creation interact in a healthy way?' I wanted to find out what roadblocks, misunderstandings, or misconceptions were creating challenges and confusion in the classroom and thus the survey stories served a deeper purpose than I had foreseen.

Initially, I had hoped for a more quantitative (larger sample) response, yet the smaller sample of student responses gave a qualitative depth that revealed the tension experienced in studying science and religion. Reading their questionnaires, surveys, and responses to questions was like looking into the window of their lives as they disclosed much about their interpretive struggles and benefits of grappling with three of life's most fundamental questions:

1) What kind of beings are we?
2) Where did we come from?
3) Is faith irrational?

It also allowed me to grapple with specific questions about science and religion:

1) What does the biblical text of Genesis really teach us?
2) Is there a dichotomy between science and faith: are they at war with each other?
3) Is there a purpose to life that science can give me?

I was also encouraged by their stories, because a passion for learning was visible in their answers and they had such a varied breadth in their feedback. It was evident that this class really changed how they viewed life: the change was not towards a narrower view as the cynic in me might have thought; rather, their enthusiasm was contagious. I witnessed their experience of wonder not only as they worked through the tensions in their worldview in their survey/questions responses but also in the classroom setting of CHRTC 350. What I observed there also was indicative of how their personal texts were challenged and broadened through the teaching experience itself. I discovered that young people could grapple with deep questions about science and religion and be the better for that grappling.

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In reading Chapter Five, one might wonder why there was a change in perspective for each student. In each student response, remarks were made about the professor's classroom teaching style and how it helped to make them think more deeply about their own standpoints. Because I took the class myself, I viewed this interactive situation firsthand and was able to participate in discussions that were conducted during class. I wrote down my own observations of what I could see taking place and here are some of the insights that I think help to provide further data to what they students were describing in their written responses to my research questions.

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It would be another project in itself to examine the teaching plan and strategy displayed in this science and religion classroom, but there are several features I would like to suggest are important background to the stories above. I experienced

these for myself as I took the course in tandem with taking notes about the pedagogical moves the professor made. At the same time, I was being tested on the course material and personally struggling with how to understand my own points of tension.

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The first aspect of the class that stands out clearly from CHRTC 350 is that the professor shows care for the students and is constantly working to put students at ease. If something radical or stretching was said, he always added words of caution or care and affirmed that what he was saying was difficult. This strategy helped me as I took the class and kept me open to thinking about tough subject areas – Denis worked to keep the environment inclusive. The professor never made the course work an us vs. them situation (religious vs. non-religious), as can be seen above reflected in the third student's story, as an atheist taking the class. During teaching, things would be said like, "You religious guys won't like this one." or "I give as many A's to atheists who make good arguments as to religious people. I will defend you from the horde of Christians." When stating something challenging to religious people, he would say, "Remember I'm a flaming Christian, too" as to key aspects of Christian belief. His candidness as to constantly check his statements as to their validity was also helpful because it gave students the sense they could question his statements and not just take what he said on his authority alone. He also pointed to the importance of respecting other's opinions and comments, as well as not taking the material taught and throwing it in people's faces for argument's sake. It was as important to him how something was said as to what was said.

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The second aspect that stands out is his up-to-date teaching that incorporates contemporary ideas into his teaching by the recycling of concepts from new angles and depths. Denis taught everything in the course in a macro perspective at the beginning over several lectures and then unpacked each section little by little during

the rest of the course. He would throw out a teaser as to what was coming, but didn't teach the most difficult aspects of the course until enough of a foundation was given that would allow a better understanding of the material. One main strength in this approach was the development of categories that would help frame the rest of the course and give it context including the Message-Incident Principle, Metaphysics-Physics Principle, the groundwork concept for hermeneutics of accommodation, the embeddedness of ancient science in the scriptural text, and the unpacking of conflations and dichotomies that are part of popular scientific and religious understandings. The Message-Incident Principle was used to explain that messages of faith in biblical writings are given in such a way for those who receive it to understand in their own cultural context. The Metaphysics-Physics Principle helped explain that we all take a step of faith from the physical to the metaphysical, whether we are atheistic or hold to a religious framework. For example, Lamoureux said, "we all bring metaphysics to the game" even someone like Richard Dawkins who speaks from the dysteleological side against religion.

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(Another aspect of the stories I have recounted is a teaching method geared to appropriately defusing and creating tension in the classroom. The first case included defusing tension by reviewing of the history of science and religion and by clearing up cultural myths that had become so deeply part of the either/or dichotomy of creation and evolution. It was helpful to see that, although there have been tensions throughout history, the ideas that the issue with Galileo was not science vs. religion and that Darwin was not an atheist were both tensions that needed to be dispelled. Both have contributed to a dichotomy that is not helping students gain a clear view of their world and what has happened.

(On the other hand, a carefully provocative style stretched students to engage concepts that many likely would never have endeavoured to seriously explore. Some concepts may never have even crossed students' minds, as the survey questions showed, and some topics maybe were taboo or off limits but could have been there

in the background nagging at them (this was the case for me). A helpful comment that was made continually in this regard was, “We would have thought this too if we had lived in that day.” This comment made what was said more plausible and seemed to respect the ancient peoples and ancient text in a way that still allowed for constructive engagement.

Thus, the teaching experience also influenced students and contributed to their stories. Next I want to look at how former students of CHRTC 350 in the Pilot Project, and recent students involved in my survey/questions express the stories of their experiences.

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Several exemplary stories stood out for me - first from the Pilot Project data; second, from my own research survey/questions; and finally from a student essay I haven’t commented upon previously in this thesis, that was given to me by one of the students as additional data to her/his survey/questions.

First, from the graduate course Pilot Project, the story was told of an atheist student’s struggles with science and religion. While he remained a committed atheist, the viewpoints he expressed were insightful and commend themselves to further review. He began the class skeptical and affected by what he called “disrespectful interfaith dialogue” and ended the class in a place where he felt valued and his position was respected. It was remarkable for me to read the words, “I think if the disrespectful interfaith dialogue would not have happened I may have retained my faith”. He expressed that, during his academic journey, people of faith had ridiculed him and this had given him a negative taste for religion. He talks about his epistemological struggles and how those he differed with appeared to have a simplistic understanding of science, which deterred him from seeking anything to do with faith. He explained that, when he came to CHRTC 350, he found a place where faith and science were not out of step or at odds and an epistemology that was more rigorous, broadly encompassing both science and religion. While clearly

stating that he has remained an atheist, he gained a more open perspective to religion. He indicates that some of the negative he had experienced has been compensated for in finding a class and professor where he felt valued and respected.

In contrast, another student's questionnaire answers from the Pilot Project showed a large shift in her overall viewpoint. One of her comments spoke volumes: "A new world opened as I learned about these things". The dichotomy of science vs. religion, a conflict typology addressed in this thesis at various points, was deterring her from openly studying either subject area. It was interesting to read about her "Damascus road" experience that opened up a whole world of learning. She had previously been convinced that there was no God or gods, expressing that her view of science had been the stopping point for even considering the possibility of there being a God. Once the dichotomy was addressed and challenged, her worldview allowed for a theistic viewpoint to be explored. While the intent of my study was not to look for religious changes but rather at how typological viewpoints affect student learning; yet, along with the atheist viewpoint just mentioned, this student also gave me food for thought. An interesting phenomenon is the similar stories I have encountered with students who have gone from atheism to theism and from theism to atheism. Might the place of ultimate beliefs in a person's thought, not be an area for future exploration of the student search for wonder?

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From my own typological survey/questions several notable stories help summarize my own learning from this research. I was surprised by the initial negativity towards science expressed in four of the five students' surveys because science has always been for me a personally fascinating area of study. Although I grew up in what sounds like a similar religious setting to several of these students, and I have also experienced some of the tension they have expressed, I don't ever remember being anti-science in my orientation or being taught from a faith perspective that was anti-science. It is unfortunate that the university students I have conversed with have had to experience such low views of science in their faith

communities.

I do remember acquaintances that thought evolution was bad, but I never felt that same negativity from my teachers. Although I can't recall learning as much about evolution as is now taught in the Alberta curriculum, I do remember that macro and micro evolution were both taught in our Ontario curriculum and were much in compliance to the basic tenets taught today. Albeit this is subjective to my experience, yet the contrast became clearly apparent in the stories students told. One student saw science "polarized in conflict against religion;" another saw that "religious tradition trumped scientific discovery;" the third that "evolution was bad for the Christian;" and the last said they were "separate entities". Against this backdrop of perspectives the stark contrast can be seen through the shifts these students made towards viewpoints that allowed for scientific and religious dialogue, coexistence and integration. The student paper given as further data gives insight into how this shift took place.

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I will comment upon one more story, from a paper written for CHRTC 350, attached as additional data from one of the students involved in the research, that I think reinforces further how shifts in viewpoint took place. This paper helps illustrate in more detail some of the student experiences in the science and religion classroom. Her paper provided additional support regarding the tensions students' experienced from the various 'texts' they took with them into the learning situation. She writes about "How Science and Religion Fit Together" by first giving her own definitions of science and religion, then how to read the "Book of God's Words," and finally how to read the "Book of God's Works".

In the definition section of her paper, she links both science and religion as part of "a search for truth." She allowed each realm to be equally important as her starting assumption, and then explained how she interprets science and religion in her search for truth. Her religious hermeneutical approach includes an acceptance

of the inspiration of the Bible qualified by the statement that she still experiences difficulties integrating her biblical view and science. She connected her difficulties to the interpretive approach one takes and explained that if a person develops categories to work with in understanding ancient texts, much clarity will be experienced. Two categories she learned from CHRTC 350 that she says helped her were what she called the "Principle of Accommodation and the Message-Incident Principle." The first can be summarized with the words,

> The former encompasses the idea that God speaks to us using our categories. He puts his message into a package small enough to fit into our brains. For example, the science in the Bible is accommodated to the understanding of an ancient people that had no microscopes. Realizing this allows reconciliation of the ancient science in the Bible with the claim that God's word is inerrant. God deliberately did not overwhelm people with incidental scientific information because his goal was to teach "How one goes to heaven and not how heaven goes."

She summarizes the Message-Incident Principle by saying,

> The Message-Incident Principle recognizes scientific information in the Bible as a vessel to carry the infallible messages of faith. The ability to identify the incidents that frame teachings, allows recognition of scientific and other inaccuracies in the text without rejection of the divine message.

From both of these hermeneutical principles, a bit more is revealed about why she made a shift towards a view that no longer holds science and religion in conflict. She shifted from a more literalistic interpretive grid to one more accommodating to the ancient mindset, allowing the context to be a stronger consideration than in her previous understanding. This allowance is clearly expressed when she said, "He (God) did not find it necessary to explain the fossil

record, the way of the heavens or quantum chemistry to give them a sufficient understanding of who he was and still is and will always be."

Through taking CHRTC 350, her newfound scientific hermeneutic allowed for a greater openness to the discoveries of geology and biochemistry, but found it hard to then make the metaphysical leap that there is no God, as some of her former beliefs implied she would need to do if she accepted any form of evolutionary thought. She had grown up with the text that the world is young and could not have evolved and so the tension of this view can still be traced in what she writes about her view of science:

> A basic understanding of geology quickly leads a person to believe that the world is older than the Bible lets on. Is science, this second book of God, misleading? God has given us two books by which to know him and I believe he wants us to learn from and enjoy both. We can worship him with our minds, as well as our hearts.

She writes that she believes both these statements but doesn't try to answer the scientific questions from the ancient text. What is different is that she no longer tries to jettison scientific discoveries; rather, she says, "Studying science constantly leaves me in a state of wonder." She concludes, "So science does not usurp religion, nor religion science. Far from being exclusive, both exist to lead people to God in complementary ways." From her comments about where she initially came from, caught in a conflict dichotomy, this depicts a major shift in worldview. Thus, although I have gone through a small sampling of student responses to my survey/questions, having also considered this paper, I am intrigued to further research: What has contributed to the shifts in perspective and how did some students find wonder again in studying science and religion?

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For the Pilot Project where I assisted Denis Lamoureux in his research as

part of my graduate course requirements, I was less concerned about sorting students into the four typologies than interested if the typological categories worked in a practical way (my own Master's survey/questions to follow sought a less direct approach). To discover its usefulness, I directly asked which typology they would place themselves – conflict, independence, dialogue, or integration. I used pictorial representations of each typology that students would have been familiar with because of their class experience. I directly asked the questions I wanted them to answer and allowed them time to consider their answers without the pressure of face-to-face interviews. Using a questionnaire also seemed more feasible within timeframe and geography. Student response data gave details to their stories that provided insight into where they were before CHRTC 350 and what changed for them after they had finished. Most telling were the dramatic changes that had occurred and the reasons they gave for why their perspectives changed.

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Following my involvement in this initial Pilot Project, the quest continued to understand the loss of wonder in learning, the tension between science and religion in the classroom and on the university campus, and the implicit typologies affecting student perceptions motivated me to read widely in the science and religion and educational literature (see Chapter Three Literature Review). Seeing the usefulness of the questionnaire, I narrowed my research into the same categories for pragmatic reasons, recognizing that my own hermeneutical framework seeks to take a broad strokes approach that would allow for diversity and complexity and disallow for simplistic categorization of students' beliefs. Keeping my own framework in mind, I still needed to make this a manageable thesis: the typological frameworks provided focus. With that focus of the ways people interact with science and religion, I was then able to further develop what I was learning in relationship to education and the classroom setting. With that setting as a backdrop, constructing a survey for students and asking them to choose five statements that best described how they

thought of the interactions between science and religion seemed beneficial in providing a specific tool for teacher's use.

In reading student responses, stories were told of their shifts from a conflict dichotomy to a combination of independence, dialogue, and integration. No student fit neatly into any one of these typologies because these typologies are constructs and were a way to describe viewpoints, not make absolute categorical judgments. Thus, while the categories helped me work with large amounts of information and data, in the end the students' choices ranged across several typologies, reinforcing the fluidity of the categories. The statements they chose could not be isolated from their contexts or their understandings and suggest changes in viewpoint rather than a concrete ideological location. Understood hermeneutically, this diversity among several typologies makes sense of why none of the students had the majority of descriptive statements in one category, first because there was a limit of four statements per category so overlap was a given and, second, no student had prior knowledge of which categories statements fit. At the time, this approach seemed the best way to develop the survey.

Currently, after some further reflection, I might try alternate methods using the same survey - such as asking for more statements to be selected to solidify their preferred typology, or by ranking the statements in order of their perceived importance. Thankfully, the three questions included with the survey gave enough further data to provide a clear enough result of their viewpoints and indicated the appropriateness of the survey setup. From the results obtained, I think that the survey was successfully piloted because the students were able to successfully fill out the survey/questions and the survey choices corresponded with their questions that followed. Each question contributed to discovering what students had experienced, and giving stories of pedagogical significance.

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Chapters One through Five have outlined my personal background, a short

history of science and religion, literature review, research protocol, and student data and stories. Different academic factors contributed to the development of this thesis, including my participation in the graduate class Pilot Project (questionnaire), background reading on scientific typologies, hermeneutical and educational theory, as well as research into developing and piloting a survey. Classroom instruction also certainly provided insights into student's engagement of the material as I experienced firsthand what they experienced. Chapter Six thus far has summarized the journey of writing this thesis. Having written these chapters, I conclude then with two related questions:

1) How can understanding typologies of science and religion help teachers in their classrooms?
2) Could a typological survey impact the classroom positively?

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How many times have teachers sat down after two students went head to head in a conflict over what was being taught and said: "Glad that is over!" Conflict is a major part of any human endeavour – just ask parents, teachers, students, colleagues, co-workers, friends, husbands, and wives in any part of the world at any given time, in any given school, about what really goes on behind closed doors. Go ahead and accuse the person who disputes this statement of lying (tongue in cheek) and then watch, as the next few minutes become a case in point! Try to go a week without experiencing some level of conflict and, when it happens, breathe a sigh of relief and then prepare yourself for the following week.

Resources about developing classroom management skills are legion. They are often a lifeline young teachers are looking for to help them enter what can be scary situations. I remember my own sense of satisfaction as I finally learned how to "control" my students, not because of my own insecurities, of course not, (tongue in cheek) but because I wanted to "keep them safe"! The type of system that has that high a need for control, is a topic for another conversation but practically it is

important to learn how to help students learn in as effective a manner as possible. Especially when controversial subjects such as science and religion become the topic of teaching, there may be an even higher level of anxiety or challenge for teachers and greater need to discern ways to find helpful bridges across possible minefields for conflict and pathways through to open-minded learning.

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My research into the tension that occurs in science and religion classrooms may have some insight to shed upon this volatile area of potential conflict. I found from surveying students about their frameworks of understanding and how science interacts with religion that knowing what students think ahead of time can be a useful preventative and proactive measure – it is important to know what 'texts' they take into the learning situation. For teachers to be able to give themselves a heads up before the tension "explodes", might it not be useful to have a way to find students' preconceptions of science and religion without directly asking them through categories that may prejudice their responses? Not only does this prior assessment entail awareness of outer conflict that could erupt but also this would help teachers know of the inner conflict that may be present. Things of this nature may be part of the inner thought process that would not otherwise become apparent if it were not 'coaxed' out to the forefront. Thus, I sought to develop a practical way to do this coaxing out of viewpoints for teachers, in an uncomplicated survey that gives the educator enough knowledge about students' views to provide a means for a smoother classroom dialogue situation and understanding of student viewpoints (texts). Not only would the survey help with classroom dialogue but also it could help uncover the "inner conflict" that students may have that they are not readily willing to express.

The survey I created for my research used indirect questions as a way to not alert survey recipients to their potential bias towards one viewpoint or another; rather, I put down sixteen descriptive statements (see Appendix) that emphasized different viewpoints to allow student to more subtly reveal their preconceptions. I

chose five statements as a large enough sample, without being encumbered by too much information, so that teachers conducting the survey could cluster them as a class and get a glimpse of where students are before the various units are taught. In this way, a teacher could be prepared for those areas that may be hot-button topics and thus either be equipped to go knowingly into a conflict, avoid unnecessary confrontations, or more proactively find out the views of students to encourage open-minded learning.

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Teachers who understand typologies and use this survey need not simply avoid conflict in the classroom. They can also use the survey to promote open-mindedness and refocus any excessive dogmatism present in the learning situation towards a positive interactive atmosphere of learning. Many teachers of older students have had a moment when they shared a statement(s) that was initially thought to be innocuous and then, through intuition, sense spines straightening and several students getting ready to begin a tirade. Conversely the opposite affect also might be noticed that students "clam up" and become unwilling to engage. How many times have I thought to myself, "Think before you speak!" and regretted opening a can of worms that really needed to come up at another time or not at all?

Knowing the typological orientations of our students could help to at least give some prior knowledge and awareness about which issues to broach and when to broach them or to expose points of dogmatism that we need to be careful to allow to stay under the surface rather than to call it out. Knowing the students who see science and religion as in opposition or as separate fields (conflict and independence) as their initial position on the issues would help teachers lead the discussion towards showing how they can possibly integrate. The teacher could also be aware of students who need encouragement to contribute positively to the discussion.

Using the survey prior to a unit or class startup could help teachers draw out

those more open to science and religion who lean towards dialogue or integration frameworks and who might be afraid to speak up. Regardless, working through the survey holds the promise that students can become both more engaged and more grounded when discussing controversial subjects. As a result, the learning process might be improved. Thus, a teacher who understands typologies can patiently work at challenging students that may be frozen into a dogmatic stance or those who are often silenced by students with more outspoken opinions.

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A third possibility for using the typology survey in a classroom setting is to implement the survey as part of arranging or choosing curricular emphases, since the responses can give the teacher a sense of how important the subject area is for their students. Knowing if students highly value science and religious subjects ahead of time can allow for the interjection of lessons or the addition of illustrations that take the opportunity to draw out the students to discuss and think about related topics. Allowance to explore the categories could be part of lesson planning and could be a big picture way of drawing students into a required subject area that might be helpful in holding students' interest. It could also alert students to their own biases and the texts that are currently influencing them. Thus, a teacher who has a background with typologies can develop their curriculum in ways that encourage students to explore differing perspectives.

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A final educational possibility for this typology survey is as an artifact for classroom discussion. Students could respond to the survey, then to critique, challenge, and improve it based on their own understandings. Using prior teaching to introduce the typologies could be a way for students to sort out the statements according to category. Asking which descriptive statements fit into the four typologies is itself a teaching tool, especially if students choose to place a statement in a different category than the creator of the survey. Students could then argue for

why they chose statements to go into a different category than the survey creator and give their reasons. (The feedback to me would actually be helpful fine-tuning and further developing the survey.) Thus, a teacher who through the survey introduces different typological viewpoints to students can encourage informed classroom discussions, aware of the categories for discussion and of other student's perspectives.

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In writing this thesis, the starting and ending points are related but, as I suspect is often the case, these points have developed in expanded ways different than initially planned. The subject of research has taken on a life of its own and exposed new areas of interest and evoked a greater sense of curiosity. While starting with the trajectory of researching student experiences of science and religion has remained unfaltering, new areas to explore have emerged. Through looking at my own location of inquiry, exploring the history of science and religion, developing the survey and conducting the research, I explored the tension in student learning, as well as how students perceive the interactions between science and religion. What has come out of this exploratory journey is another theme that I would like to consider for future study – the learning process itself and students' loss of wonder in education. My own anecdotal evidence from my science and religious teaching experiences has been part of my curriculum inquiry, but also the data I received from students implies junctures in their stories where they "lost their way" and education became mere drudgery rather than being *educare* "led into the light."

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As previously mentioned, several stories were highlights for me from the Pilot Project that informed and encouraged the development of my own typological survey that followed and have pointed me forward in considering future research possibilities. These stories and the educational influences have provoked thoughts

for additional research. The story of the self-described atheist who had many positive things to say about his experience of the science and religion class was one story that brought to mind new questions. He had gone into the class with some of the same preconceptions that the other students had, that there is a dichotomy between science and religion and that they cannot co-exist, correspond, correlate, or cooperate. Yet, apart from religious experience, his descriptions were also a fascinating display of what can happen when a teacher takes an interest in someone and works hard to make the classroom experience a fair one, even for an atheist in a religious environment.

It was specifically educators such as David Jardine, Kent denHeyer, David Smith, Bonnie Watt-Malcolm, Denis Lamoureux, and Jim Parsons among others, that have been part of this quest and have also contributed to new questions for future consideration including:

> Is loss of wonder a broader curricular issue rather than it being subject specific? (science or religion)
>
> Is the creation and evolution issue a symptom of something bigger amiss with education, science, and communities of faith?
>
> Do religion and/or science lend themselves to binary thought patterns (dualism) that sets people on a path to oversimplified thinking?
>
> Have religion educators and science educators adopted a binary approach to teaching that has affected educational formation?
>
> Is there something hermeneutically askew with how science and religious educators perceive their own task?
>
> Is loss of wonder a merely a student's personal choice or are educators implicated and if so, how?
>
> When does this loss of wonder generally happen – or is this too nebulous and

mysterious of an occurrence to actually assess?

What are the Canadian historical, cultural, and philosophical contributors to the loss of wonder in education?

Is this a systemic or paradigmatic issue?

This growing and developing list of questions has directed my focus from the specifics of my teaching and chaplaincy that were part of my initial challenges to the hidden curriculum I am carrying, and how I am implicated. Have I been or continue to be a contributor to what one pundit called apatheism or the loss of wonder? With these questions in mind and the likely refinement of an ongoing research conversation, I hope to continue this quest through further graduate work.

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I0<,70,(.78(',D<4<57(I6/F,=(TTRead each of the below carefully and circle the 9<F,(

`Wa statements that J,->(8,-0/<J, what you think about science and religion. If any statement doesn't make sense to you please right comments below it:(

1) Scientific and religious assertions do not compete and serve different functions in human life.

2) Religion and science inform and uphold each other.

3) Science and Religion should be able to correspond in the search for truth.

4) Science can contribute to religion, and religion can contribute to science.

5) Evolution and creation can co-exist as concepts.

6) Science and religion essentially address the same issues.

7) Evolution and creation cannot coexist as true understandings of how the world came to be.

8) Science and religion should remain in their own realms of inquiry.

9) The religious meaning of creation stories is unrelated to the scientific enterprise.

10) Blind chance produced conditions favorable to the appearance of intelligent life in the universe.

11) The results of scientific experimentation are not affected by religious beliefs.

12) Science has questions it cannot answer without religion.

13) Science without religion lacks ethics; religion without science lacks data.

14) Matter is the only reality of the universe.

15) Acceptance of evolution requires the rejection of all forms of belief in a God or gods.

16) Science and religion can each provide some concepts that help in understanding each other.

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1) What were your preconceptions of science and religion?

2) How have your views changed while thinking about science and religion?

3) How important is the issue of science and religion?

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You are invited to participate in a survey being conducted by Bryan Clarke at the University of Alberta. The purpose of this study is to examine student experiences in the Science and Religion class CHRTC 350, which aims to develop your knowledge, and awareness of your viewpoints on issues relating to science and religion. My research is seeking to understand what types of preconceptions people bring to this topic and if serious classroom study affects points of view on the issue. I am also interested in how important students see this subject area and how this relates to classroom content. I want to find out whether student viewpoints have developed or shifted at the end of the course from their previous understanding and whether the survey itself has been a helpful aide to sorting out points of view.

We will send out the survey and questions, at the end of classroom lectures, in order to ensure that there has been engagement with sufficient classroom content and to receive a wide sampling of responses, also to give students time to decide whether to be involved in study. This will be done through professor sending out request to participate to enrolled students, student's responding individually and contacting researcher, and then filling out a survey the researcher sends which upon completion and return, assumes student participation in study. The aim is to work through the data, held in confidentiality, in order to improve future classroom teaching. The outcomes of this study hope to improve future offerings of this course material.

Your participation involves the completion of a survey, and three open-ended questions pertaining to the topic, with a possible follow-up interview. The responses of all participants will be completely(057<8,7><.D. Only the researcher and his advisor working on this project will have access to the information that is provided; no other people, including University instructors and administrators, will have access to the responses. The information provided might be used in professional research reports and presented at professional conferences. If we use a quotation that you provided, your name will be kept anonymous. The surveys will be stored in a locked cabinet for 5 years, following the

guidelines of the University of Alberta. After 5 years, the surveys and related materials will be destroyed.

Your decision to participate in this study is entirely F5□67>.*/=(and you may decide at any time to withdraw. The data may be used as part of future studies, and if this is done the anonymity of participants will remain protected. Should researcher decide to use a research assistant, he/she will sign a confidentiality agreement.

This study has been .CC/5F,8(J=(Education, Extension, Augustana, Campus Saint Jean Ethics Board (EEASJ REB) at the University of Alberta. If you wish a clarification of rights as a research participant, you can contact at the number and address below.

Bryan Clarke, University of Alberta Edmonton, Alberta T6G (587) 785-4344
Email: bclarke1@ualberta.ca
!57-,7>(Q5/A(
Please sign the form below to indicate your willingness to take part in the study described above.
I, _____, have read the accompanying information letter and give my consent to participate in the research study, Student Experiences in Science and Religion, conducted by Bryan Clarke.
I consent to (Please tick each item you consent to):

- ○ complete a survey
- ○ answer several open ended questions
- ○ be interviewed if necessary at a future time

In agreeing to take part in this study, I understand that:

- ○ I am under no obligation to participate
- ○ Even after giving my consent to take part, I may discontinue my participation without penalty at anytime. I may withdraw information that was already collected by contacting Bryan Clarke or the professor of CHRTC 350 within one month of the collection of that data.
- ○ Information that is provided will be treated as confidential. Direct quotes may be used in research reports (i.e. presentations and publications), but my name and other

identifying information will be changed or omitted.

- Research reports will be used for academic and professional presentations (e.g. conferences, workshops) as well as academic and professional publications. They will also be used to inform teaching practices.

_____

(print Name)

Signature Date:

The plan for this study has been reviewed for its adherence to ethical guidelines and approved by the Education, Extension, Augustana, Campus Saint Jean Ethics Board (EEASJ REB) at the University of Alberta. For questions regarding participant rights and ethical conduct of research, contact the Chair of the EEA REB at 780-492-3751

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Thank you for consenting to help us with this pilot study for CHRTC 350 by answering the questions below. (it is possible we will contact you for follow-up)

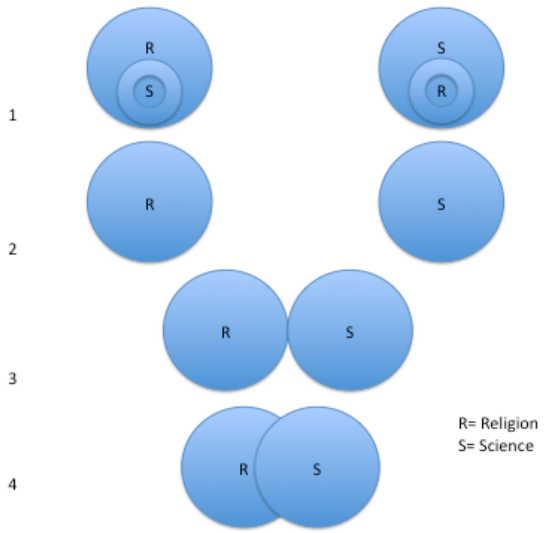
Can you remember any defining moments in CHRTC 350?

What were your preconceptions of the class?

Did you make any changes to your views while in the class? If so, what were they?

Which diagram below best represents where you started the class, where you ended class, and where you are now?

OR



1- Religion over Science) ' (Science over Religion 2- Independence between Science and Religion 3- Science and Religion in dialogue 4- Science and Religion integrated

If possible outline a timeline of your class progress.

Describe your thought process (anecdotes) as it happened in the class. Is there something we need to ask? (if there are any notes you made in the class that would help provide insight into any of the questions please include them with a date if possible)

Thanks, we appreciate your feedback

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BEYOND THE "EVOLUTION" *VS.* "CREATION" DEBATE

Denis O. Lamoureux DDS PhD PhD
St. Joseph's College, University of Alberta

THE PROBLEM

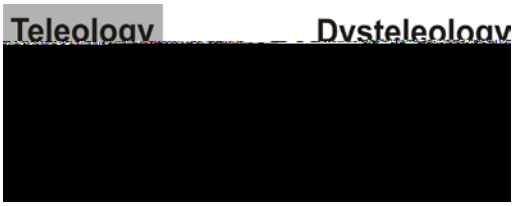
DICHOTOMY

"SCIENCE"	"RELIGION"
"Evolution"	"Creation"
No God	God
Humanist Ethics	Biblical Ethics
↓	↓
SCIENTISM	FUNDAMENTALISM
Science & Secular Worldview	Christianity & Origins in 6 Days
CONFLATION	CONFLATION

Dichotomy: Division of an issue into two simple positions
Caused by 'black-and-white' & 'either/or' thinking
Humanism: Belief that humans alone determine values & morals
Conflation: Sloppy blending of distinct ideas into one simple idea

TOWARD A SOLUTION

A. Terms & Definitions



Teleology: Belief the world has plan & purpose
Dysteleology: Belief the world has NO plan & purpose
Evolution: Scientific theory that natural processes over billions of years produced all living organisms, including humans
Creation: Belief that the world is the product of the Creator

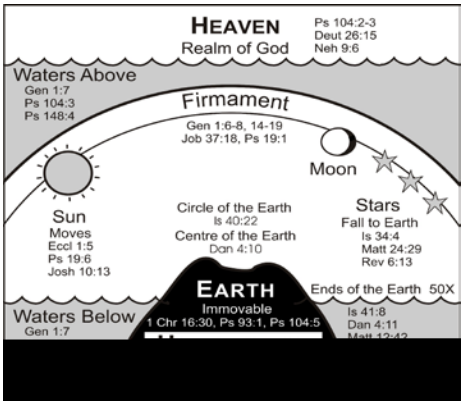
B. Science-Religion Relationship

Intelligent Design: Belief that the beauty, complexity, and functionality in nature point to an Intelligent Designer

C. Views on the Origin of the Universe & Life

(Back of handout)

The 3-Tier Universe



Flood Account Chiasm (Gen 6-9)

A Noah & his sons Shem, Ham & Japheth
B Promise to flood & to establish Covenant
C Preservation of life & food for sustenance
D Command to enter ark
E **7 days** waiting for earth to flood
F **40 days** waters increase & ark floating
G **150 days** waters prevail
CENTER **GOD REMEMBERS NOAH**
G' **150 days** (end of) waters abate
F' **40 days** (end of) waters decrease & ark resting
E' **7 days** (periods of) waiting for earth to dry
D' Command to leave ark
C' Multiplication of life
B'
A'

Creation Account Panels (Gen 1)

CONCLUSIONS

- Define the Terms & Concepts
- Recognize the Faith Jump
- Move Beyond the "Evolution" *vs.* "Creation" Debate
- Consider the Two Books Model:
  Book of God's Works → Nature → Physical
  Book of God's Words → Scripture → Spiritual

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Views on the Origin of the Universe & Life

	YOUNG EARTH CREATION "Creationist" Position Creation Science	PROGRESSIVE CREATION Old Earth Creation Day-Age Theory	EVOLUTIONARY CREATION Theistic Evolution	DEISTIC EVOLUTION God-of-the-Philosophers "Theistic" Evolution	DYSTELEOLOGICAL EVOLUTION "Evolutionist" Position Atheistic Evolution
Teleology	Yes	Yes	Yes	Yes	No Plan & purpose a delusion
Intelligent Design	Yes Points to a Designer	Yes Points to a Designer	Yes Points to a Designer	Yes Points to a Designer	No Design a delusion
Age of the Universe	Young 6000 years	Old 10-15 billion years	Old 10-15 billion years	Old 10-15 billion years	Old 10-15 billion years
Evolution of Life	Rejects macro-evolution Accepts micro-evolution	Rejects macro-evolution Accepts micro-evolution	Accepts macro-evolution	Accepts macro-evolution	Accepts macro-evolution
God's Activity in the Origin of the Universe & Life	Yes Direct Interventions over 6 days	Yes 1. Direct for basic "kinds" of life Interventions over billions of yrs 2. Indirect for inanimate universe *Ordained & sustained natural processes*	Yes Indirect *Ordained & sustained natural processes*	Yes Indirect Ordained natural processes God never enters the world	No Blind chance natural processes God a delusion
God's Activity in the Lives of Men & Women	Yes Personal God Dramatic & subtle	Yes Personal God Dramatic & subtle	Yes Personal God Dramatic & subtle	No Impersonal God God never enters the world	No No God God a delusion
Nature of the Bible	Word of God Inspired by Holy Spirit	Word of God Inspired by Holy Spirit	Word of God Inspired by Holy Spirit	Human beliefs about God Rejects divine revelation God never enters the world	Human superstitions Rejects divine revelation God a delusion
Interpretation of Genesis 1-11	Strict literalism Creation days = 24 hrs Global flood	General literalism Creation days = geologic ages Local flood	1. Divine Theology 2. Ancient science 3. Ancient poetry	Irrelevant origins myth	Irrelevant origins myth
Origin of Humanity	Adam & Eve Accepts Image of God & human sin	Adam & Eve Accepts Image of God & human sin	Humanity evolved Accepts Image of God & human sin	Humanity evolved Rejects Image of God & human sin	Humanity evolved Rejects Image of God & human sin
Theology/Philosophy	Conservative Christianity Accepts Incarnation & Resurrection	Conservative Christianity Accepts Incarnation & Resurrection	Conservative Christianity Accepts Incarnation & Resurrection	Deism & Liberal Christianity Rejects Incarnation & Resurrection	Atheism Rejects Incarnation & Resurrection
Ethics	Biblical	Biblical	Biblical	Humanism	Humanism
Examples	*Institute for Creation Research*: Henry Morris & Duane Gish *Answers in Genesis*: Ken Ham	*Reasons to Believe*: Hugh Ross [Intelligent Design Theory]	Roman Catholicism Some Evangelical Protestants Francis Collins	Charles Darwin Michael Denton Anthony Flew	Richard Dawkins Daniel Dennett Christopher Hickens

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DOL, *Evolutionary Creation: A Christian Approach to Evolution* (2008) 500 pages.
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www.ualberta.ca/~dlamoure

Web Lectures: In slides & audio with handouts. Includes this lecture and chapter summaries of my book *Evolutionary Creation: A Christian Approach to Evolution*.
Papers: Evolutionary Creation, Ancient Science in the Bible, Charles Darwin & Intelligent Design, Debates with ID Theorists Phil Johnson & Michael Behe.
Online Science-Religion Course:
CHRTC 309 Topics in Christian Faith: Evolutionary Creation
Syllabus at: www.ualberta.ca/~dlamoure/online_ec.htm