INTEGRATED INSTRUCTIONAL PROGRAMMING MODELS FOR DEVELOPMENT
OF 21st-CENTURY EDUCATION CORE COMPETENCIES.

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Abstract
This study modified the Assessment & Teaching of 21st-century Skills™ Knowledge Building Analytic Framework survey to compare secondary-level integrated outdoor, experiential, and ecological education (OE3) and conventional instructional programming models (IPMs) in Whitehorse, YT. The quantitative attitudinal data indicated the degree to which participants perceived each as developing 21st-century core competencies, including; creativity, collaboration, and critical thinking, as well as various social, digital, and economic literacies. Comparison of quantitative attitudinal data indicated higher average ratings by integrated OE3 participants for all categories, with statistically significant differences in nine of twelve competencies. Exciting information and communication technology (ICT) innovations have the potential to overshadow traditional OE3, which has been shown to promote 21st-century competencies and nurture holistic wellness. A refined definition of an ‘educational system’ into component pedagogies and IPMs promotes conceptual blending to meet the evolving needs of learning communities and to increase resilience within a dynamic 21st-century educational system.
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<table>
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<th>Description</th>
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<tbody>
<tr>
<td>EnvEd</td>
<td>Environmental Education</td>
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<tr>
<td>ExEd</td>
<td>Experiential Education</td>
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<tr>
<td>EcoEd</td>
<td>Ecological Education</td>
</tr>
<tr>
<td>ICT</td>
<td>Information and Communication Technology</td>
</tr>
<tr>
<td>IPM</td>
<td>Instructional Programming Model</td>
</tr>
<tr>
<td>OE3</td>
<td>Outdoor, Experiential, and Ecological Education</td>
</tr>
<tr>
<td>PBL</td>
<td>Project-based Learning</td>
</tr>
<tr>
<td>PLN</td>
<td>Personal Learning Networks</td>
</tr>
<tr>
<td>STEAM</td>
<td>Science, Technology, Engineering, Arts, Mathematics</td>
</tr>
<tr>
<td>TBL</td>
<td>Technology-based Learning</td>
</tr>
<tr>
<td>UNESCO</td>
<td>United Nations Education, Science, and Cultural Organization</td>
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Glossary

**21st-Century Core Competencies** - Characteristics that can help individuals effectively interpret and respond to challenges and opportunities. Such ‘habits of mind’ are characterized by their transferability between situation and context. Ex. Critical thinking, Creativity, Collaboration, etc.

**21st-Century Education** - Pedagogies and instructional programming models that emphasize learner-centred, exploratory, and highly-connected - interpersonal and digital - information exchanges. Methods are increasingly decentralized and individuated, which requires improved critical thinking, metacognitive, and information literacy competencies.

**21st-Century Skill Sets** - Specific capacities and aptitudes that are assumed to be key to success in an intensifying technological world. Ex. Computer programming, computational thinking, information and research literacy, etc.

**Creative Economy** - Decentralized system of generative development of social innovations, design, and aesthetic products and services

**Industrial Economy** - Based in large-scale manufacturing of physical products.

**Information Economy** - The creation, collection and distribution of information as a service or commodity.

**Instructional Programming Model** - Inclusive of the location, duration, and available resources that influence and structure the lesson planning and execution. Pedagogy is facilitated by the physical environment and logistical constraints, or lack thereof, that the IPM’s venue, schedules, and staffing involve.

**Knowledge Economy** - Extension of the information economy, it applies the information in
context-relevant ways to create products, design solutions, and test innovations.

**Outdoor, Experiential, and Ecological Education** - Catch all term for the heuristic, haptic teaching methodologies that emphasize practical application and hands-on learning. Specific foci are often crafted to support improved nature-connectedness and social development.

**Pedagogy** - The craft of teaching and instruction, especially children and youth. Pedagogical methods may follow specific ideologies (e.g. behaviourist, constructivist, critical, etc.) and are generally guided by assumptions how to best ‘lead a child into the world’ or, more specifically, how to prepare a child to fit into a particular social system.

**Web 1.0** – Transmissive technology (hardware and software). Websites provided information and interactions were generally one-directional.

**Web 2.0** – Transactive technology (hardware and software). Poly-directional, participatory, and socially connective applications that promote engagement. Hyper connectivity and sharing from social media platforms expand possibilities of how information is shared, received, and created.

**Web 3.0** – Semantic web interactions where standardized data formats allow for rapid communication across enterprise, application, communities and databases.
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Dr. Bob Kull, thank you for educating me in humility when all I brought to the conversation was hubris. Together with Peter Norman, I hold you both in the highest regard as the embodiment of enlightened diamond minds.

Bud and Linda Gooderham, my parents, deserve my profound gratitude for their unwavering support over the past 36 years. Thank you for believing in me so that I could believe in myself.

For my wife, Katie Beadon, and the way she inspires me to strive to be the best person I can be.
Dedication

I dedicate this to George and Johnny Bradley. Loving Grandparents who instilled in me a deep aesthetic appreciation for family, nature, and simplicity.

For Buddha, Bunny, and all the future leaders of this world by whom this work is driven and inspired.
Chapter 1: Introduction

According to the emergent ‘21st-century education movement’, students require specific skill sets and core competencies to be successful in an increasingly uncertain future (Dede, 2009; S. Johnson, 2009b; Mathieu, 2005; Salpeter, 2008). This nascent pedagogical framework is being developed to educate our children and youth in such a way that they will become a critically minded, creative, and conscientious citizenry. In 2000, Richard Judy of the Hudson Institute expressed to a subcommittee of the U.S. House of Representatives his vision for a workforce equipped with 21st-century skills:

…adaptability, receptivity to change, and the motivation to be a lifelong learner. Higher requirements are everywhere evident for “soft” skills (communications skills in the English language; ability to work in teams, to relate well to customers, to interact with fellow workers, etc.) as well as for cognitive and job-specific skills. Rapid technological innovation in the American economy means that the requirements for knowledge, problem-solving skills, and the ability to find needed information to solve work-related problems are also on the rise. (Judy, 2000, p. 6)

The 21st-century education movement has since begun to reorder pedagogical priorities so that students may be educated in such a way that they can confidently engage the projected demands of industry, society, and the environment (Bingimlas, 2009; Hudson, 2001).

Integrated Outdoor, Experiential, and Ecological Education (OE3) programs provide an alternative to the conventional model for the development of 21st-century skills. If integrated OE3 programs are not inferior to conventional education models in pedagogical outcomes and costs, this justifies the creation, continuation and diversification of such models within the existing educational system. I hope the outcomes of this study will positively influence the
expansion of active, nature-connected programming in a mainstream educational system that is increasingly influenced by indoor, sedentary programming. (Davies & Ryan, 2011)

**Topic Background**

*Outdoor, experimental, and ecological education.*

OE3 is a term coined by Dr. Tom Puk, instructor of Environmental Science in the Lakehead University Education Department for three educational streams, outdoor education, experiential education, and ecological education, that employ different instructional programming models (IPMs) to meet similar pedagogical outcomes. They share beliefs and practices that promote active, hands-on learning for meaningful knowledge acquisition and understanding.

*Outdoor education* (OutEd) refers to the teaching and learning of skills for outdoor, wilderness living. This may include campcraft, navigation, species identification, safe travel preparation and the like. OutEd embraces many traditional ways of knowing and living and is the foundation of what has developed into more formalized and academic activities.

*Experiential education* is a pedagogical philosophy that can be applied to many teaching practices when educators want to have learners engage in direct experience. It follows a constructivist approach by emphasizing guided reflection in order to build knowledge, develop skills, engage in a posteriori sense-making, and develop deeper understanding of phenomena (*AEE*, 2014).

The adoption of the term *Ecological Education* (EcoEd) in OE3 is meant to assimilate ‘environmental education’ (EnvEd) and expand the term to embrace ecological principles and encompass systems theory. The EcoEd component of OE3 draws heavily on holistic interpretations of the natural world by seeking and drawing out connections between nodes in the
web of life. “By adopting a holistic approach, rooted in a broad interdisciplinary base, it creates an overall perspective which acknowledges the fact that natural environment and man-made environment are profoundly interdependent” (UNESCO, 1978b, p. 2). The Tbilisi Declaration of 1977 sought to refine the definition of EnvEd in order to reconcile the persistent notion that ‘man’ had dominion over ‘the environment’ and they largely operated as two discrete interacting systems (Campbell, 2010; UNESCO, 1978a). “(T)hose of us in environmental education need to renew our commitment to a sustainable human future. The foundation of sustainability, however defined, will be the clear awareness that our well-being is inseparable from that of nature” (Orr, 1992, p. 148).

The UNESCO-sponsored Tbilisi Declaration (1978) recommends that “…member states…develop a systems approach to the analysis and management of natural and human environments” (p.99). The phrasing echoes of the previous binary definitions of ‘human’ and ‘natural’ by emphasizing that the two environments are separate, as opposed to two components of the same system. However, refinements within the definitions include words such as community, complexity, interdependence, processes, and comprehensive, all terms that are common to systems thinking and form the foundation of Ecology as a discipline (Capra, 1994; Odum & Barrett, 2005; Orr, 1992).

The term EcoEd dissolves the artificial boundary between human and natural environments and builds on the previous definition of EnvEd, such as was provided in Tbilisi. EcoEd, having grown from the study of ecology and systems thinking, places us directly within and as a part of, the earth’s living and non-living systems (Hautecoeur, 2002; Puk, 2002).

**Conventional education.**

Conventional education refers to the dominant pedagogies and IPMs that typify
mainstream education. Conventional education is generally organized using ‘factory-model’ scheduling and administration (Friesen & Jardine, 2009; Robinson, 2010; Shortt & Thayer, 1997). Courses are often discrete, curricula and assessments are widely standardized, and the scheduling of each day and year follow the requirements of a 20th-century industrial or agricultural economy.

**Philosophical divergence between 20th- and 21st- century education.**

The general imperative to have our children educated to become capable and confident individuals has long been held by parents and society. Lindsay and Ewert (1999) rightly point out the many similarities between the fundamental objectives of 20th and 21st-century education. However, despite their observations, which include fostering academic development, instilling a sense of civic responsibility, vocational preparation, and socialization, the overt means and subtleties of applied educational models can lead to very different experiences and outcomes. The principal difference between 20th and 21st-century education is that in the former students were considered passive recipients of a body of common knowledge and in the latter they are actively engaged participants in the process of personal growth and development (Carroll, 1990; 1994; Itin, 1999; Lindsay & Ewert, 1999; Rankin, 2007; The Carnegie Foundation for the Advancement of Teaching, 1906).

There is at present a paradigm shift in process where education is moving away from the “sage on the stage” and towards the “guide on the side” model of instruction. In the latter, teachers assume the role of facilitators of individualized knowledge exploration and act as maps that can lead students towards different information access points (Banathy, 1999; King, 1993; Lindsay & Ewert, 1999; Rankin, 2007; Ravitch, 2007). To extend the metaphor, students may use the maps to arrive at a predetermined location, but the ways in which they choose to do get
there may be different from their peers despite the fact that they are using the same map.

The conceptual relationship between an educator and learner as co-sojourners was popular with the progressive educational movement in the early 20th-century and was embodied in the work of John Dewey (Dewey, 1938; Estes, 2004; Itin, 1999; Kraft, 1986; 1999). This learner-centred experiential approach has more recently gained influence and popularity within the mainstream systems looking to adapt to the changing needs of the ‘Knowledge Age’ (Hackmann, 2004; Ontario Ministry of Education, 2010; Stringer, 1999). It has no doubt been strongly influenced by the ubiquitous access to information that was unheard of in the pre-internet era and has become unfathomable since the rise to Internet 2.0. The unlimited availability in time and space of teaching and learning resources has necessitated a complete revisioning of how, where, when, why, and from whom education can be received (Baird & Fisher, 2006; Cookson, 2009; Dabbagh & Kitsantas, 2012; Joseph, 2012; Siemens, 2008). Technological innovations and the accompanying applications have put students and teachers on more equal ground with regards to information access and have expanded the range of practical assessment strategies. As the means by which information is accessible changes, it stands to reason that the models of inculcating our students with the values and competencies related to its wise use should be adapted accordingly (Autor, Levy, & Murnane, 2003; Greenhow, Robelia, & Hughes, 2009).

Youth agency and the promotion of self-directed, engaged exploration of knowledge is driving pedagogical reform and from this it reasonably follows that the IPMs that scaffold these philosophies must also be updated to reflect contemporary educational research, objectives, and opportunities (Larson & Angus, 2011; Scardamalia, Bransford, Kozma, & Quellmalz, 2012). Educational administrators who anticipate and embrace changes by updating IPMs will have the
best opportunities to leverage millennia of pedagogical iteration against the fulcrum of technological advance. In my opinion, educators who do not evolve their practice to reflect the blending of 21st-century humanistic-digital skills and competencies should not be surprised to find their courses replaced by YouTube videos and Massive Open Online Courses (MOOCs). I believe that teaching must engage students with one another in critical inquiry and social development in such a way that incorporates, not competes with, the ubiquitous podcasted, video, and open-source courses offer quality instruction that is freely available, easily accessible, and constantly updated.

These concepts have been implemented at Abilene Christian University, TX and have benefitted from the work of former faculty William Rankin. Rankin, now Director of Learning at Apple Inc., has been instrumental in integrating digital technology into the curricula and pedagogy of 21st-century learning and an excellent article entitled “Convergence and the 21st-Century Classroom” can be found at www.acu.edu/technology/mobilelearning/vision/convergence. It cites a table by Rankin that compares the objectives and practices of 20th and 21st-century classrooms. Specifically, it notes that 20th-century classrooms were typified in the following ways:

“classroom presentations and materials are typically developed in advance outside of class with teachers as primary developers; classroom activity often focuses on the teacher as the presenter and the students as audience; classroom activity emphasizes exposition, displaying, organizing, summarizing, and explaining information; the classroom is the primary site of access to course content, and access is often “linear”- students cannot typically return to previous class presentations; students and teachers have access to one another primarily in the classroom; and discrete disciplinary boundaries are often
established and preserved.” (Rankin, 2007, para.3)

In contrast, he projects that the successful 21st-century classroom will have the following characteristics:

“(c)lassroom presentations and materials are developed dynamically both inside and outside of class with students as co-developers or as primary developers; classroom activity focuses on students as participants and agents and the teacher as guide or mentor; classroom activity emphasizes discover, application: finding, assessing, synthesizing, and utilizing information; access to course content is augmented by electronic sources and media, and access is often recursive or “on-demand”, allowing students to return to content when and as often as they like; in addition to classroom access, students and teachers have access to one another via virtual means: online discussions, email, chat, social networking, etc.; interdisciplinary connections are encouraged and disciplinary boundaries are seen as porous or even arbitrary.” (Rankin, 2007, para.3)

Research Background

Research problem.

The overarching problem that this study attempts to address is to understand how different IPMs help to develop the core competencies required by future generations of citizen-workers. Furthermore, rapid advances in educational technology are contributing to growing disparity between 21st-century-responsive IPMs and pedagogies and conventional educational models that are currently applied by the mainstream education system.

The innovations and evolutions of digital technology have significantly changed how, where, when, and by whom information is accessed (Baird & Fisher, 2006; Greenhow et al., 2009; Koller, Harvey, & Magnotta, 2008; Siemens, 2008). It has also significantly altered how
students and workers are creating information and the communication systems that transmit knowledge. The rapid development of technology and emergence of new economies have led to resources, methods, and objectives for 21st-century education that are significantly differentiated from those of the 20th-century. (Bertalanffy, 1972; P21.org, 2011; Rankin, 2007). This study assesses different IPMs for their ability to develop the following ‘21st-century’ core competencies: i. Creativity and Innovation, ii. Collaboration and Teamwork, iii. Critical Thinking and Problem Solving, iv. Communication, v. Citizenship, vi. Information and Research Literacies, vii. Social Literacies, viii. Digital Literacies, xi. Financial Literacies, x. Metacognition and Reflection, xi. Accountability: Personal and Social, and xii Ecological Literacy.

I am not presently aware of any studies that have studied the efficacy of OE3 programs in meeting the objectives of 21st-century education. Recognition of this justifies an evaluation of how different IPMs can be blended with context-responsive pedagogies to promote the revised and updated educational objectives.

Acknowledgement that the dominant economic drivers of the 20th-century, such as industry and manufacturing, were largely responsible for standardizing the mainstream pedagogy and IPMs calls into question their applicability in new emergent economies (Stuart, 1999). Information, creative, and knowledge-based industries are projected to continue to increase in importance and relevance to life in the 21st-century (Binkley et al., 2011; Robinson, 2010). In contrast to the standardized administrative model that dominated 20th-century mainstream education, this study proposes the intelligent diversification of blended pedagogies with IPMs that are contextualized to the needs of learner communities. The vision for 21st-century education using a more learner-centric educative approach is a departure from the current
didacticism of mainstream education (Bertalanffy, 1972; Greenhow et al., 2009; Rankin, 2007; Siemens, 2008). Siemens (2008) remarks that the “…World Wide Web… has raised the profile of networks as a means of human organization.” (p.5) He elaborates on how a systems approach can positively influence how education is designed to effectively to promote conceptualization, experimentation, and implementation, three key aspects shared with constructivist pedagogy.

**Guiding premises of the research.**

Four widely repeated conclusions form the guiding premises for this research.

1. The core competencies required for a successful life in the 21st-century are broadly focused on creativity, collaboration, and critical thinking as well as social, digital, and economic literacies (Binkley et al., 2012; Crawford, 2003; Hmelo-Silver, Chernobils, & Jordan, 2008; Jerald, 2009; Mathieu, 2005; Robinson, 2010; Rotherham & Willingham, 2009; Scardamalia et al., 2012; Stuart, 1999; Trespalacios, Chamberlin, & Gallagher, 2011).

2. Cultural momentum and social pressure to implement emergent information and communication technology has the potential to overshadow the time-tested effectiveness of OE3 in developing these 21st-century core competencies (Goldenberg, McAvoy, & Klenosky, 2005; Looney, 2005; Martin, 2012; Prensky, 2010; Project Tomorrow, 2009; Stringer, 1999).

3. Research by social psychologists, neurobiologists, health professionals, and educators have all shown that time spent being active in natural environments is positively correlated to improved psychological (Fromm, 2009; Hans, 2000; Kahn & Kellert, 2002; Louv, 2008), physical (Charles, 2010; Cleland et al., 2008; Dickson, 2008; Laurson et al., 2008; Leiba et al., 2012; Mark & Janssen, 2008; National Office of The Surgeon General,
1998), and social wellness (Hungerford, Volk, & Ramsey, 2000; Learning and Teaching Scotland, 2010; North American Association of Environmental Education; The National Environmental Education and Training Foundation, 2001; Sobel, 1999).

4. Experiential, hands-on learning scheduled to provide extended time for engagement and immersion has been shown to increase both student and teacher satisfaction with the educational experience. (Zepeda & Mayers, 2006) Likewise, scheduling fewer classes for longer periods, a hallmark of integrated curricula and OE3, has been shown to improve retention of information, decreased instances of misbehaviour, and promotion self-expression through individualized demonstration of comprehension (Carroll, 1994; Eineder & Bishop, 1997; Evans, Tokarczyk, Rice, & McCray, 2002; Koller et al., 2008; Rettig & Canady, 1998; 2001; Zepeda & Mayers, 2006).

Research question.

The overarching research question was: To what degree do secondary school students interpret instructional programming models as facilitating the development of 21st-century core competencies?

Additional sub-questions that guided inquiry but were not systematically answered in this thesis include:

1. What observations do students make regarding their experiences in semester-long integrated OE3 programs when compared to the experiences of their peers in conventional classroom settings.

2. Upon reflection, what skills do participants in both conventional and OE3 instructional programming models believe they have learned?

3. What is their sense of core competency development?
4. How are these skills related to the objectives of 21st-century education?

**Research hypothesis.**

With these aforementioned premises in mind, the study tested a hypothesis that students involved in integrated OE3 programs would not rate their perceived development of 21st-century competencies as being different from their peers in conventional IPMs. The null hypothesis then is that students will perceive integrated OE3 programs as offering no difference for developing their 21st-century core competencies. This study compares and contrasts integrated and conventional models in general, but has narrowed to scope of the integrated model to focus on OE3 programs in Yukon Territory in particular. This follows from the recognition by Scardamalia et al. (2012) that research into 21st-century competencies would benefit from greater understanding of how they are currently represented and what are their trajectories in various current learning environments.

**Research delimitation and limitations.**

The research is delimited by the mandate to explore the outcomes, beneficial or otherwise, of two distinct IPMs, Integrated OE3 and Conventional. Although a comparative analysis of the two is necessary, the research objective is to determine the extent to which both IPMs influence student perceptions of 21st-century competency development.

Yukon Department of Education offers several integrated programs including an arts-focused integrated program (visual and dramatic) and OE3. This study concentrates solely on those with an OE3 focus. The efforts of a dedicated cohort of educators have grown the Yukon’s integrated model of education includes an astonishing 12 programs, many of which are housed within the Wood Street School (R. Sharp, 2011). Wood Street School currently has 8 integrated semester programs, seven of which are OE3-focused and one with an Arts focus. Porter Creek
School in Whitehorse offers one grade 9-level OE3 integrated program in each semester and there is a satellite ES11 course offered in Haines Junction, YT (Yukon Education, 2014). To put this into perspective, Education Yukon has approximately 240 seats/year in OE3-focused integrated programs (1 seat per 9.3 students) whereas Vancouver District School Board offers one OE3-focused integrated program (TREK) that can offer 112 seats/year (1 seat per 293 students).

A potential limitation is related to the extent to which 21st-century educational pedagogies have been implemented and supported by local and territorial/provincial administration. Each school’s administration will strongly influence the standards under which their IPM operates; any intra-institutional differences could be related to the pedagogical style that each model is designed to emphasize. The influence of individual teachers on the student experience of 21st-century teaching practices cannot be underestimated. However, I feel that any school specific data indicating different student experiences in 21st-century skill development is valuable regardless of the extent and/or the nature of the program in which it is found.

Data comparison from larger test and control groups could provide more generalized evidence of how 21st-century skill development is being addressed by two distinct IPMs

*Indigenous and land-based epistemologies.*

It is out of the deepest respect and intention that the perspectives of Indigenous people have not been included in this survey of the literature. It is not my place to comment on the experience of indigenous peoples, nor do I feel that I could adequately represent their rich and powerful beliefs, customs, and history in such a way that would respect and convey their millennia-old cultural experiences.

Although there is some commonality in the practices shared between OE3 and
Indigenous pedagogies and, it may even be argued, between 21st-century education and traditional Indigenous ontologies, the scope of this research is particularly concerned with Western educational models, practices, and worldviews.

**Social significance of the research.**

As previously mentioned, recent advances in educational and social technology (e.g. video games, social media, internet-based activities, accessibility of both hard and software, powerful apps and programs, etc.) although extremely valuable tools, have begun to overshadow the importance of nature-connected educational opportunities (Bentley, 2010; Zaradic & Pergams, 2007).

The criticisms of digital technologies’ application methodology are primarily related to their sedentary and ‘indoor’ nature. Trespalacios et al. (2011) contributed to this perception by having students inside for two weeks over the summer to study video gaming as a means for developing 21st-century skills. The perceived overconsumption of ICT and the resulting deteriorative impacts on health is of increasing concern for researchers, teachers, and parents who view it as a contributor to behaviour aberrance, obesity, and heart disease (Laurson et al., 2008; Mark & Janssen, 2008; Zabinski, Norman, Sallis, Calfas, & Patrick, 2007). Many publications have focused on the negative effects on physical, psychological, and social wellness that results from the growing disconnect between youth and their natural surroundings (Boesveld, 2012; Cleland et al., 2008; Dickson, 2008; Hutchinson, 2012; Laurson et al., 2008; Leiba et al., 2012; Louv, 2008; Mark & Janssen, 2008; Zabinski et al., 2007).

OE3 programs generally, and integrated OE3 IPMs in particular, are uniquely positioned to integrate extended-duration nature-interactive activities with digital literacy instruction in ways that can enhance the students’ experience with both. By crafting and presenting very
deliberate lessons that apply both in varying degrees, which depend on the nature of the desired learning outcomes, the programs can foster meaningful development of all categories of 21st-century core competencies. Teaching digital literacy in active, natural environments addresses the principal concerns of critics that technology is negatively affecting the holistic (i.e. physical, emotional, psychological, social, and natural) wellbeing of the digital native generations.

Education is capable of setting conditions for technological development by nurturing the decidedly analog “human” competencies of creativity, collaboration, critical thinking, and citizenship. According to leaders in the knowledge economy and 21st-century education movement, individuals equipped with these core competencies have the potential to positively influence dynamic innovation and technological advancements (ATC21S.org, 2012; Google, 2014).

Although there are significant costs, society as a whole can benefit from the expansion of digital technology just as 15th century society evolved with Gutenberg’s printing press, and likely in the same manner. If it is a tool used by people to continue to explore and expand their capacity for humanity, technology can amplify the reach of our collective imagination, creativity, and innovation (Stringer, 1999).

Researcher’s Perspective

In order to situate myself, I want to introduce my own perspective on the topic. I am a BC certified teacher, the Founding Faculty of Coast Mountain Academy (CMA) and the architect of the 21st-century IPM currently in use at the Squamish, BC independent school. I have spent over 20 years in OE3 programming and completed my teaching degree at Lakehead University with certification in Geography and Environmental Science with a specialization in outdoor, experiential, and ecological education.
I have seen first hand the transformational effect of OE3 on youth and adults alike while working with Outward Bound, Blyth Academy Summer Semester Abroad, and Yukon integrated OE3 programs, as well as in a number of other independent schools and summer camp/outdoor education centres. The bias that I recognize balance in my work is the belief that nature interaction is absolutely critical to developing affective connections with the ecological systems that support human health and wellness.

While at CMA, I was the coordinator of both technology and the extensive OE3 program. This provided a very unique opportunity to develop, practice, and iterate the integration of the two disciplines that are commonly seen as oppositional. I view technology and OE3 as core nodes within a 21st-century ecology of learning and value the judicious application of technology at times when it can enhance learner experience.
Chapter 2: Research Context

Introduction and Parameters of the Research

The topic of this research is anchored within a detailed examination how existing pedagogies and IPMs can be adapted and applied to meet the objectives of the 21st-century educational movement. Further to this, integrated OE3 and conventional IPMs were compared and contrasted to determine how each can be employed to meet our present understanding of the objectives. This research assumes that the continued application of OE3 programming is dependent on whether or not it has the capacity to meet and/or exceed the standards of instruction and student achievement established by the growing 21st-century education movement. My research is designed to explore where our education system is succeeding and is intended to determine if and to what extent different methods can develop 21st-century core competencies in particular and nurture holistic well being in general.

Basis for Literature Selection

The literature has been selected to reflect the historical development of paradigms concerning the role of formal and informal education in preparing individuals to serve the needs of society and self. As this research frequently contrasts the mainstream conventional education system to classical/traditional and OE3-centric pedagogies, a retrospective on the development of worldviews that situate humans in relation to nature is also included. The review covers historical texts that shed light upon the roots of Western thought, resources that document the changing nature of human-environment relations throughout the 19th and 20th centuries, and seminal works that had a powerful influence on the philosophy and psychology surrounding the Western environmental worldview.

I will present literature that documents the historical evolution of formal education in
North American society and the influence that the dominant economies have had in setting the directions for both pedagogies and instructional programming models. This background is of importance when examining the past, current status of, and potential future directions for education and educational priorities.

Although the vast majority of the literature has come from peer-reviewed journals and books, the influence of blogs, websites, online databases, and social media on the research cannot be underestimated. The resources provided by social media in particular are especially salient when one seeks to understand the experience of teachers, researchers, and students in response to cutting edge innovations in educational technology and practice.

**Review of the Field of Research**

**Principal questions in the field.**

One of the questions being asked by educational administrators in the mainstream is *how can education be adapted to ensure that students remain competitive in education and industry* (ATC21S.org, 2012; Dede, 2009; Scardamalia et al., 2012; Siemens, 2008)? This question is the fundamental driver of the development of 21st-century learning objectives. As business and industry tackle the challenges associated with uncertainty in the direction of economies, education administrators are faced with the question of *how do the pedagogies and IPMs employed contribute to the development of a resilient workforce?* This is balanced with *how can educational pedagogies contribute to the development of a conscientious citizenry?*

The growing concern over the rise of psychological and emotional disorder is also beginning to draw a great deal of attention from policy makers and educators. There have been many active forums that deal directly with the nature-deficit disorder proposed by Louv (2008) and other research that asks to what degree does isolation from nature and the ‘free play’ that it
encourages affect the psychological well being of youth (and to a degree adults) (Boesveld, 2012; Bratman, Hamilton, & Daily, 2012; Cleland et al., 2008; Laurson et al., 2008).

How can we deconstruct the current outdated educational system and craft an ecology of learning that functions as a resilient and diversified system? is not yet a mainstream topic of conversation. Fromm (2009) has intimated that Ecology could be the ligative ideology capable of reconciling biocentrism, politics, philosophy, and theology. Further support for systems thinking approaches that follow ecological models to address the challenges facing society in general, and education in particular are gaining momentum (Capra, 1994; Cloud, 2005; Fromm, 2009; Meadows, 2008; Siemens, 2008).

General conclusions in the field.

Review of the prevailing discussions gives the impression that instead of elemental reform the popular response to the challenges of 21st-century education is to add digital technology to the existing 20th-century IPM frameworks. Research in support of the 21st-century education movement has so far been largely predicated on the assumption that its teaching and learning takes place indoors and requires improved access to digital educational technologies (Ashton & Newman, 2006; Binkley et al., 2011; British Columbia Ministry of Education, 2014a; Koller et al., 2008; Martin, 2012). In the vast majority of journals, books, reports, or government documents reviewed, the option of teaching 21st-century skills outside of the conventional classroom has received minimal attention. A review of the literature has led me to the impression that the dominant conclusions in the field are that, in order to teach 21st-century skills, the education system must: equip students with ICT resources (hardware and software), update the digital means by which students can be quickly and accurately assessed, and consider qualitative attributes of education with the same, or greater, weight as quantitative outcomes.
INTEGRATED IPMs FOR 21ST-CENTURY EDUCATION

(Binkley et al., 2011; Griffin, McGaw, & Care, 2011; Koller et al., 2008; Kozma, 2003). The former two seem to have received great attention and the latter seems to be addressed more tentatively. Wiggins & McTighe (2005) concluded that the demands of the 21st-century economies require educational models that are designed to foster conceptual understanding of processes rather than inculcation of practical skills and the training to apply them. To achieve this, most proponents agree that 21st-century learning is typified by transactive, rather than transmissive, pedagogies (Banathy, 1999; Estes, 2004; Itin, 1999).

**Discoveries, concepts and arguments.**

Richard Louv (2008) published one of the most influential explorations of child-nature relationships in recent times. *Last Child in the Woods* examines how ‘nature-deficit disorder’ is negatively affecting the holistic wellness of entire generations (Louv, 2008). Intensification of youth use of digital technology has been linked to various health and mental disorders that are only exacerbated by an educational systems that systematically cuts active, nature connected programs (Charles, 2010; Louv, 2008; Lowry et al., 2007; Mark & Janssen, 2008; Pergams & Zaradic, 2006; A. Simpkins & Simpkins, 2011).

The youth empowerment movement also requires that young people's’ agency be respected and its development encouraged so that they may add their voice to an environmental dialogue that will shape their future (Rickinson, 2001; Rickinson, Lundholm, & Hopwood, 2009; Wray-Lake, Flanagan, & Osgood, 2010). Schools of the future will do well to recognize the agency of youth and create inclusive decision-making models when it comes to the educational needs of students (Carroll, 1990; Rickinson et al., 2009; Scardamalia et al., 2012)

Wray-Lake et al. (2010) places strong emphasis on “students as long term markers of social change” (p. 62), and research should seek to understand how learners themselves perceive
nature or make sense of environmental education (EnvEd). EnvEd appreciates learners as active agents rather than passive subjects in their environments, educational settings and family homes (Ballantyne, Connell, & Fien, 1998; Ballantyne, Fien, & Packer, 2001a; Payne, 2005; 2010; Rickinson, 2001; Wray-Lake et al., 2010). The aforementioned research also suggests that, in order to have maximum influence, OE3 would do well to focus on promoting intergenerational transactive learning strategies that encourage students to teach to, and learn from their parents and other adults. The learner-centred, constructivist approach of OE3 has much in common with 21st-century education in that it has specific emphases on perceptions, experiences, and influence on parents or community (Rickinson, 2001).

**Research: Current gaps and future directions.**

The 21st-century education movement is highly motivated by curricular integration and research is beginning to show its influence through active assimilation into mainstream practices (Ontario Ministry of Education, 2010). Proponents of OE3 are now ideally positioned to capitalize on the existing evidence that suggests that it is highly proficient at meeting the objectives of both mainstream and 21st-century systems (Stringer, 1999). For many years, there existed a seemingly irreconcilable gap between 20th-century and OE3 educational models that resulted in splintering of ExEd approaches (Glover, 1999; Itin, 1999; Russell & Burton, 2000).

Within the academic literature and government at the highest level there is a clear and undisputed call to incorporate EnvEd into all levels of education (Bondar et al., 2007; Lieberman & Hoody, 1998; National Environmental Education Advisory Committee, 2005; Office of Superintendent of Public Instruction, 2009; Orr, 1991a; Puk, 2002; Sharpe & Breunig, 2009; Tilbury, 1995; UNESCO, 1978a). It has been pointed out that the hierarchical approach to implementation of EnvEd lacks two critical elements: 1) measures of accountability to ensure
EnvEd objectives are being sought and met and 2) formalized support structure for a practical shift towards action learning and experiential teaching methodologies (Grace & Sharp, 2000; Puk & Haines, 1999; Scardamalia et al., 2012; Stevenson, 2007). Addressing these two challenges requires a restructuring of the bureaucratic process to recognize the value of grassroots, community-based educational initiatives, and the quantitative data to support administrative decision making (Blair, 2008; Luchs, 1980; Uzzel, 1999; Waetjen, 1991).

Educational administrators require access to relevant data if well-informed leadership is to make choices that will take into account the many aspects of a holistic educational system (Waetjen, 1991). Integrated IPMs, specifically OE3, must raise its voice above the chorus concerned with the ‘technological panacea’ of more screens and higher bandwidth and make available to educators the teaching frameworks, as well as data that support them, that encourage learning outside of the conventional classroom (Crawford, 2003; R. Sharp, 2011; UNESCO, 1978b).

**Evolution of Outdoor, Experiential, and Ecological Pedagogies**

**Traditional social ecologies of learning.**

Human-nature interactions within ecological systems have long guided the exploration of, and hence education on, the external world. Interactive, exploratory experiences in and of the natural world have guided individuals and society towards an internalization of the ‘human condition’(Odum & Barrett, 2005; Payne, 2003; Payne & Wattchow, 2009). Millennia of human evolution have led to well-formed understanding of how different groups, communities, and societies learn and teach. The traditional social (learning) orientation was typified by recursive, experiential, multi-sensory - though largely haptic - nature-connected experiences in clearly defined social networks, which are said to have ‘layers of intimacy’. The ‘*Dunbar number*’
(Dunbar, 2010) identifies natural divisions within communities where layers of social intimacy scale in a very consistent pattern. They occur at 5, 15, 50, 150 and it is believe that there are more at 500, 1500, and even 5,300, which was proposed by Plato as the ideal size of a democracy (Dunbar, 2010). This understanding sets some empirical guidelines when considering how to optimize group, class, cohort, or school sizes to facilitate learning and achievement of specific objectives.

What motivates individuals to form social groups? Extrapolating from the work of Gardner (1983) on Multiple Intelligences it could be speculated that non-familial cohorts may choose to associate based upon their specific blends of intelligences in order to maximize their ‘communal knowledge’. We also see a division into social groups based upon commensurate interests and dispositions (Renzulli & Zhang, 2001). As will be demonstrated, this forms the basis of integrated IPMs that are proposed to influence the diversification of 21st-century educational models.

Our human dispositions to social, nature-integrated learning ecologies support one premise of this research that any new directions in educational practice should consider time-tested pedagogies and IPMs when attempting to develop enlightened 21st-century educational systems.

**Classical Western epistemologies and the influence on contemporary educational practice.**

Western civilization and the epistemologies that it expounds are generally agreed to have emerged from Greece in the centuries leading up to the start of the Common Era (Reeve, 2004). It is important to note that the core competencies of 21st-century education - creativity, collaboration, critical thinking, and citizenship - were equally, perhaps more so, relevant in
Socrates’ day as they are now in ours (Cookson, 2009; Hahn, 1965; James, 2000; Rotherham & Willingham, 2009). At this time, philosophers such as Socrates, Plato, and Aristotle were operating schools with the expressed desire to activate the human mind in explorations of the natural sciences, epistemology, and ontology. At Plato’s school, Akademia, or The Academy, the dialectic method was employed and polished in long exchanges on the nature of society, good and evil, truth, and beauty (Reeve, 2004). The education of the acolytes through this method would have required a strong dedication to developing their critical, creative, collaborative and communicative faculties. The pedagogical model of The Academy was a progenitor of learner-centric constructivism. For example, two women were known to have studied with Plato, making his school elite but not exclusive, and the long hours and days of dialectic took place in a sacred olive grove where all could join in a circle with no head or leader, only the distinction between junior and senior members (Dillon, 2003; Reeve, 2001). This particular aspect has much in common with the pedagogical and organizational practices of OE3, many practitioners of which see the circle as being the physical manifestation of the philosophy of equality. The style of dialectic learning practiced by the Ancient Greeks is henceforth referred to as Classical Education. This style involved an organization that nurtured a highly transactive ecology of learning that valued each member for what they could add to the dialectic interactions.

Aristotle’s statement that “the whole is greater than the sum of its parts.” underlies the sum of earliest conceptual and philosophical explorations into systems thinking that were being established in this period (Bertalanffy, 1972; Meadows, 2008; Rotherham & Willingham, 2009).

One of the earliest recorded examples of man’s belief that they are separate from, and in fact superior to, the natural world can be found in Genesis 1:26 (Campbell, 2010). The mentality of ‘dominion over nature’ has been infused in the subsequent Western decision-making models
and have guided much of the way that Western society has chosen to interact with the natural world. Ironically, this religious belief would also have influence in the thinking that led to the scientific revolution.

**Influence of Enlightenment thinking on Western epistemologies.**

Classical education was expanded and applied to further exploration of natural sciences that themselves led to the development of the scientific method and the expansion of enlightenment reductionism. It is outside of the scope of this research to review effects of Newtonian mechanism but suffice to say that the reductionist approach to knowledge generation stands in opposition to the integrative systems approach currently favoured by proponents of integrated curricula for 21st-century educational excellence (Banathy, 1999; Senge, 2002). The influence of Cartesian reductionism has also contributed a certain degree of psychological divorce of humans from both the abstract systems thinking and the concrete ecological systems upon which we are physically dependent. (Bertalanffy, 1972). This conceptual human-nature separation of has manifest in the unfettered exploitation of natural resources, specifically fossil fuels, that has, without question, had a catastrophic effect on the earth’s biological systems (Barry, 2009; Guggenheim, 2006; IPCC, 2014; Payne, 1997). This duality has also influenced the ways in which social systems were conceived and built in the industrial age, inclusive of education (Bertalanffy, 1972). The mainstream ‘Carnegian’ organization of educational systems that dominated the Industrial Age has been challenged by those in favour of what Carroll (1990) has called, the ‘Copernican system’. It is described in detail below in the section: *Defining 20th-century education.*

**The Progressive Education movement of the early 20th-century.**

Even in the assembly line educational systems arising from the demands of the industrial
revolution and subsequent technological explosions of the post-nuclear era, there were still those who recognized the profits of classical educational methods and the potential for their reinvestment in future models. The ‘progressive education’ movement of the early 20th century emphasized subjective, experiential knowledge development in contrast to the objective, skills-and-drills-focused educational machine of the time (Dewey, 1938; Kraft, 1999; Montessori, 2004). The leaders of this movement forged their approaches as alternatives to the 20th-century educational priorities and its misalignment with both the past and their future aims of society.

I draw a broad distinction between administrative and educative decision making where the former is concerned with budgets, efficiency, and standardization, the latter is motivated by satisfaction, effectiveness, and differentiation. Early in the 20th century, even as the administrative educational paradigms were rising, pioneers in education such as Montessori, Steiner, Piaget, and Dewey, were championing educative IPMs and pedagogies that sought to develop many competencies such as empathy, morality, creativity, and self-discovery. Such competencies were common to the classical education of Ancient Greece, and have now come to define 21st-century education (Bresler, Cooper, & Palmer, 2001; Dewey, 1938; Kraft, 1999; Montessori, 2004; Steiner, 2003). Itin (1999) points out that Dewey’s progressive educational platform was largely crafted to prepare students to assume an active role in democratic society and not simply for the transmission of facts. This characteristic is represented as Citizenship: Local and Global in 21st-century education. Kurt Hahn, arguably the most influential and prolific visionary in experiential education, based much of his work on the work and philosophies of Plato (Hahn, 1965; Itin, 1999; James, 2000). United World Colleges, The Duke of Edinburgh Award, Outward Bound, Round Square and several internationally recognized schools can all attribute their progressive philosophies to the vision of Hahn and the inspiration
that he received from pre-20th century thinkers (dukeofed.org, 2013; Hahn, 1965; James, 2000; www.kurthahn.org, 2014; Outward Bound International, 2012). These constructivist-oriented programs have challenged the mainstream 20th-century educational system, which were very much influenced by behaviourist views of how education is best served.

**Historical context of OE3.**

The seeds of contemporary western environmental thought were heavily influenced by the moral and aesthetic focus of ecological thinkers such as Emerson, Thoreau, Muir, and Leopold (Barry, 2009; Bratman et al., 2012; O'Reilly, 2011; Stevenson, 2007). It was Rachel Carson, with her seminal 1962 work *Silent Spring*, that germinated the modern ecological movement by reconciling the established philosophical concept of ‘ecological consciousness’ with the environmental crises of the day (Barry, 2009; Carson, 1962; O'Reilly, 2011; Stevenson, 2007). In *Silent Spring*, Carson (1962) details the socio-ecological crisis of the Chemical Age and reestablishes the concept of intimate interconnection between humans and all other living and non-living entities. This can be interpreted as a powerfully punctuated reintroduction of systems thinking into the collective consciousness of society. The direct causative relationship between specific human action and ecological catastrophe was laid bare before a uniquely open-minded generation. Her influence is noted by the fact that shortly after, in 1965, the term ‘Environmental Education’ was first used (Palmer, 1998). “The 1970s were frequently referred to as the “decade of the environment,” initiated by the first “Earth Day” on April 22, 1970.” (Odum, 2005, p.4)

**Government and political support for Environmental Education.**

In 1977, The United Nations Education, Scientific, and Cultural Organization’s (UNESCO) Intergovernmental Conference on Environmental Education (ICEE) held in Tbilisi,
Georgia set a mandate for worldwide, integrated EnvEd. Their objectives included promoting specific pro-ecological behaviours encompassed by the general categories of awareness, sensitivity, attitudes, skills, and participation (UNESCO, 1978b). The Tbilisi Declaration states that education should “(u)tilize diverse learning environments and a broad array of educational approaches to teaching/learning about and from the environment with due stress on practical activities and first-hand experience” (UNESCO, 1978b, p. 4). This description is nearly perfect for the integrated OE3 models being highlighted by this study.

The conference organizers made two major assumptions: that by learning about the imperiled state of the health of the environmental, people would be compelled to action; and that countries, administrators, schools, and educators would be willing and capable of initiating the integration into the curricula. Time has shown that neither of these two assumptions was correct (Grace & Sharp, 2000; Puk & Behm, 2003; Scott & Oulton, 1999; Tilbury, 1995). In the decade that followed, societal awareness of ecological issues slowly infiltrated institutional policy but, even with international support, it was 1990 before the National Environmental Education Act (NEEA) was passed in The United States (National Environmental Education Advisory Committee, 2005). Possibly owing to the NEEA, the early 1990s experienced a surge of youth awareness and interest in EnvEd (Wray-Lake et al., 2010). At this time Hungerford and Volk’s (1990) research sought to advise on how to change learner behaviour through EnvEd.

If environmental issues are to become an integral part of instruction designed to change behavior, instruction must go beyond an “awareness” or “knowledge” of issues. Students must be given the opportunity to develop the sense of “ownership” and “empowerment” so that they are fully invested in an environmental sense and prompted to become responsible, active citizens. (Hungerford & Volk, 1990, p. 267)
Their work goes on to contrast the traditional 20th century pedagogy with their own speculations regarding the necessary skills of 21st-century citizens. This would prove to be a prescient prototype of 21st-century educational objectives. Their research speculates on the adaptations required of the dominant educational model in response to imminent societal developments, specifically, the rise of the digital age and societal evolution in a globalized world. More detail is provided in the section *Philosophical alignment of new 21st-century paradigms with existing OE3 praxis*.

Possibly spurred by government interest in the topic, the 1990s and early 2000s were especially productive in terms of EnvEd research and development. Along with many colleagues, Ballantyne contributed to our understanding of EnvEd objectives and teacher preparedness for meeting their objectives (Ballantyne et al., 1998; Ballantyne & Packer, 1996; Ballantyne, Fien, & Packer, 2001b; 2001a). Orr’s focus on the imperative of political action in addressing ecological issues is especially relevant to this research as the intent is to provide sound evidence for administrators and politicians to use in justifying continued OE3 programming (McKenzie, 2003; Orr, 1991b; 1991a; 1992). Payne has provided valuable information on the role of pre-service teachers in the dissemination of EnvEd and the nature of phenomenological ontologies in development of pro-environmental attitudes (Payne, 1997; 2003; 2006a; 2006b; Payne & Wattchow, 2009; Payne & Riddell, 1999; Payne & Wattchow, 2011). His methods could effectively be scaled to secondary, and perhaps primary, school programs, both integrated and conventional. Palmer was prolific in her comprehensive analysis of new understandings of fundamental relationships and in unveiling the role of affect in constructivist approaches to OE3 programming (Neal & Palmer, 2003; Palmer, 1998; Palmer, Cooper, & Corcoran, 2002). These authors have continued publishing their research and so a longitudinal analysis of their
contributions will be a valuable gauge of how education is adapting to the needs of 21st-century society.

Despite the quality of research and its application across educational disciplines, a study (1976 - 2005) found that high school seniors showed “(d)ecreasing trends in reports of personal responsibility for the environment, conservation behaviors, and the belief that resources are scarce” (Wray-Lake, 2010, p. 62).

**Ideological approaches to the contemporary OE3 pedagogy.**

Effective OE3 programming is now, as it has always been, well-steeped in both behaviourist and constructivist ideology (Itin, 1999; Lindsay & Ewert, 1999). It is behaviourist in that it engages learners in specific activities in specially designated locations based on the understanding that environmental stimuli can prompt behaviour that influences the development of attitudes and conditioned responses. With or without the key constructivist elements of activity framing and reflection, participation in OE3-style programming as a youth have been shown to engender pro-ecological behaviours (Wells & Lekies, 2006; Wray-Lake et al., 2010). Some approaches that employ elements of behaviourist pedagogy include ‘place-based learning’, ‘bioregional education’, ‘service learning’, and ‘community-oriented schooling’ (Lieberman & Hoody, 1998; Payne & Wattchow, 2009; Sauve, 2005; Scardamalia et al., 2012; Scott & Oulton, 1999; Woodhouse & Knapp, 2000).

The backbone of successful OE3 programs has always been to support learner engagement in experiences and facilitate a reflective and conscientious manner, which is a hallmark of constructivist pedagogies (Banathy, 1999; Dewey, 1938; Itin, 1999). Reflection is defined by the Knowledge Building Analytic Framework and this study as metacognition. Reflection underlies the process of meaningful development of the core competencies and is the
conduit that transmits the experience of doing to the sense of understanding (Azevedo & Aleven, 2009; Berdrow & Evers, 2011; Boesveld, 2012; Dewey, 1938; Hutchinson, 2012; Itin, 1999; Louv, 2008; Mathieu, 2005). The OE3 approach to learner engagement has always served as a bridge between these two disparate streams of educational psychology.

**Evolutions in Pedagogy: 20th- to 21st-Century Education**

**Description of 20th-century education.**

The economic engines of the time and society as a whole largely shaped educational paradigms of the 20th century. Starting with the industrial revolution and progressing through the late 19th century, the beginning of the 20th century in North America saw rapid expansion of heavy industry and mass production of goods. Fueled by two world wars, the invention of automobiles, and the widely-adopted factory-model of production and preparation of commodities, the economic engine was powered by line workers in rapidly expanding, increasingly industrialized urban areas (Goloboy, 2008; Holdren, Ehrlich, & Daily, 1995; Robinson, 2010). This industrial-economic engine required a workforce who were disciplined, capable of orderly, repetitive behaviours, and trained to subordinate their individuality to the needs of the system (Robinson, 2010). Correspondingly, the general educational IPMs and pedagogies were predicated upon discrete - siloed, or “stove-piped” (Berdrow & Evers, 2011)-courses, rote-learning in didactic lessons, and standardized organizational models. The behaviourist pedagogies and rigidly prescribed IPMs taught compliance with expected behaviour, promoted standardized achievement indicators, and centred on vocational skills training for participation in the economy of the day (Griffin et al., 2011; Helfand, 2013; Robinson, 2010). For much of the 20th century this approach was sufficient for individuals following a path in occupations where the desired inculcation was a skill set promoting time on
task, maintaining schedules, abdication of choice and individualism, and molding the individual to be a recipient of direction (Friesen & Jardine, 2009). These skills had been emphasized as necessary for a successful life in the 20th century and are elements of the paradigm from which we must now make a departure, and indeed return to traditional and historical ways of educating.

From a socio-cultural perspective, young people in the 20th century were far less empowered to set their own direction in education and were often regarded as passive recipients of education who were empty vessels to be filled up with knowledge directly from teachers and adults (Helfand, 2013; King, 1993). ‘Youth as agentic individuals’ was not a widely accepted perspective and, as such, the educational systems employed rigid vertical hierarchies, rewarded externally mandated standardized performance, and involved centralized planning and preparation of curricula. The mores of institutionalization influenced the disregard for the uniqueness of individuals and the blends of learning styles that they differentiated their needs and outcomes. As Robinson (2010) says in his popular TEDTalk, “Students are educated in batches, according to age, as if the most important thing they have in common is their date of manufacture.” The natural variation in cognitive development from student to student was of secondary concern to administrators tasked with moving large groups of children through the industrialized educational system (Friesen & Jardine, 2009; Joseph, 2012).

**Description of 21st-century education.**

In contrast to 20th-century education, the new pedagogical paradigms emphasize student-centred, individualized (yet collaborative), decentralized ‘ecologies of learning’. Many perceptions of 21st-century education appear to be disproportionately influenced by the application of digital technology and emphasize digital literacy, while finding *post hoc* attributions of the other 10 widely accepted core competencies (See Table 4) (Greenhow et al.,
2009; Trespalacios et al., 2011). Based on the fact that computers were only recently introduced into schools as an educational tool and the rise of Internet 2.0 has made digital EdTech ubiquitous, digital literacy is certainly the most recent addition to the core competencies list and it is understandable that a period of frenetic catch up should occur. However, the majority of these core competencies are based on more distinctly analog, humanistic capacities and should not be overlooked in the excitement over technological implementation. In the rush to implement digital technologies administrators may be displacing valuable pedagogies that teach the other core competencies. Binkley et al. state that,

...whether a technician or a professional person, success lies in being able to communicate, share, and use information to solve complex problems, in being able to adapt and innovate in response to new demands and changing circumstances, in being able to marshal and expand the power of technology to create new knowledge, and in expanding human capacity and productivity. (2011, p. 17)

It is necessary to highlight the distinction between skill sets and core competencies as used in 21st-century education. *Skill sets* refers to domain-specific actions such as coding, bricklaying, and playing a piano. *Skill* is the capacity for a person to perform a task efficiently and effectively. Skills have predetermined measures of achievement and prescribed outcomes to practical activities. *Core competency* is used herein to describe the domain-specific and general knowledge that can be applied across disciplines and may be viewed as conceptual in nature (Scardamalia et al., 2012). Competency may involve a skill but it also includes attitudes, behaviours, and knowledge that contribute to an understanding of ‘Why’ and ‘How’, as opposed to just ‘What’, decisions lead to a desired outcome (Berdrow & Evers, 2011; Binkley et al., 2011; Crew, 2010; Ewert & McAvoy, 2000).
The impetus for an evolution to 21st-Century education has been largely derived from the needs of emergent industries and the economies, much like it was in the 20th-century (ATC21S.org, 2012; Autor et al., 2003). Scardamalia et al. (2012) point out that “…the health and wealth of nations is tied to the innovative capacity of its citizens and organizations” (p.5). They go on to explain how rapid technological growth that outpaces societies’ ability to adapt can lead to disparity and not the intended prosperity.

Of the corporations said to be operating in the ‘information’, ‘knowledge’, or, now commonly referenced, ‘creative’ economy, the vast majority operate in the digital realm and require workers with the commensurate skills, but more critically, the core competencies required to be resourceful, resilient, and anticipatory of such change (Bingimlas, 2009; Binkley et al., 2011; Google, 2014).

**21st-century core competencies.**

A compilation of the core competencies required for success in the 21st-century includes:


**Added emphasis on ecological literacy.**

Ecological Literacy, although almost universally omitted from lists of 21st-century core competencies, is included in my study in recognition of the work of many 21st-century education
pioneers who used outdoor, experiential and ecological education (OE3) as a jump off point for their influential contributions to 21st-century educational theory. The overlapping objectives of OE3 and 21st-Century Education is discussed in detail below. Ecological Literacy generally, and nature-connectedness in particular, are absolutely critical if we are to develop the individuals, resources, and technologies that can effectively mitigate the current global catastrophe (Ballantyne et al., 1998; Ballantyne & Packer, 1996; Puk, 2002; Wells & Lekies, 2006; Wray-Lake et al., 2010). Anthropogenic climate change, population growth, pollution, and social justice are just some issues that will need to be mitigated and resolved by present and future generations and it is our duty to equip them with the skills and competencies that they will need to be effective (Cookson, 2009; Guggenheim, 2006; Wray-Lake et al., 2010).

The practice of developing ecological literacy assumes interaction with the natural world, which also assumes active, exploratory learning. Nature-connected activities can promote short term physical health, long term habits of wellness, and can lead to a more conscientious consideration when it comes to protecting the natural systems that support human life (Asah, Bengston, & Westphal, 2012; Ballantyne, Fien, & Packer, 2001a; Bogner, 1998; Chawla, 1998; Wray-Lake et al., 2010). Ecological literacy learning through nature-connected activities is as socially salient as it is educationally for its ability to contribute positively to students sense of holistic well being (Bratman et al., 2012).

**Fundamental characteristics of 21st-century core competencies.**

According to Partnership for 21st-Century Skills (P21) (2014), education that embodies 21st-century standards:

- Focuses on 21st-century skills, content knowledge and expertise.
- Builds understanding across and among core subjects as well as 21st-century
interdisciplinary themes.

- Emphasizes deep understanding rather than shallow knowledge.
- Engages students with the real world data, tools, and experts they will encounter in college, on the job, and in life--students learn best when actively engaged in solving meaningful problems.
- Allows for multiple measures of mastery.

The specific emphasis on integration and interdisciplinarity share similar conclusions with the research of Gardner (1985), specifically his work on multiple intelligences. As indicated above, 21st-century education recognizes how appealing to differential blends of learning styles can foster “deeper understanding” and allow for “multiple measures of mastery”. From the work of Partnership for 21st-Century Skills and more organizations like it, (ATC21S.org, 2012) the 21st-century education movement has adopted a respect for learners as self-directing individuals who bring different blends of learning styles, strengths and challenges to their personalized educational experience (Friesen & Jardine, 2009; Gardner, 2006; Lindsay & Ewert, 1999). To this end, 21st-century learners are encouraged and expected to access, assess, analyze, and create information in ways that are critical, meaningful, and creative pathways for knowledge building. The creation of collaborative “knowledge building environments” has received much emphasis from leading 21st-century assessment and teaching researchers and organizations (Bell, 2010; Scardamalia et al., 2012). This decentralized, team-oriented, innovation-seeking approach stands in stark contrast to centralized, standardized rote-learning expectations that dominated the 20th-century (Binkley et al., 2011; Boaler, 1999).

Due in large part to pervasive influence of the Internet, and specifically the geographically-dispersed communities of practice that are closely connected through social
media, this new educational paradigm is being actively implemented across the globe. Such hyper-connectivity plays a key role, indeed it is the single most influential factor in the emerging knowledge economy, in the rapid commensurate innovations in education and industry (Autor et al., 2003; Binkley et al., 2011; Shaw, 2009). In order to capitalize on this new economic model, the 21st-century education movement is reviving the humanistic, systems-thinking-influenced constructivist pedagogies that have been refined over centuries. (Koller et al., 2008; Lindsay & Ewert, 1999; Stringer, 1999) Weaving these together with the exciting technological innovations and by diversifying the IPMs that scaffold it all, our educational systems can foster the core competencies required to nurture efficient, effective, and conscientious growth.

**Alternative descriptions of ‘21st-Century Education’.**

There are many who define effective 21st-century education as being based firmly on technological skill development and utility. Many such practitioners support the development of an upgraded pedagogy that is designed to follow the available technology but still employs 20th-century IPMs. The approach assumes that learning is a product of technological development and therefore logically demands that education is in a perpetual lag behind technology.

One example of this is the 2012 National Association of Independent Schools (NAIS) Conference held in Seattle, WA, where the theme was ‘Innovation’. In his NAIS 2012 presentation titled *Innovative Schools, Innovative Students*, the speaker offered his opinion that in order for schools to teach for the 21st-century they would need two things: more screens and higher bandwidth (J.E. Martin, personal communication, March 1, 2012). This clearly demonstrates the perspective that increased access to technology will result in better quality education and better-prepared students. Stringer (1999) notes that “Technology in general (and the computer in particular) serves as a symbol of educational quality for many” (p.67). Techno-
rhetoric and the to-be-expected excitement over breakthrough innovations in information and communication technology (ICT) have the potential to overshadow the time-tested efficacy of traditional, nature-connected, pedagogical strategies (Cuthbertson, Socha, & Potter, 2004; Glover, 1999; Louv, 2008; Suzuki, 2012). This assertion is supported by the BC Ministry of Education (2014) website, which states; “In 21st Century Learning, students use educational technologies to apply knowledge to new situations, analyze information, collaborate, solve problems, and make decisions. Utilizing emerging technologies to provide expanded learning opportunities is critical to the success of future generations.” In their documentation, as with Mr. Martin’s presentation, no mention is made of other opportunities outside of digital technology to equip students with the skills deemed necessary for the 21st-century (British Columbia Ministry of Education, 2014b; 2014a; Government of British Columbia, 2010). Also telling is the lack of organizational integration of OE3, specifically ecological literacy and 21st-century educational theory is the glaring omission of any reference to the 21st-century education in the Environmental Learning and Experience documents produced by the BC Ministry of Education (2010).

Moving outside the comfort zone and away from sedentary, indoor learning.

A review of the NAIS talks, workshops, and presentations, as well as the five ‘tracks’ into which they were categorized (i.e. communications and advancement, management, governance, leadership development, and classroom experience.), none attempted to advise on or address the role of innovation in OE3 (National Association of Independent Schools, 2012a; 2012b). Many of the presentations addressed the dominant themes of sustainability, 21st-century learning, and educational technology, and yet each approach seemed to be predicated on the indoor classroom as the primary learning venue.

Davies and Ryan (2011) raise an excellent point that, throughout most of human history
and still to this day, education was not limited to the formal, indoor style that has come to dominate the teaching paradigm. “Education, of course, in its widest sense, is not confined to the classroom nor does it end when formal schooling is completed” (Davies & Ryan, 2011, p. 1). In their discussion of vocational education they touch on the long-held belief that experience teaches wisdom, as famously summarized by Confucian philosopher Xunzi;

(n)ot hearing is not as good as hearing, hearing is not as good as seeing, seeing is not as good as mentally knowing, mentally knowing is not as good as acting; true learning continues up to the point that action comes forth. (213 BC)

This traditional wisdom compliments the prescient research by Lieberman and Hoody (1998) and recent suggestions by Partnership for 21st-Century Skills (2014) that 21st-century education is best served when students collaborate with different communities to solve meaningful problems with real world data, tools, and experts (Bell, 2010; Boaler, 1999).

Meeting the demands of the Knowledge Economy.

Despite the forecast of NAIS, the ways in which learner-centred, ExpEd programming can be effective in helping students develop their creativity, critical thinking, and collaborative learning skills is well known by OE3 educators and with other like-minded constructivist pedagogies (Berman, Jonides, & Kaplan, 2008; Charles, 2010; Conrad & Hedin, 1982; Ewert & McAvoy, 2000; Goldenberg et al., 2005; Hattie, Marsh, Neill, & Richards, 1997; Itin, 1999; McKenzie, 2003; NOLS.edu, 2012). OE3 perspectives, inclusive of the ExpEd described above can also be seen in the rise to the mainstream of these pedagogies, once considered fringe, that are increasingly in demand by leading edge innovators, entrepreneurs, and visionaries (Richtel, 2011).

Independent schools such as Waldorf, Montessori, and others emphasizing varying
degrees of digital-analog balance have flourished with the rise of the digital age and the

corresponding ad hoc adaptations of business and industry (ATC21S.org, 2012; Carroll, 1994;
Times article, many Silicon Valley executives are choosing to send their children to Waldorf
Schools where screens are not allowed and “(e)ngagement is about human contact, the contact
with the teacher, the contact with their peers” (Richtel, 2011). The pace of innovation is such
that skill-specific training may quickly become obsolete and in many instances, specialized
technological skill is being deemphasized in favour of transferable competencies. Google
(2014) emphasizes the ability to embrace and chase change for the future as being equally
important as the skills that are relevant to the technology of today.

Many businesses that operate in the knowledge or creative economy, which is largely
digital, have adopted recruitment practices that emphasize humanistic competencies over
technical skill. Google (2014) lists the four things that they look for in new recruits as
leadership, role-related knowledge, how you think, and Googliness, a state whose definition is
innately amorphous but recognizable amongst fellow Googlers. Only role-related knowledge
mentions skill-based requirements - specifically coding and technical expertise - and even then
only for engineers. The other three components are the humanistic competencies that define
productive, creative collaborators.

...we have to be nimble, both in how we work and how we hire. We look for people who
are great at lots of things, love big challenges and welcome big changes. We can’t have
too many specialists in just one particular area. We’re looking for people who are good
for Google—and not just for right now, but for the long term. (Google, 2014)

Describing the Instructional Programming Model
In order to draw attention to the similarities and shared objectives of both OE3 and 21st-century education, it was necessary to refine the definition of an educational system into pedagogy and the newly coined term instructional programming model. The Instructional Programming Model (IPM) refers specifically to the location, duration, and available resources that influence and structure the lesson planning and execution. Pedagogy comprises the other half of the educational system as it is facilitated by the physical environment and logistical constraints and freedoms that the IPM’s venue, schedules, and staffing involve. The IPM is the framework around which pedagogies are built and by which their objectives are pursued. The two aspects of the educational system work together; the pedagogy informed the ideal design of the IPM and in turn the IPM facilitates the pursuit of the pedagogy. Necessary adaptations arising from issues such as budget restrictions, staffing expertise, philosophical ‘drift’, available resources, etc., in one of the two should result in commensurate adaptations in the other.

In conventional mainstream education, there are 1-2 dominant IPMs that were similar but somewhat variable, into which most pedagogies were expected to conform. They were generally applied across North America and were found in all parts of the world (see section below: Describing the Conventional Instructional Programming Model). This study proposes that diversification of the educational system can be achieved through the differentiation of its component parts (i.e. pedagogies and IPMs) based on the needs and interests of communities and their cohorts of learners. Following from systems theory, the more complexity - attributed to greater diversity - there is within our educational system, the more resilient and adaptive to change it becomes (Capra, 1994; Meadows, 2008).

**Describing the conventional instructional programming model.**

The conventional IPM for secondary schools has a few administration-dependent
variations but is typified by students arriving between 8:30 to 9:00 a.m. and rotating through 4 - 8 classes each day, each taught by different teachers, with lunch and short breaks between before departing 6 - 6.5 hours later. This generally occurs 5 days per week 10 months of the year with scheduled time off for vacation, closures, and examinations (Carroll, 1990; The Carnegie Foundation, 2012).

To understand the nature and impetus behind the lingering organizational and operational structure of 20th-century education we must turn the clock back to the early years of the century. It was in 1906 that philanthropist Andrew Carnegie created a $10,000,000 US pension fund available to university and college professors. The Carnegie Unit was a mathematical calculation of teaching time that would enable college and university professors to access the fund (The Carnegie Foundation for the Advancement of Teaching, 1906). The Carnegie unit is a strictly quantitative measurement of 'seat-time' that has been widely accepted as a reasonable measure of the degree to which the students were being educated and by which a professor was said to be teaching (Besvinick, 1961; Carroll, 1994; Socol, 2009; The Carnegie Foundation for the Advancement of Teaching, 1906). The unit was developed as a measure of the amount of time a student has studied a subject. For example, a total of 120 hours in one subject -- meeting 4 or 5 times a week for 40 to 60 minutes, for 36 to 40 weeks each year -- earns the student one "unit" of high school credit. Fourteen units were deemed to constitute the minimum amount of preparation that may be interpreted as "four years of academic or high school preparation" (The Carnegie Foundation, 2014). This economic-administration model, which was originally developed as a practical means of regulating access to a pension fund has since informed the standards conventional instructional programming models (IPMs) across much of the world. It has led to the fragmentation of learning into discrete ‘silos’, requirements that students literally
be in seats in order to count the instructional time, and a divorce from the traditional pedagogical practices and wisdom (Berdrow & Evers, 2011; Carroll, 1994; Lindsay & Ewert, 1999).

**Describing the integrated instructional programming model.**

Integrated IPMs can be generally defined by their organizational structure and the methodology of course presentation. They can range from 2 - 4 courses with highly variable degrees of interdisciplinarity. Typically, integrated courses are cohort-based, facilitated by few (1-3) teachers or educational specialists, blend curricula for interdisciplinary exploration, include expedition or residential components, offer highly dynamic scheduling that capitalizes on natural dispositions and opportunities, are thematically-based to capture interest of a particular demographic, and value practical over abstract lessons (Drake & Reid, 2010; Lindsay & Ewert, 1999; Renzulli & Zhang, 2001; R. Sharp, 2011). (See Charter Schools below for examples)

The individuals who create, organize, and oversee integrated OE3 programs are often highly engaged teachers who have, themselves, benefited from similar experiences. OE3 in the Yukon was largely driven, and still is, by the indefatigable vivacity of Robert (Bob) Sharp. Twenty-two years ago Sharp and colleagues founded the Environmental Science 11 (ES11) “school-within-a-school” program in Whitehorse, YT. ES11 is among the most comprehensive science-focused integrated programs in Canada, if not North America. Sharp is an archetype of integrated OE3 and is widely recognized for his exceptional contributions to the ExpEd movement. His life’s work has significantly contributed to the data that reports the potential for well-designed integrated OE3 programs to promote above average student achievement in a variety of disciplines (Drake & Reid, 2010; Russell & Burton, 2000; R. Sharp, 2011). Sharp forged the legitimacy of his programs despite tireless struggles against budget cutbacks and pedagogical opposition and I am proud to contribute to his canon of research.
The success of outdoor, experiential, and ecological education-focused multi-day courses, as well as other extracurricular programs such as the Duke of Edinburgh Award, Scouts, Girl Guides, and summer camps are likely to have played a role in encouraging teachers to develop many of the formalized integrated programs at the high-school and post-secondary level across Canada and the world (*integratedprograms.ca*, 2013). This was certainly the case for me as the architect and Founding Faculty of Coast Mountain Academy (CMA) in Squamish, BC. CMA is an independent school that emphasizes practical, hands-on learning that enhances their students’ understanding of the rigorous theoretical academic curricula. (*CMA*, 2014)

Similarly organized integrated programs with foci on arts, music, and technology have existed in larger centres but have recently increased in scope, visibility, and number (*integratedprograms.ca*, 2013; R. Sharp, 2011; Yukon Education, 2014). The surprising representation of unique integrated programs in Whitehorse, YT will be addressed in the research description.

Charter Schools in both Alberta, Canada and the United States, as well as School-within-a-School approaches, are excellent examples of how thematically-oriented (*i.e.* integrated) IPMs can be employed to varying extents and for a variety of outcomes. Examples of these include High Tech High in San Francisco, Africentric Alternative School in Toronto Canada, and the Music, Arts, and Dance (MAD) program in Whitehorse, YT (*High Tech High*, 2014; *Yukon Education*, 2014). The desired program outcomes are often derived from the priorities of local communities that the programs strive to serve and are highly responsive to, and structured by, the proximate human, social, and natural resources. “Chartering gives schools the freedom to tailor programs that are reflective of the community needs. … Parents and educators are looking at chartering as a way to increase educational choice and innovation within the public school
INTEGRATED IPMs FOR 21ST-CENTURY EDUCATION

system” (What is a charter school?, 2014).

**Conventional vs. Integrated IPMs**

In conventional IPMs, the educational value assessment was related to the quantity of instruction the students received and not based on the quality of knowledge, and the media with which it can be demonstrated, that students have gained. The latter is the emphasis of 21st-century education (Banathy, 1999). Banathy proposes that the differences between 20th and 21st-century education are related to the ‘focus’ or objective of the practice; he uses the terms ‘instruction-focused’ and ‘learning-focused’ to highlight differences. Banathy (1999) applies his comparison to five categories including: learning outcomes, presentation of content, interaction with content, learner experience, and achievement indicators. The pedagogical differences that he details are very similar to those of Estes (2004) in that he describes 20th-century instruction-focused pedagogy as being transmissive and didactic and 21st-century learner-focused pedagogy as highly transactive and iterative. For example, in describing presentation of content the instruction-focused model prescribes that “(s)ubject matter is presented by the teacher and textbook. Students are responsible for completing assignments and taking tests.” Whereas in the learning-focused designs, “(a) variety of learning resources, situations, and learning resources are available, including self-directed and guided learning, tutorial, team learning, and the use of technology” (Banathy, 1999)

For comparison, the differences between the instruction-focused and learning-focused models identified by Banathy (1999) and their respective associations with 20th- (conventional) and 21st- (assuming integrated) century pedagogies have been adapted for presentation in the table below.
When comparing instruction-focused and learning-focused approaches as presented by Rankin (2007), the conventional model is strongly instruction-focused and the integrated IPM supports a learner focus. Table 1 compares how instruction- and learning-focused approaches from Banathy (1999) are applied in, and compare to, different IPMs.

Table 1: Comparison of Instructional Programming Models (IPMs)

<table>
<thead>
<tr>
<th>Salient aspects of IPMs</th>
<th>Conventional</th>
<th>Integrated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content Presentation</td>
<td>Discrete curriculum is presented. Courses are ‘siloed’ or ‘stove-piped’ (Berdrow and Evers, 2010)</td>
<td>Blended curricula with tasks, assignments, and assessment that crosses disciplines.</td>
</tr>
<tr>
<td>Class Composition</td>
<td>Mixed. Possibly streamed by aptitude in a particular skill or discipline.</td>
<td>Largely self-selected participants with common interests and shared objectives.</td>
</tr>
<tr>
<td>Class Length</td>
<td>45, 60, 75, or 90 minute classes for each discrete subject, usually.</td>
<td>Flexible length classes depending on the emphasis of the activities. 15 minutes to 15+ days for single activities.</td>
</tr>
<tr>
<td>Course Scheduling</td>
<td>Fixed course times or rotations. Regular, dependable schedules.</td>
<td>Flexible activity scheduling. Responsive to the needs and dispositions of teachers and students.</td>
</tr>
<tr>
<td>Teacher Scheduling</td>
<td>Regular, fixed rotations between multiple (4-8) teachers with single specialties.</td>
<td>Fewer teachers (1-3) teach multiple courses. ‘Polymathic’ or generalist.</td>
</tr>
<tr>
<td>Class Location</td>
<td>Generally fixed location with some opportunity for field trips. Limited mobility.</td>
<td>Highly mobile with class relocations to relevant teaching/learning venues encouraged.</td>
</tr>
</tbody>
</table>

Integrated Outdoor, Experiential, and Ecological Education as a Model for 21st-Century Educational Programming

Philosophical alignment of new 21st-century paradigms with existing OE3 praxis.

The philosophical alignment of OE3 and 21st-century education - namely an ‘ecological’ or integrative ‘systems’ approach - provides suitable comparisons and contrasts to conventional 20th-century education. The strength of a system is measured by its resilience and adaptability to
change, which is how many define the success of our 21st-century students and educational system as a whole (Banathy, 1999; Capra, 1994; Clark, 1997; Meadows, 2008; Senge, 2002; Systems Research and Behavioral Science, n.d.).

Banathy (1999) describes a “learning epistemology system” with seven components/concepts: constructivist, authentic, situated, applications-focused, tailored, integrated, and reflective. In that sense IPMs are objective, behaviourist-influenced frameworks that provide environmental stimuli around which the complimentary pedagogies (e.g., constructivism - exploration, reflection, learner-centred, self-regulated, etc.) can be scaffolded. Dabbagh (2012) uses the example of online or blended learning IPMs that use social media Personal Learning environments (PLEs) to support self-regulated learning and the development of a sense of agency.

‘Ecological Education’ is the pedagogical manifestation of the philosophy of ecological ethics that aims to situate humans within dynamic system that are natural, social, and philosophical. It has grown out of decades of Environmental Education (EnvEd) research and is deeply rooted in systems theory. Further discussion below will demonstrate how it has played a pivotal role in the development of relevant, holistic 21st-century pedagogies.

As early as 1990, Hungerford and Volk, working towards improving the EnvEd model, provided a glimpse of some of the elements that would go on to be further adapted to fit the emergent needs of the Information Age. Their work would contribute widely to a cohesive pedagogical redesign formulated for success in the 21st-century that brought together ecological ethics and computational cognition (i.e. programming). They identified four goal levels, organized by priority, necessary for effective education:

I. The ecological foundations
II. The conceptual awareness—issues and values

III. The investigation and evaluation

IV. Action skills—training and application (Hungerford & Volk, 1990)

Even in the pre-internet era in which Hungerford and Volk were working, they recognized the necessity for individuals to be prepared with the resiliency and broadly applicable ‘conceptual awareness’ that would allow individuals to embrace the opportunity in a future defined by uncertainty. Uncertain future conditions of a rapidly changing society require that emphasis be placed on skills that equip citizens to adapt with, and respond to, emergent challenges and obstacles (Berdoc & Evers, 2011; McCune & Entwistle, 2011).

Common values between integrated and conventional models.

It is clear from a review of the literature that the values of classical, traditional OE3, and 21st-century education are aligned and directed towards fostering creative, critical, and conscientious citizens (Hungerford et al., 2000; James, 2000; Lindsay & Ewert, 1999; Luchs, 1980).

The seeds of progressive 21st-century educational paradigms were planted very early in the 20th-century and first took root with constructivist pedagogical radicles from Dewey, Steiner, Montessori and Piaget (Dewey, 1938; Friesen & Jardine, 2009; Kraft, 1999; Montessori, 2004; Steiner, 2003). Their unique approaches adapted traditional values to the social context but nonetheless focused on the holistic development of competent individuals. Their pedagogies, which emphasize learning through interaction with others and environment (experiential) and not in intensely digital forums, have recently gained popularity with those who recognize that skills can be learned but competencies must be earned (Ontario Ministry of Education, 2010; Outward Bound International, 2012; Richtel, 2011).
Throughout the 20th-century there have been integrated programs developed and operating on the fringes of mainstream education. Outward Bound and the National Outdoor Leadership School (NOLS) are two programs that epitomize the integrated model and have become world renowned for their effectiveness in fostering ‘21st-century core competencies’ decades before the term even existed (Goldenberg et al., 2005; NOLS.edu, 2012; Outward Bound International, 2012).

Table 2: Comparison of the charter values of Outward Bound and 21st-century core competencies (Outward Bound, 2014).

<table>
<thead>
<tr>
<th>Outward Bound Charter Values</th>
<th>21st-Century Core Competencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning through Experience</td>
<td>Critical Thinking and Problem Solving</td>
</tr>
<tr>
<td>Character Development</td>
<td>Metacognition</td>
</tr>
<tr>
<td>Challenge and Adventure, Leadership</td>
<td>Collaboration</td>
</tr>
<tr>
<td>Excellence, Compassion, Supportive Environment</td>
<td>Social Literacy</td>
</tr>
<tr>
<td>Integrity</td>
<td>Accountability</td>
</tr>
<tr>
<td>Inclusion and Diversity, Service</td>
<td>Citizenship</td>
</tr>
</tbody>
</table>

Table 2 demonstrates how the aims and outcomes of OE3 programs established throughout the 20th-century are nearly perfectly aligned with the newly established 21st-century core competencies. The obvious exceptions are digital and financial literacies. This near direct overlap makes integrated OE3 programs the ideal candidate for the establishment of baseline data regarding relations between the IPM (and the associated pedagogy) and 21st-century education objectives (Stringer, 1999).
Similarities between integrated OE3 and 21st-century assessment criteria.

Determining the success of IPMs in fostering 21st-century competencies requires a revisioning of the methods by which student achievement is evaluated. Contemporary knowledge acquisition assessment techniques place a significant, if not disproportionate, weighting on summative evaluations and standardized testing. Lindsay and Ewert (1999) state:

Evaluation in [experiential education] serves two major purposes. The first is identifying individual growth as defined by the student and includes changes in such variables as self-concept, levels of trust, and communication skills….In either case, success in [experiential education] programs is often determined by the fulfillment of individual student needs as opposed to externally defined criteria for success. (p. 16)

Commonalities between the assessment criteria of OE3 and 21st-century education are remarkably similar. Compare the above with the following criteria for knowledge-building environments - extrapolated to infer assessment of success in promoting 21st-century competencies - as defined by Scardamalia et al.(2012),

(a) empowering users and transferring greater levels of agency and collective responsibility to them;...(e) supporting the community in self-directed rigorous assessment so that there is opportunity for the community’s work to exceed, rather than simply meet expectations of external assessors; (f) supporting inclusive design,...(h) encouraging openness in knowledge work. (p. 37)

Integrating curricula promotes assessment of and for learning.

The Government of Ontario (2010) released a Capacity Building Series article that focuses on the imperative for promoting “Integrated Learning in the Classroom.” In it they recognize that significant revision of both the pedagogies and IPMs that are implemented “...as a
way to meet the demands of 21st century curriculum…” (para.1). They quote from Drake and Reid (2010) who claim “(r)esearch has consistently shown that students in integrated programs demonstrate academic performance equal to, or better than, students in discipline-based programs. In addition, students are more engaged in school and less prone to attendance and behaviour problems” (para.5). This demonstrates the recognition by large educational administrations that the assessment of 21st-century core competencies is poorly suited to the contemporary model and that the integration of curricula is an effective and valuable directive to pursue. As of the 2015 admissions intake, Temple University (Pennsylvania) will no longer require students to provide SAT and other standardized assessments (Fischer, 2014). Their news release states that students...

...will have the option of either submitting traditional standardized test scores or submitting answers to specially designed, self-reflective short-answer questions. When evaluated by trained readers, the answers to these questions provide evidence of non-cognitive motivational and developmental traits that are better predictors than standardized test scores of future college success. (p.1) (italics added)

Integrative and interdisciplinary programming, such as thematic or project-based learning (PBL), are gaining recognition from practitioners keen to stimulate development of 21st-century competencies (Bell, 2010; Boaler, 1999; Hmelo-Silver et al., 2008). Project-based learning promotes a learner-centred approach that is highly conducive to formative, ongoing assessment often conducted as self-assessment or debriefs. This mindful practice of iterative reflection may help promote engagement by encouraging students to set personal goals and take the necessary steps to achieve their benchmarks. The skill of reflection, a core objective of constructivism and OE3 programming, is being recognized as an advantageous quality of workers entering the
knowledge economy. “As the business world becomes more complex, the role of professional higher education in the development of “reflective practitioners” becomes more cogent. … Competency-based performance models… have helped practitioners and educators understand the need for and process of identifying skills for effective performance…” (Berdrow & Evers, 2011, p.406)

Whether the project is a 15-day canoe trip or a the exploration of applications of mathematics, the emphasis is on process over product and shifts from procedural to conceptual thinking (Bell, 2010; Crew, 2010; Ewert & McAvoy, 2000). In contrast, standardized tests and end of term exams are summative assessments that have been found to be poor litmus’ for student demonstration of long-term knowledge development (Dochy, Segers, & Sluijsmans, 1999). Summative assessment is deficient in providing the ongoing evaluation of creativity, collaboration, problem solving, and knowledge building such as is facilitated by recursive learning processes (Kolb, 1984; Kolb, Boyatzis, & Mainemelis, 2011).

**Common pedagogy: Roles of teacher and student.**

One of the most prominent similarities between OE3 and 21st-century education is the transactive nature of the interactions between student and teacher. (Estes, 2004; Itin, 1999; Lindsay & Ewert, 1999; Stringer, 1999). The strongly constructivism-influenced pedagogy of both approaches places great value on the personal experiences of the learner and the role of the educator in facilitating the process of meaning-making before, during, and especially after the experience (Estes, 2004; Itin, 1999; Lindsay & Ewert, 1999; Stringer, 1999). This contrasts with the transmissive ‘sage-on-the-stage’ approach, that assumes the professor to be a “fountainhead of knowledge” who is a conduit for one-way information (King, 1993).

Indeed, the key aspects of both constructivist and OE3 pedagogies is that meaningful
learning is believed to come from internalized reflections on experience (Dewey, 1938; Kime, 2008; Kolb, 1984; Kolb et al., 2011). This ‘experiential learning cycle’ is described by Lindsay and Ewert (1999) as inclusive of focus, action, feedback, support, and reflection, which is itself an iteration of Kolb’s (1984) description of the recursive learning process that involves experiencing, reflecting, thinking, and acting. Similar variations on the simplified “plan, act, observe, reflect” cycle are being used in a range of fields from ExpEd (frontload, experience, guide reflection) to Action Research (plan, act, observe, reflect) (Carr & Kemmis, 1986; Estes, 2004). The common objective of the aforementioned pedagogies and 21st-century education are to create what Berdrow and Evers (2011) call “reflective practitioners”.

Itin (1999) defines the role of the ExpEd educator as follows. “The educator's primary roles include selecting suitable experiences, posing problems, setting boundaries, supporting learners, insuring (sic) physical and emotional safety, facilitating the learning process, guiding reflection, and providing the necessary information.” Like 21st-century educators, instructors of OE3 programs are embedded in the education of the students and they become a part of, as opposed to apart from, the internalized experience. Educators are responding to the needs of their students by guiding them towards self-discovery, exploration, and tenacity (Itin, 1999). In this way, these educators have more in common with the map than with the compass. The former shows what is possible and provides guidance whereas the latter indicates direction and little else to justify the path.

**Debugging the Digital Dilemma**

Starting with the evolution of Web 1.0, to 2.0, and now that we are on the cusp of 3.0 (Dominic, Francis, & Pilomenraj, 2014), it has been increasingly necessary for OE3 to incorporate technology and digital literacy into its curricula in order to remain truly holistic and
to stay relevant in the student’s day-to-day life (Baird & Fisher, 2006; Greenhow et al., 2009).


Complications with, and vocal resistance to, the implementation of digital educational tools became apparent in the age of Web 1.0. At that time the technology was layered onto existing curricula with little significant integration into the content, pedagogy, or IPM.

Joseph (2012) notes the significant opposition by scholars in the Web 1.0 age at the inclusion of technology for technology’s sake. The objection was centred on exclusion of humanistic pedagogies and the assumption of a digital panacea that those scholars did not share. Dixon (2001) established the notion of an ‘ingenuity gap’ between technology and our ability to control the many unintended outcomes. He specifically pointed out our inability to supply the necessary ingenuity fast enough to solve the problems that we have created. In this great rush to bring our students online with the newest technologies, I feel that it is incumbent upon administrators and teachers to assess the likely outcomes and question whether the digital intensification is in fact what is best for our students’ holistic wellness.

**Balancing digital and ecological literacies for holistic development.**

Paul Thomas, a former teacher and an associate professor of education at Furman University supports the humanistic approach in a New York Times article by saying, “(t)eaching is a human experience...Technology is a distraction when we need literacy, numeracy and critical thinking” (Richtel, 2011). The judicious application of digital technology must be encouraged both inside schools’ conventional classroom and while out in the world’s non-conventional learning venues. The key to this judicious application is for educators to seek out their own understanding so that they can appreciate when the digital technology is amplifying the learner’s
experience and when it begins to encroach upon the very skill development that we intend to teach (Bell, 2010; Carroll, 1994; Cuthbertson et al., 2004; Dede, 2009; Greenhow et al., 2009; Scardamalia et al., 2012).

Traditionally, OE3 programs, integrated or not, have not generally focused on the extensive integration and application of digital technology. In fact, these programs aim to provide alternatives to the digital intensity that contemporary culture promotes, and as such actively avoids integrating digital technology in much of its programming (Glover, 1999; Russell & Burton, 2000). These resources and the skills to use them productively is nonetheless a core competency for success in the 21st-century and additional emphasis needs to be given to the development of digital literacy.

Far from being at odds, the digital resources of technology and the analog practices of OE3 are ideally suited to amplify one another. Real-world, practical application of technology in fieldwork enhances skills training opportunities and the translation of student experience onto digital media, for example social media, can facilitate and nurture metacognitive/reflective practice (Baird & Fisher, 2006; Dabbagh & Kitsantas, 2012; Hester & Hirsch, 1999; Huang, 2011). Adaptation of curricula and mutual adoption of blended digital-analog practices is an “easy” challenge for the 21st-century educator when compared to the requisite update to mainstream theories (Stringer, 1999). Chavez (2009) found that urban children with little previous exposure to natural environments were very receptive to nature-based activities when blended with familiar technologies. Leveraging digital technology to augment nature-based activities may be a necessary intervention to incite active, outdoor learning in a digitally saturated society or in nature-isolated urban environments. (Chavez, 2009)

OE3 educators are already primed to take a seat at the forefront of the educational
paradigm shift and are in the best position to capitalize on this opportunity. Their natural open-mindedness to alternate pedagogies and IPMs, flexible schedules, and involvement in educational innovation makes them the ideal group to experiment with digital-analog integration (Russell & Burton, 2000; Stringer, 1999). This assumes a willingness to cultivate digital integration that may or may not be widely accepted by the current leadership but will be innate in the upcoming generations of digital native educators. The research conducted by and for these willing innovators may provide the maps for educational reform in this time that it is most open to redirection.
Chapter 3: Research Methodology

Die-hards claim that research isn't needed and instead offer up dozens of anecdotal accounts of students who have benefitted from taking courses in technology education. But no matter how titillating the anecdotes, they simply do not convince deans, superintendents and boards of education. Only research results will be convincing... Indeed, research has established itself as a primary vehicle by which change is promoted and effected in education. Research now has a major impact on the focus, direction, and development of all aspects of education - and properly so. (Waetjen, 1991, p.3)

Although Waetjen was describing technology education, it could be argued that it is true for all education, and especially so for OE3, as it is beset on all sides by challenges to its validity and relevance in a rapidly changing educational system. Russell and Burton (2000) recognize the specific need for additional research into integrated OE3 programs “...to bolster anecdotal evidence of their success” (p. 268).

Research Design and Rationale

This research employed a mixed-method data collection methodology approach with emphasis placed on gathering attitudinal data appropriate for statistical analysis. An online survey was used to collect quantitative (i.e. rank order scaling of attitudinal response) data. The online medium was selected to facilitate flexible administration dates/times and to purposely engage students with digital technologies, a central tenet of 21st-century education.

“Systematic, direct assessment of 21st-century skills in classrooms is rare. …the state of practice for assessing 21st-century skills integrated into learning activities remains in its infancy” Scardamalia, et al., 2011, p. 31). The decisions of policy makers and administrators are strongly influenced by research that reflects both generalized and specific factors affecting educational
outcomes. Quantitative data that demonstrate strong correlations between dependent (e.g. sense of core competency development) and independent (e.g. IPM) variables are highly effective justifications for implementing proposed programs (Waetjen, 1991). Quantitative analysis has been identified as an effective means of augmenting the predominantly qualitative data collection and analysis methodology (i.e. the perceptions and attitudes of the study participants) upon which this project is based (R. Kool, personal communication, July 11, 2012).

…the tools provided - and the consequent capacity to link qualitative with quantitative data and qualitative interpretation of text with interpretation of numeric analyses - do, nevertheless, make possible an entire new range of analyses that have the potential to greatly enrich our understanding of the social and behavioural world. (Bazeley, 2002, p. 242)

Data Collection

Data collection tools

I adapted the Knowledge Building Analytic Framework (KBAF) Template for Analyzing Environments and Assessments, which was designed and piloted by the Assessment and Teaching of 21st-century Skills Project (ATC21S.org, 2012; Scardamalia et al., 2012). Based out of the University of Melbourne, the public-private initiative is sponsored by Cisco, Intel and Microsoft Corporations with an international collaboration between scholars and researchers in Australia, Finland, Singapore, the United States, Costa Rica, and the Netherlands (ATC21S.org, 2012). The KBAF was developed to assess the degree to which environments characterize and support knowledge-creating organizations. This assessment framework is appropriate because it has been developed by an international consortium of education scholars and seeks to measure the attitudes of educands towards 21st-century competency development. The attitudinal rating scale of the KBAF collects interval data from both test and control groups without the need for
population-specific alteration or specification. The language of the KBAF was altered slightly to improve clarity and readability for youth. In addition to the KBAF, additional sections were added to the survey to provide opportunities for participants to include additional feedback that they felt is relevant. Ecological literacy was added to the existing eleven core competencies included in the original KBAF in order to assess the highly relevant, if commonly underrepresented, core competency.

This survey provided opportunities for students to reflect upon and evaluate their own learning. This sampling methodology was applied but the results were not studied for this research. The qualitative data was collected with foresight to mitigate inconclusive or poorly defined quantitative datasets. It was assumed that the qualitative data would help to contextualize the quantitative data (i.e. different conditions, spaces, and people) or provide additional data for future research. Since the survey should be deployed through and across space and time (Dervin, 1983; Shenton, 2004).

Data collection process.

The process began with a research proposal and subsequent approval to conduct research with youth participants in Whitehorse, YT. Yukon Education Administration was first contacted for local ethics approval and permission to speak directly with teachers and program administrators. Parents and students were provided with paper information and informed consent packages that included links to the research website - [http://ipmsfor21stc.webs.com/](http://ipmsfor21stc.webs.com/)- and pertinent contact information (Appendix B). I flew to Whitehorse, YT to present the research introductions to students and teachers. Both were provided with opportunities to ask questions. Administration of the online survey for the test group was conducted in person at Wood St. School and Porter Creek Secondary School, YT, January 13th-15th, 2014.
Integrated OE3 program faculty were trained to administer surveys to the control group at the start of the Winter/Spring semester program (January 30th – February 5th, 2014) concurrently with the survey administration for the test group. A copy of the online survey can be found at [http://fluidsurveys.com/s/Goederham/](http://fluidsurveys.com/s/Goederham/).

**Research site and participants.**

Whitehorse, Yukon was selected as the research location because of the extremely high concentration of exceptionally well-developed integrated programs. The small size of the school administration and the prevailing ‘pioneer spirit’ in the Yukon facilitated much of the planning and organization of the study.

This study surveyed 89 secondary school students (Grades 9 – 11). The test group included 56 (63%) students who were in the final week of an OE3-focused integrated semester IPM. The control group was comprised of 33 (37%) students who took part in conventional IPMs in the fall/winter semester and had been accepted into OE3 programs for the winter/spring semester. This group was surveyed in the first week of the winter/spring integrated OE3 semester, and was necessary if conclusions were to be drawn on the degree to which student attitudes on 21st-century skill development vary between integrated OE3 and conventional IPMs.

The test and control groups are homogenous in the sense that they are all of the same age cohort, are drawn from a variety of feeder schools, are self-selected to participate in the integrated semester OE3 programs, and have all had relatively similar educational backgrounds. The key difference is that the test group had already completed their integrated semester program whereas the controls were just about to start theirs.

**Data Analysis**

The Statwing statistical analysis tools provided by the FluidSurveys online survey
software were used to analyze the quantitative data (i.e. attitudinal interval data). Comparisons of mean and standard deviation values were made between test and control groups as a whole. Computational software provided by Statwing, v.2013-09-20 provided additional statistical calculations including t-test, and effect size (Cohen’s d).

Effect size is defined by d value that is either small (.2-.49), medium (.5-.79), and large (> .8). Data meta-analysis used calculations of Effect Size (Cohen’s d) to account for relatively small sample sizes, abnormal data variation, and variable ranking frequency. Measuring the degree to which sample size can be said to influence statistical significance using Cohen’s d can help to calculate statistical significance of small sample sizes more accurately (Coe, 2002). Effect size “…is easy to calculate, readily understood and can be applied to any measured outcome in Education or Social Science (Coe, 2002, para.2).

**Reliability and validity.**

Reliability has been addressed by administering the survey in one jurisdiction where students have minimal variation in experiential learning opportunities, governmental education requirements, social climate (both in and out of school), how climate/geography/location influences planning, and resource availability. OE3 programs in the Yukon have been running for many years, often taught by the same teachers year to year and semester to semester, allowing for a standardized approach and low variability between semesters. The integrated OE3 programs are well-established and further research could use this study’s survey to validate the conclusions herein in subsequent research.

Validity was addressed through the collection of attitudinal data from students in grades 9-11 who participated in a variety of programs at different schools in the Yukon District. In this way, the influence of individual teachers, schools, resources, and student experience was
mitigated in the measurement of the degree to which Yukon Education as a whole develops 21st-century core competencies.

Data exclusion was applied to incomplete surveys, for one respondent not in an integrated OE3 program or conventional IPM for the test period, and on three respondents who provided contradictory program information and therefore could not be associated with either test or control group.
Chapter 4: Results

The data represented in Table 3, and Table 4 below, indicates how students in integrated programs ranked their perceptions of 21st-century core competency development as generally being greater than those of their peers in conventional IPMs. Contextualized descriptions of 21st-century competencies as defined in the survey can be found in Appendix A. For each core competency, italicized descriptions below the heading are based on the 10 point rating from the modified KBAF, where 1 most closely aligns with conventional instructional environments and 10 represents characteristics of a ‘21st-century knowledge-building environment’. The differences between KBAF scores between the two groups was statistically significant (p<0.01) in all categories except financial literacy and digital literacy.

Figure 1: Comparisons of Integrated and Conventional Group KBAF scores (Averaged w/
Standard Deviation) across all 12 21st-century core competencies. The difference between groups was statistically significant (p<0.01) in all categories except financial and digital literacy.

Table 3: Comparisons of Integrated and Conventional Group KBAF scores across all 21st-century core competencies.

<table>
<thead>
<tr>
<th>21st-Century Core Competencies</th>
<th>Integrated Average</th>
<th>Std. Dev.</th>
<th>Conventional Average</th>
<th>Std. Dev.</th>
<th>p-value</th>
<th>Cohen’s d</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financial Literacy</td>
<td>4.54</td>
<td>2.95</td>
<td>4.15</td>
<td>2.59</td>
<td>.384</td>
<td>0.138</td>
</tr>
<tr>
<td>Digital Literacy</td>
<td>6.36</td>
<td>2.49</td>
<td>5.12</td>
<td>2.94</td>
<td>1.24*</td>
<td>0.469</td>
</tr>
<tr>
<td>Information and Research Literacy</td>
<td>6.70</td>
<td>1.99</td>
<td>4.73</td>
<td>2.38</td>
<td>1.6***</td>
<td>0.744</td>
</tr>
<tr>
<td>Critical Thinking and Problem Solving</td>
<td>6.75</td>
<td>2.71</td>
<td>4.39</td>
<td>2.05</td>
<td>2.13**</td>
<td>0.859</td>
</tr>
<tr>
<td>Collaboration and Teamwork</td>
<td>7.20</td>
<td>1.94</td>
<td>5.60</td>
<td>2.55</td>
<td>2.29**</td>
<td>0.931</td>
</tr>
<tr>
<td>Communication</td>
<td>7.32</td>
<td>2.69</td>
<td>5.03</td>
<td>2.33</td>
<td>1.97**</td>
<td>0.96</td>
</tr>
<tr>
<td>Citizenship: Local and Global</td>
<td>7.43</td>
<td>2.20</td>
<td>4.67</td>
<td>2.69</td>
<td>2.36**</td>
<td>0.902</td>
</tr>
<tr>
<td>Metacognition</td>
<td>7.50</td>
<td>2.36</td>
<td>4.70</td>
<td>2.58</td>
<td>2.8**</td>
<td>1.17</td>
</tr>
<tr>
<td>Creativity and Innovation</td>
<td>7.55</td>
<td>2.19</td>
<td>4.94</td>
<td>2.29</td>
<td>2.76**</td>
<td>1.16</td>
</tr>
<tr>
<td>Accountability: Personal and Social</td>
<td>7.59</td>
<td>1.95</td>
<td>4.88</td>
<td>2.46</td>
<td>2.61**</td>
<td>1.27</td>
</tr>
<tr>
<td>Social Literacy</td>
<td>7.77</td>
<td>2.39</td>
<td>5.64</td>
<td>2.70</td>
<td>2.71**</td>
<td>1.19</td>
</tr>
<tr>
<td>Ecological Literacy</td>
<td>8.82</td>
<td>1.73</td>
<td>3.45</td>
<td>2.33</td>
<td>2.37**</td>
<td>2.75</td>
</tr>
</tbody>
</table>

* indicates p<.05
** indicates p<.01

Table 4 ranks the statistical significance between Conventional and Integrated program response averages in ascending (low to high) order. Although there are some variations in the rank order shown (i.e. Collaboration and Teamwork - 5th to 3rd - and Social Literacy - 11th to 4th) in Table 5 the variations are small. Cohen’s d effect size is also shown Table 3. Cohen’s d effect size was small (d<0.3) for financial and digital literacy, medium (d>.31 <0.8) for collaboration and teamwork, and large (d≥0.8) for all other core competencies. This indicates that despite small sample sizes, for nine of eleven core competencies the results were strong enough to show statistically significant differences between test and control groups.

A calculation of mean for combined averages in each category provided a generalized measure of performance that can be compared to the other metrics of perceived development of
competency (Figure 2). Combining the averages provides data on the general student population’s perception of how Yukon Education is performing in 21st-century core competency development opportunities. Combining the averages may provide some insight into how students can expect to develop their core competencies over the course of an entire year if they take one conventional and one integrated semester. It is very clear from Figure 1, Figure 2, Figure 3, Table 4, and Table 5 that Financial Literacy and Digital Literacy are not being interpreted as having sufficient emphasis in either of the IPMs. Although schools will certainly want to promote each of these core competencies, Figure 2 below indicates where particular areas of focus are needed in the most general system-wide sense. Note that the combination of averages can disguise significant shortcomings. For example, although the combined average for ecological literacy rates a moderate 6.1 it has the highest variability in ranking (Int = 8.8 and Conv. = 3.75).

Figure 2: Mean of Combined Averages for Integrated and Conventional Responses.
Result: No Statistically Significant Differences

Statistical analysis of test and control group responses for Financial Literacy (p = 0.52; d = 0.14) and Digital literacy (p = 0.05; d = 0.47) showed no statistically significant relationships. The difference in means for the test groups vs. control groups were 0.7 higher for financial literacy and 1.05 higher for digital literacy.

Financial Literacy.

*Students are taught how to budget for and purchase goods and services and have the opportunity to apply these skills. Different business models are explored (e.g. non-profit, for profit, government, and private industry) and students interact with representatives from each. Case studies and experiential projects allow students to practice financial planning skills.*

![Perceived 21st-Century Skill Development: Financial Literacy](image)

Figure 3: Integrated OE3 and Conventional IPM Rankings Comparison for Financial Literacy.

There was no significant difference in the scores for integrated OE3 (M = 4.54, SD = 2.95) and conventional (M = 4.15, SD = 2.59); t = .384, p = .523 in the financial literacy competency.

I anticipated that Financial Literacy would rank very low for both categories due to the ambiguous nature of the term and the lack of interdisciplinary emphasis in the curricula.
Financial literacy is covered in specific courses in the Yukon Curriculum (e.g. Planning 10, Business 9-12, Career and Health Education 9, etc.) and as such may not have received the attention or encouragement required to integrate it into other courses.

**Digital Literacy.**

*Information and Communication Technology (ICT) integrated into the daily workings of the lessons and activities. Students are active creators and consumers of media. Shared online community spaces built and continually improved by participants (i.e. class Facebook groups, twitter accounts, teacher webpages, etc.) Regular interaction with organizations and resources worldwide through the internet.*

![Figure 4: Integrated OE3 and Conventional IPM Rankings Comparison for Digital Literacy.](image)

There was a significant difference in the scores for integrated OE3 (M = 6.36, SD = 2.49) and conventional (M = 5.12, SD = 2.94); t = .1.24, p = .0477 in the digital literacy competency.

These results for the integrated test group were not surprising as OE3 programs have traditionally not been focused on digital integration; often times it is quite the opposite (Glover, 1999). It was unexpected, however, that integrated programs scored perceived development of Digital Literacy 12.7% higher on average. It was anticipated that the expeditionary
programming would limit students’ access to technology and result in few opportunities to develop technological skills. This is discussed in the Ch.2, section: *Debugging the Digital Dilemma*.

**Result: Moderate Statistically Significant Differences**

**Collaboration and Teamwork**

*Each student aims to enhance and add to the group's knowledge. Team members try to find ways in which their skills can best contribute to group success. Work with networked information and communication technology. Advances in community/group knowledge are prized, over-and-above individual success, while still allowing each participant to contribute in their own way.*

![Perceived 21st-Century Skill Development: Collaboration and Teamwork](image)

Figure 5: Integrated OE3 and Conventional IPM Rankings Comparison for Collaboration and Teamwork

There was a significant difference in the scores for integrated OE3 (M = 7.20, SD = 1.94) and conventional (M = 5.60, SD = 2.55); t = 1.6, p = .003. Although the t-test for *Collaboration and Teamwork* indicated a strong statistical significance, the Cohen’s d effect size was calculated as 0.744. (see Table 3) This value is only .056 off of what Cohen (1988) has indicated as being a “strong” effect size but, nonetheless, falls into the “medium” effect size category. It is worth
noting that, when the means for both groups were combined and averaged, *Collaboration and Teamwork* ranked in the #2 position (See Table 5). This calculation, despite statistically significant and medium-strong effect size differences, reflects the students’ overall positive perception of Collaboration and Teamwork development over the course of the entire school year, independent of the IPM in which they are being schooled.

I anticipated that Collaboration and Teamwork would receive a very high average ranking (>8/10) from the integrated test group due to the nature of OE3 programming, specifically the expeditionary and cohabitational nature of a significant proportion of the programming. In preparation for these activities there are frequent significant discussions surrounding, and preparation for, leadership opportunities that are then put into practice on trips. The terms ‘collaboration’ and ‘teamwork’ are common jargon in OE3.

Over 60% of respondents in the integrated program ranked Collaboration and Teamwork as 6 or above. In the conventional control group, over 50% of respondents ranked Collaboration and Teamwork at 5 or below. The low ratings suggest that more could be done to facilitate student-centred group initiatives in this cohort.

**Result: Strong Statistically Significant Differences**

Strong statistically significant differences (p < 0.01) were found for the 9 core competencies listed below by ascending order of p-value. Despite the relatively small sample sizes (control=33; test=56), Cohen’s d > 0.8 for all 9 corroborated the t-test results. As the data in Table 3 shows, the strength of these associations indicates strong positive perceptions of core competency development are related to integrated IPM participation for 75% of the competencies being evaluated.

In ranked order of significance, competencies 4 - 11 had effect size (d) values ranging
from 0.859 to 1.19, where >0.8 indicates large effect size significance. Analysis of the 12th rank competency, Ecological Literacy, calculated a \( d = 2.75 \). This represents a more-than-double (216%) increase in statistical strength over the next closest ranked competency and clearly demonstrates the strong positive perception of Ecological Literacy development. See Figure 6 for comparisons of Cohen’s \( d \) across all categories.

![Comparison of Effect Size (Cohen's d) for Integrated OE3 and Conventional IPM Responses.](image)

Figure 6: Comparisons of Effect Sizes (d) for Integrated OE3 and Conventional IPM Responses.
Social Literacy.

Inspired to engage in continuous, “lifelong” and “life-wide” learning opportunities. Self-identification as a 'knowledge creator', regardless of life circumstance or past performance.

Encouraged to feeling that one can do anything they put their mind to. Emphasis on capability.

Regular emphasis on development of skills relevant to life outside of school.

Figure 7: Integrated OE3 and Conventional IPM Rankings Comparison for Social Literacy.

There was a strong significant difference in the scores for integrated OE3 (M = 7.77, SD = 2.39) and conventional (M = 5.64, SD = 2.70); t = 2.13, p < .001. Social Literacy data presented the widest variability of all the core competencies. The results indicate that the integrated test group did perceive their program to contribute significantly to the development of key 21st-century social competencies.

Information Literacy and Research.

We learn many different techniques to efficiently and effectively search for, filter, sort, evaluate, and present valid and reliable information. Numerous sources and citations are always required and recording them is a skill that is taught. All claims must be supported. Encouraged
to take different or unique research approaches to identify and add to what is already known. Research tests existing assumptions; connects multiple sources to inform perspectives and make original conclusions.

Figure 8: Integrated OE3 and Conventional IPM Rankings Comparison for Information and Research Literacy.

There was a strong significant difference in the scores for integrated OE3 (M = 6.70, SD = 1.99) and conventional (M = 4.73, SD = 2.38); t = 1.97, p = .0002. I anticipated that the integrated OE3 programs’ emphasis on analog experiences and expeditionary programming would have afforded fewer opportunities for exposure to research and information literacy development opportunities based solely on the time available to access the necessary resources. As with all other competencies assumed to require access to digital technologies, the results indicate that perhaps perception of development is more dependent on quality of overall instruction and not simply quantity of interaction hours.

**Communication**

*Open, ‘brainstorming’ type discussions aimed at understanding the topic better or adding to it.*

*Discussions are given enough time to achieve a deeper and more complete understanding. Free*
time and open spaces encourage person-to-person and extended interactions including reflection and debriefing learning. Students taught how to communicate with others effectively, including conflict resolution.

Figure 9: Integrated OE3 and Conventional IPM Rankings Comparison for Communication.

There was a strong significant difference in the scores for integrated OE3 (M = 7.32, SD = 2.69) and conventional (M = 5.03, SD = 2.33); t = 2.29, p = .00008. The strong positive statistical difference of integrated over control for Communication was very much anticipated. The cohort-based nature of the integrated programs coupled with extended socialization on expeditionary programs requires that students have regular interactions with one another in many contexts. This level of familiarity and the inevitable empathetic bonds that are created are the likely cause of increased openness to sharing ideas, feelings, and reflections on learning. The necessity for OE3 leaders to provide instruction specific to maintaining group wellness (e.g. conflict resolution, debriefing, decision-making, personality styles, etc.) could also be a contributing factor to the strong positive results.

Critical Thinking and Problem Solving.

Students encouraged to engage in high-level thinking skills in order to develop authentic/original
personal knowledge. Self-initiated problem solving and consideration of what makes for a good idea is encouraged. Participants engage in complex analyses that require them to think about problems from many different perspectives. Students are taught skills that enable them to draw and act upon their own conclusions.

Figure 10: Integrated OE3 and Conventional IPM Rankings Comparison for Critical Thinking and Problem Solving.

There was a strong significant difference in the scores for integrated OE3 (M = 6.75, SD = 2.71) and conventional (M = 4.39, SD = 2.05); t = 2.36, p = .00001. Strong positive responses in this category were anticipated for the integrated test group due to the nature of OE3 programming. Traditionally, OE3 programs engage participants in activities that attempt to prepare them to take up leadership roles and have strong emphases on developing greater independence and self-reliance. These activities are often called ‘initiative games’ and are centred around developing communication, leadership, and problem solving skills. I anticipated that the conventional control group, following a prescribed curricula in discrete courses, would have fewer opportunities to practice the integrative and iterative processes that interdisciplinary programming nurtures and as such would report lower perceived development.
Citizenship: Local and Global.

Learners taught to identify as ‘Citizens’ who are capable of contributing to local community development and larger global causes. Regularly working in teams, students encouraged to value diverse perspectives and build shared, interconnected knowledge in formal and informal settings. Students encouraged to demonstrate leadership and support for inclusive rights.

Figure 11: Integrated OE3 and Conventional IPM Rankings Comparison for Citizenship: Local and Global

There was a strong significant difference in the scores for integrated OE3 (M = 7.43, SD = 2.20) and conventional (M = 4.67, SD = 2.69); t = 2.76, p = .00001. Given the results of the survey one hypothesis that could explain the difference is the nature of scheduling in integrated IPMs that allows teachers to tackle local and global issues through themes related to different classes. Scheduling independence would also allow classes to take part in extended activities that have them interacting with various communities, organizations, and programs.
Creativity and Innovation.

Student encouraged to design assignments and projects that interest them. Students generate theories and make models to test hypotheses. Students encouraged to 'think outside the box' and are supported in developing their own conclusions. Students pursue promising ideas and plans that interest them.

Figure 12: Integrated OE3 and Conventional IPM Rankings Comparison for Creativity and Innovation

There was a strong significant difference in the scores for integrated OE3 (M = 7.55, SD = 2.19) and conventional (M = 4.94, SD = 2.29); t = 2.61, p = .00001. This outcome was anticipated due to the constructivist methodologies that integrated OE3 programs are known to follow and the emphasis on interpretation and personal sense-making that they embrace. I believe that the nature of OE3 programs attracts teachers of high quality who are seeking to promote Creativity and Innovation and that this self-selection accounts for the very high ratings by students in this category. The role of teachers cannot be underestimated when it comes to positively influencing students’ perception of their ability to express themselves creatively and
facilitating their exploration of innovative thinking and practice. It is much easier for a teacher to maintain the expectations provided by the administration and their peers with regards to assignments and activities than it is to experiment outside of the status quo. It is the exceptional teacher who will embrace the uncertainty involved with allowing student to interpret, alter and personalize their demonstrations of comprehension. The teachers who take on this additional challenge are found in both integrated and conventional IPMs but integrated IPM teachers almost always require this predisposition as a condition of the position.

**Metacognition.**

*Students are taught skills that make them capable of taking on leadership roles for high-level decision making. Regular social (group) as well as individual reflection on events, decisions, communication, etc, is required. Ongoing assessment (debriefing) emphasized as learning opportunity. Reasons for activities and assessment explained in detail. Taught "Why" not just "What".*

![Perceived 21st-Century Skill Development: Metacognition](image)

*Figure 13: Integrated OE3 and Conventional IPM Rankings Comparison for Metacognition*

There was a strong significant difference in the scores for integrated OE3 (M = 7.50, SD = 2.36) and conventional (M = 4.70, SD = 2.58); t = 2.80, p = .00001. Metacognition is another
a term the encompasses, among other things, the practice of reflection, which is the cornerstone of constructivist pedagogies that dominate OE3 programs. It comes as no surprise that the data indicates strong positive results for metacognitive skill development in integrated OE3 programs.

As previously stated in the literature review, 21st-century core competencies, including metacognition and personal and communal accountability (next section) in particular, have long been taught by OE3. This enculturation of pedagogy and IPM that supports it would appear to be another strong argument in favour of integrated programming for 21st-century education.

Accountability: Personal and Communal.

(Note: Formerly Citizenship: Personal and Social Responsibility (including cultural competence) but updated to disambiguate from Citizenship: Local and Global)

Team members act to build on and improve knowledge assets (research, social programs, school climate) of different communities. Lessons regularly include and appreciate cultural diversity. Ideas and actions serve and benefit a multicultural, multilingual, changing society. Students taught to be accountable for their choices, which tend to have positive outcomes.

![Perceived 21st-Century Skill Development: Accountability: Personal and Communal](image)

Figure 14: Integrated OE3 and Conventional IPM Rankings Comparison for Accountability: Personal and Communal
There was a strong significant difference in the scores for integrated OE3 ($M = 7.59, SD = 1.95$) and conventional ($M = 4.88, SD = 2.46$); $t = 2.71$, $p = .00001$. Personal and Communal Accountability was ranked significantly higher in the integrated cohort. As previously mentioned, communal accountability has long been a cornerstone of OE3 instruction. See comments under Metacognition.

**Ecological Literacy.**

*Environment and ecology themes are a part of everything that is taught. Students regularly go out into nature to learn lessons that relate to the school curricula. The importance of a healthy ecology is a primary focus and we often discuss ways that we can lessen our 'ecological footprint'. Regular opportunities to develop an appreciation for the natural world and we interact with living and non-living components.*

![Perceived 21st-Century Skill Development: Ecological Literacy](image)

Figure 15: Integrated OE3 and Conventional IPM Rankings Comparison for Ecological Literacy

There was a strong significant difference in the scores for integrated OE3 ($M = 8.82, SD = 1.73$) and conventional ($M = 3.45, SD = 2.33$); $t = 5.37$, $p = .00001$. Given that the integrated programs being evaluated were focused on outdoor, experiential, and ecological education, it is not surprising that Ecological Literacy had the highest average rank of all 21st-century core
competencies (8.82). The average rank in the conventional group was 3.45. This yields a dramatic difference between integrated and conventional average ratings with an effect size of 2.58. This gaping disparity is a strong indicator that there is a significant shortcoming in the conventional system when it comes to the teaching of ecological ethics, systems, interactions, and the human influence on ecological health. More detailed commentary is found in the Discussion chapter.

**Results Summary**

Statistical analysis of the quantitative data indicates statistically significant differences for nine, moderate differences for one, and no statistically significant differences for two categories of core competencies (See Table 3 above). These results met the expected findings with the exception of Collaboration and Teamwork: I anticipated that the expeditionary and integrated programming would naturally facilitate collaborative opportunities and that the emphasis on leadership that many OE3 programs adopt would promote teamwork skills.

Given that the ranking was from 1-10, each of the averages can be interpreted as a ‘grade’ and converted to a percentage. This quantitative data can be used by administrators to empirically measure changes to student perceptions over time and to focus their efforts on developing curricula that supports core competencies that fall below a desired threshold. For example, if a ‘pass’ was a traditional 50%, Integrated OE3 students would have passed the pedagogical model and IPM in all categories except Financial Literacy; Ecological Literacy would have received an A (88%). Conversely, the conventional students would have failed nine out of twelve categories and the highest ‘mark’ would only have been 56%, a tie between Collaboration and Teamwork and Social Literacy. (See Table 4 below)
Table 4: Student rankings of perceptions of 21st-century core competency development converted to percentage grades.

<table>
<thead>
<tr>
<th>21st-Century Core Competencies</th>
<th>Integrated Average</th>
<th>Conventional Average</th>
<th>Difference between Averages (Int. - Conv.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financial Literacy</td>
<td>45.4%</td>
<td>41.3%</td>
<td>3.8%</td>
</tr>
<tr>
<td>Digital Literacy</td>
<td>63.6%</td>
<td>51.2%</td>
<td>12.4%</td>
</tr>
<tr>
<td>Information and Research Literacy</td>
<td>67.0%</td>
<td>47.3%</td>
<td>19.7%</td>
</tr>
<tr>
<td>Critical Thinking and Problem Solving</td>
<td>67.5%</td>
<td>43.9%</td>
<td>23.6%</td>
</tr>
<tr>
<td>Collaboration and Teamwork</td>
<td>72.0%</td>
<td>56.0%</td>
<td>16.0%</td>
</tr>
<tr>
<td>Communication</td>
<td>73.2%</td>
<td>50.3%</td>
<td>22.9%</td>
</tr>
<tr>
<td>Citizenship: Local and Global</td>
<td>74.3%</td>
<td>46.7%</td>
<td>27.6%</td>
</tr>
<tr>
<td>Metacognition</td>
<td>75.0%</td>
<td>47.0%</td>
<td>28.0%</td>
</tr>
<tr>
<td>Creativity and Innovation</td>
<td>75.5%</td>
<td>49.4%</td>
<td>26.1%</td>
</tr>
<tr>
<td>Accountability: Personal and Social</td>
<td>75.9%</td>
<td>48.8%</td>
<td>27.1%</td>
</tr>
<tr>
<td>Social Literacy</td>
<td>77.7%</td>
<td>56.4%</td>
<td>21.3%</td>
</tr>
<tr>
<td>Ecological Literacy</td>
<td>88.2%</td>
<td>34.5%</td>
<td>53.7%</td>
</tr>
<tr>
<td>Average</td>
<td>71.3%</td>
<td>47.8%</td>
<td>23.5%</td>
</tr>
</tbody>
</table>

Note: Red highlights indicate conventionally-defined ‘failing’ grades (<50%).

The statistical analysis of the results have yielded findings that can be built upon, expanded, and researched in greater detail. Although there are a number of statistically significant differences between integrated and conventional averages of the measured competencies, the data will be most relevant when the desired achievement objectives are established and the empirical outcomes are measured against their achievement indicators.

The results will now be discussed in relation to the review of the existing research, and will be used to connect 21st-century educational theory with the practices of existing integrated models.
Chapter 5: Discussion

This study sought to determine the extent to which different instructional programming models - integrated OE3-focused and conventional - were perceived by students to have contributed to their development of 21st-century core competencies. For ten of the twelve 21st-century core competencies studied, integrated OE3 participants mean scores showed a statistically significant difference for perceived development when compared to conventional IPM respondents (Table 3).

Therefore, data for integrated OE3 and conventional IPMs, in Yukon Schools, September 2013 - January 2014, has clearly qualified an acceptance of the non-inferiority hypothesis for all twelve of the 21st-century core competencies. Additionally, the data suggests that integrated OE3 programs achieve significantly higher rates of perceived 21st-century competency development.
Table 5: Ranking of core competency data by different metrics.

<table>
<thead>
<tr>
<th>Ranking</th>
<th>Integrated OE3 IPM Ranked by Mean</th>
<th>Conventional IPM Ranked by Mean</th>
<th>Ranked by Average of Combined Means</th>
<th>Ranked by Effect Size (d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ecological Literacy (8.82)</td>
<td>Social Literacy (5.64)</td>
<td>Social Literacy (6.7)</td>
<td>Ecological Literacy (2.75)</td>
</tr>
<tr>
<td>2</td>
<td>Social Literacy (7.77)</td>
<td>Collaboration and Teamwork (5.60)</td>
<td>Collaboration and Teamwork (6.4)</td>
<td>Accountability: Personal and Social (1.27)</td>
</tr>
<tr>
<td>3</td>
<td>Accountability: Personal and Social (7.59)</td>
<td>Digital Literacy (5.12)</td>
<td>Creativity and Innovation (6.2)</td>
<td>Creativity and Innovation (1.19)</td>
</tr>
<tr>
<td>4</td>
<td>Creativity and Innovation (7.55)</td>
<td>Communication (5.03)</td>
<td>Accountability: Personal and Social (6.2)</td>
<td>Citizenship: Local and Global (1.17)</td>
</tr>
<tr>
<td>5</td>
<td>Metacognition (7.50)</td>
<td>Creativity and Innovation (4.94)</td>
<td>Communication (6.2)</td>
<td>Metacognition (1.16)</td>
</tr>
<tr>
<td>6</td>
<td>Citizenship: Local and Global (7.43)</td>
<td>Accountability: Personal and Social (4.88)</td>
<td>Ecological Literacy (6.1)</td>
<td>Critical Thinking and Problem Solving (0.96)</td>
</tr>
<tr>
<td>7</td>
<td>Communication (7.32)</td>
<td>Information and Research Literacy (4.73)</td>
<td>Metacognition (6.1)</td>
<td>Information and Research Literacy (.931)</td>
</tr>
<tr>
<td>8</td>
<td>Collaboration and Teamwork (7.20)</td>
<td>Metacognition (4.70)</td>
<td>Citizenship: Local and Global (6.1)</td>
<td>Communication (.902)</td>
</tr>
<tr>
<td>9</td>
<td>Critical Thinking and Problem Solving (6.75)</td>
<td>Citizenship: Local and Global (4.67)</td>
<td>Digital Literacy (5.7)</td>
<td>Social Literacy (.859)</td>
</tr>
<tr>
<td>10</td>
<td>Information and Research Literacy (6.70)</td>
<td>Critical Thinking and Problem Solving (4.39)</td>
<td>Information and Research Literacy (5.7)</td>
<td>Collaboration and Teamwork (.744)</td>
</tr>
<tr>
<td>11</td>
<td>Digital Literacy (6.36)</td>
<td>Financial Literacy (4.15)</td>
<td>Critical Thinking and Problem Solving (5.6)</td>
<td>Digital Literacy (.469)</td>
</tr>
<tr>
<td>12</td>
<td>Financial Literacy (4.54)</td>
<td>Ecological Literacy (3.45)</td>
<td>Financial Literacy (4.3)</td>
<td>Financial Literacy (.138)</td>
</tr>
</tbody>
</table>

**Contributions to Existing Research**

Additional quantitative, empirical data such that this study offers is much needed augmentation to the anecdotal reports of the effectiveness of integrated programs (Rickinson et al., 2009; Russell & Burton, 2000). Specifically, data that addresses the effectiveness of IPMs for supporting 21st-century educational objectives will certainly be of growing importance to decision-making (i.e. staffing, funding, organization, scheduling, class size, etc.) processes.
INTEGRATED IPMs FOR 21ST-CENTURY EDUCATION


This study contributes to the present understanding of 21st-century education by clearly demonstrating the objectives and outcomes shared with integrated OE3 programs, specifically the facilitation of a constructivist pedagogy (Brandsford et al., 1999; Koller et al., 2008; Lindsay & Ewert, 1999; Stringer, 1999). It also builds upon an empirical methodology by which perceptions of knowledge building environments can be quantified and measured (Scardamalia et al., 2012). At the time this research was submitted, no published studies could be found that refer to results gathered using the KBAF. I expect that future studies that adopt the KBAF will facilitate data comparison and promote the analysis of a variety of knowledge-building environments. In this way, my study contributes to existing OE3 knowledge and provides a reference point for the holistic development of nascent 21st-century pedagogy. The elucidation of how the marginalized pedagogies and IPMs of the past can be adapted to meet 21st-century educational objectives has the potential to begin reconciliation of the perception of a digital-analog dichotomy (Cuthbertson et al., 2004; Joseph, 2012; Koller et al., 2008).

Modeling intelligent and conscientious digital literacy.

This study has demonstrated that the key to effective 21st-century teaching goes beyond more screens and higher bandwidth as proposed by Martin (2012). My results indicate that, despite the number of days that are dedicated to expeditionary and field-work programming (~20-40 days per semester), integrated programs rank higher in perceived development of digital literacy. (See Figure 1) This would indicate that there is more to developing digital literacy in our students than merely improved access to, and time available to engage with technology.

Common barriers to the implementation of digital technology arise from issues with the variable support of leadership, funding, availability of requisite technology, system-wide lack of
integration, and weak teacher motivation to adopt emergent technologies (Bingimlas, 2009; Rogers, 2007). These are all potential reasons why students reported that digital literacy as not perceived as being taught well in either IPM. Although the scores were higher (though no statistically significant difference was established) for integrated programs, they were significantly lower than what would indicate proficiency in instruction.

“One reason Web 2.0 technologies are not widely integrated in Pre K-12 and graduate education is the lack of modeling by instructors” (Greenhow et al., 2009, p. 252) Teachers are the front line of education innovation and the focus of the 21st-century education movement should be to eliminate the current barriers to their effective use and curricular integration of digital resources (Bingimlas, 2009; Joseph, 2012). Teachers of any class or IPM who are comfortable with technology and can carefully plan its judicious application will be much better equipped to improve students’ digital literacy and enhance ecologies of learning (Greenhow et al., 2009; Hester & Hirsch, 1999; Joseph, 2012; Kozma, 2003). It has been my experience with Experiential Educators that, as a group, they are slower, if not resistant, to adopting digital educational technologies in their practice. There are some written and anecdotal suggestions that their involvement in practical, hands-on teaching may be as a result of a personal belief that students can be taught as well, if not better, without the use of digital, indoor, sedentary methods (Glover, 1999; Simon Fraser University Centre for Dialogue, 2013; Stringer, 1999). Many such experiential educators reject digital technology to varying degrees and as such are unaware of how digital devices and programs can be judiciously applied to meet the needs of the digital native generation.

An example of this was found at Feeling Our Way: New Pathways in Environmental Education, a day-long conference presented by Simon Fraser University. It was convened “...to
discuss the possibilities of and challenges for today’s environmental education. Keeping a firm eye on the new directions needed to both advance and deepen the research and practice in the field of environmental education…” (Simon Fraser University Centre for Dialogue, 2013). When the introductory address was opened for questions, someone asked whether there was a Twitter handle or hashtag for the sessions, but none of the organizers were on Twitter or knew what a hashtag was. This low level of digital integration was common throughout the assembled practitioners and “nationally and internationally recognized teachers and researchers in environmental education” and it is my belief that it is symptomatic of a digital divide between the seasoned practitioners and younger 21st-century-connected educators. Some of the leadership of the ExpEd/OE3 movement are seemingly reluctant to seek out the common ground and find ways to connect, integrate, and evolve the practice. This reluctance to assimilate emergent objectives of 21st-century education could be seen as a wedge that may serve to widen the gap between traditional OE3 and emergent technological pedagogies. This missed, or rejected depending on how the motivations are interpreted, opportunity would be especially regrettable in a time when OE3 is best positioned to capitalize on its past successes in fostering these highly-prized competencies.

Educators in all streams, especially OE3, can do much more to embrace the very exciting and relevant digital technologies that are available to augment their existing programs (Cuthbertson et al., 2004; Foladori, 2005; Neill, 1997). When planning food menus, teach students how to use spreadsheets and formulas. Use phones to record ‘visual notes’ and video field reports. Use live streaming video calls to bring experts into the classroom, wherever that happens to be, and have students share their experiences on teacher-curated social media channels. I believe that the key to the success of this integration will be to overcome the
preconceived ideas and misconceptions about budget, training and availability barriers, and to establish IPMs that allow for adequate teaching time to be dedicated to both analog-humanistic and digital-technologic education.

Digital tools are available to increase the reach of one’s teaching and to facilitate personal learning networks (PLNs) that support teachers’ own growth and learning (Baird & Fisher, 2006; Dabbagh & Kitsantas, 2012; Greenhow et al., 2009). The sooner teachers open themselves up to the possibilities - open up to rediscovering their own student-ness - the sooner our youth can be trained in the holistic skills and competencies that they require and deserve. The teacher of the future will have to embrace changing conditions, engage new technologies for personal and student learning, and through their own expertise be able to accurately judge when resources amplify student experience and when they inhibit it.

The key is to understand when and for what purpose digital tools are best employed, deployed, and preferentially applied to amplify student learning. One method for promoting student comprehension is the use of backwards design (Wiggins & McTighe, 2005). Educational program design that moves from desired outcome towards practice offers an effective way to ensure that activities, pedagogies, and IPMs are accurately and precisely aimed at the target objectives. I believe that in order to establish these best practices, educators must be willing to experiment, leave their comfort zones, and iterate on each attempt. This is what they ask of their students and so it should be what they model themselves.

**Common ground design for responsive integrated IPMs.**

Lindsay and Ewert (1999) proposed that Experiential Education (defined broadly as OE3) not continue to attempt integration with mainstream (defined broadly here as Conventional) education because of the consistent failure of the latter to promote the objectives of the former.
It has also been suggested that the socially critical and politically activist approaches that EnvEd adopts naturally contrasts it against the uncritical role of mainstream education to maintain the status quo (Stevenson, 2007). There are others who support the divorce of EE completely from both conventional education and the digital literacy imperatives that it promotes (Glover, 1999). All of these 20th-century perspectives belie the assumption that ExpEd/OE3 and mainstream/conventional education must operate within exclusive IPMs and that this negates any meaningful opportunity for integration. Even in 1999, this was certainly not the case even if the disparate educational and pedagogical priorities made it seem so (Hungerford & Volk, 1990). I would agree with Glover (1999) and Lindsay and Ewert (1999) that at first-glance, the fundamental opposition between digital and analog pedagogies would seem to negate any significant interaction. I would point out that the nature of short-term (~1 - 4 weeks), expedition-based OE3 lends itself to analog teaching and learning. I believe that Glover (1999) neglected to consider the holistic effect of such programs placed within the broader context of long-term (~4 month - 4 year) educational experiences such that integrated OE3 can provide.

The past struggles to situate OE3 programs into the mainstream educational system could be attributed to the diametric opposition of the pedagogical objectives (i.e. constructivist vs. behaviourist, respectively). 21st-century pedagogy, on the other hand, is largely constructivist and evidence indicating the effectiveness of the integrated OE3 at supporting its objectives will facilitate pedagogical integration through systems-designed IPMs. Kozma (2003), Joseph (2012), and Rogers (2007) have all provided literature reviews that support the claim that digital pedagogies are strongly constructivist, a very encouraging common trait for educators looking to weave together digital and analog practices.

That the integrated model is easily scalable to different needs such as curricula,
objectives, budgets, demographics, etc. all support the case for implementation. Iterative successes in situating OE3 programs (i.e. cohort-based, nature-connected, analog, constructivist, (likely) expedition-inclusive, activities) within the general framework of conventional models (i.e. prescribed learning outcomes, standardized assessment, discrete course scheduling, credit-bearing courses) has given rise to a ratified integrated OE3 IPM in the Yukon Territory. The capacity for well-designed integrated IPMs to effectively blend humanistic and technological pedagogies to enhance the development of 21st-century competencies is increasingly viable given the mobility, accessibility, and necessity of the digital resources (Joseph, 2012; Rogers, 2007).

In the knowledge/information/creative economy, employers are pressured by the increasing pace and emergent opportunities in the digital arena (Autor et al., 2003; Stringer, 1999). Google’s (2014) emphasis on group work, communication, and anticipating change suggests a need for individuals who have been given opportunities to practice integrative and interdisciplinary thinking. As is seen in Figure 1 and Figure 8, Digital Literacy is rated very poorly by both groups. This finding can inform new directions for bolstering 21st-century competency development and provide Yukon Department of Education administrators with measurable goals and baseline information.

Integrated IPMs can foster 21st-century core competencies through expanded curricula, practical, hands-on experiences, and meaningful interdisciplinary approaches to OE3, Science, Technology, Engineering, Arts, and Math (S.T.E.A.M.). Pedagogical and logistical integration of the disciplines can encourage the experiential programming that translates disparate factual information into cohesive knowledge. Deep understanding of subject matter transforms factual information into usable knowledge. A pronounced difference between experts and novices is that experts command of concepts shapes
their understanding of new information. It allows them to see patterns, relationships, and discrepancies that are not apparent to novices. (Bransford et. al., 1999, p.16)

The intrinsic emphasis on conceptual knowledge within integrated programs will prepare students to meet key demands of the emerging economy. This cognitive capacity will be necessary for a workforce whose demands will continue to move away from skill-specific labour required by the industrial economies of the 20th-century and towards the dynamic, adaptive demands of a 21st-century creative economy.

It has been stated that general education has always responded to the demands of industry (Friesen & Jardine, 2009; Judy, 2000; Robinson, 2010; Stuart, 1999). It would seem that we are facing quite a different scenario now 14 years into the 21st-century. Industry has placed demands on the educational system that does not require the development of new pedagogies and IPMs, but instead, demands the rise of existing, previously marginalized, educational models. Our economies have evolved to a point where their needs have caught up to the skills and competencies that have long been championed by the most influential and conscientious educators in history such as Plato, Dewey, Montessori, Piaget, and Gardner (Itin, 1999; Kolb et al., 2011; Reeve, 2001; 2004). There is an existing canon of research that suggests integrated OE3-style programs have demonstrated a capacity to nurture the core competencies for success in the 21st-century.

Experiential educators are uniquely poised to be facilitators of IT integration into communities of learning. ... I was struck time and time again by the degree to which the new Knowledge Age learning models are based on and incorporate experiential education theories and practices (though the literature does not necessarily identify them as such)... Our leap into successful integration of Knowledge Age tools need not be a huge one, The “easy” part is integrating the
technology; the hard part is changing/updating the theories and practices in use, the problem faced in traditional school systems around the world. This is an effort with which we are all too familiar; perhaps integration of information technology is the opening we need to integrate experiential methods and theories. (Stringer, 1999, p. 65)

This quote supports three key assertions of this study:

1. 21st-century learning models are based on OE3 theories and practices
2. Integrating technology into existing OE3 practice is a simple adaptation to the pedagogy and IPMs.
3. OE3 educators are ideally suited to lead the expansion of constructivist pedagogies and model digital literacy.

In the case of social and technological innovations, the integrated model’s pedagogy and IPM to assimilate emergent developments shows potential. Given the strong statistically significant differences in mean values that the survey response analysis reported for Social Literacy, Accountability, and Citizenship, it could be reasonably argued that integrated IPMs are as, if not more, socially salient as they are educational. This may be due in part to the prevalence of nature-interactive activities have been hailed as promoting holistic wellness, which is one of the tacit desired outcomes of the 21st-century education movement (Hans, 2000; Hutchinson, 2012; James, 2000; Sobel, 1999).

Questions Arising from Data Analysis

In each and every category, the integrated OE3 test group indicated a higher perceived development of 21st-century core competencies (Figure 1). I speculate that there is an element of educational engagement that integrated OE3 provides that may be teased out with further research. The integrated OE3 programs are well-known by students to be enjoyable experiences
as they offer a reprieve from the conventional classroom and it is possible that this IPM cultivates social disposition resulting in overall positive differences in mean responses.

Russell and Burton (2000) recognizes that many integrated OE3 programs are created, promoted, and driven by a small group of highly dedicated teachers. This engagement and enthusiasm has the potential to skew the results of student satisfaction or perceptions of core competency development. However, if the KBAF is able to determine how teachers of specific IPMs engage 21st-century teaching and learning objectives more or less than others, then the databases created by KBAF research can be applied to development of IPM’s that attract, encourage, and retain effective 21st-century educators. In order to develop an understanding of what direction pedagogical development should follow into the future, administrators and policy makers would benefit from understanding where 21st-century skills are being taught in contemporary environments (Scardamalia et al., 2012).
Chapter 6: Conclusion

This study explored the degree to which secondary school students in Whitehorse, YT interpret different instructional programming models as preparing them with 21st-century society core competencies. The results of this study demonstrate the high degree of perceived effectiveness of integrated outdoor, experiential, and ecological education (OE3) programs in promoting ten of twelve of the surveyed 21st-century core competencies.

By using integrated OE3 IPMs to test a non-inferiority hypothesis against conventional IPMs, it has contributed to the current understanding of the degree to which different IPMs are effective at teaching 21st-century skills. Specifically, the data would seem to refute the common, and oft enacted, assertion that 21st-century education is best served with intensified access to, and application of, digital technology (Martin, 2012).

The nature of the quantitative, empirical data can be applied as valuable reference for educational administrators who are motivated by evidence-based decision making based on demonstrable improvements to student outcomes. It may also help to refine our understanding of what students believe are the most significant means for meeting 21st-century objectives and, by gathering their perceptions, can fostered the 21st-century education objectives of collaboration, citizenship, communication, reflection, and agency (Prensky, 2010). Further prospective and longitudinal studies will continue to illuminate the strengths and limitations of this study.

Contributions to Future Research

As one of the first surveys to apply the KBAF, the results from this study can be used to evaluate the effectiveness of the survey tool and build on the database of information that it has been designed to collect. In that regard, this study will contribute to ongoing empirical data collection and the promotion of internationally sanctioned evaluations of knowledge-building
environments. Using the same or similar surveys, the data could provide more context and triangulation for the effect of the IPM on 21st-century competency development and establish the particular strengths and opportunities for improvement of existing and future OE3 programs.

Online surveys that apply the KBAF can contribute to the development of 21st-century core competencies by engaging students with digital technologies, involving them in the process of educational reform, and promoting metacognition. I believe that students who provide meaningful feedback into the direction of education - and who see positive results - will be more inclined to become engaged in the process thereby improving their senses of agency and volition (Kenis & Mathijs, 2012; Rickinson, 2001; Scardamalia et al., 2012). Dochy, Segers, and Sluijsman’s (1999) review of self-assessment studies concluded that, ...

research reports positive findings concerning the use of self-assessment in educational practice... self-assessment, used in most cases to promote the learning of skills and abilities, leads to more reflection on one’s own work, a higher standard of outcomes, responsibility for one’s own learning and increasing understanding of problem-solving. (p. 337)

Multi-stakeholder collaboration also models the inclusive values that can foster the skills and attitudes conducive to active citizenship (Itin, 1999).

This cross-sectional study can be expanded upon with prospective and longitudinal assessment of cohort perspectives of 21st-century skill development. Comprehensive evaluation of evolving student perspectives over the course of a semester, school year, and through multiple cohorts will provide a much more robust dataset. Uncontrollable variables such as teacher preparation, cultural influences, home life, learning styles, etc. are difficult to account for, however, larger sample sizes will provide a more accurate overview view of the average student experience at each level. Expansion of the research populations to other provinces and territories
where methodologies, curricula, climate, geography, etc. vary will improve data triangulation and control for population-specific noise. Analysis at that level may reduce program specific influences (e.g. teachers, funding, locations, etc.) and data will likely be normalized to the commonalities of the IPM as opposed to reflecting the experience of individuals.

Future research can significantly expand the scope of surveyed integrated IPMs to include programs that are thematically-oriented around academics, the arts, athletics, and specialty interests. Numerous studies have found that students and teachers prefer fewer, longer classes offered in a Copernican model and that students perform to a higher standard, both academically and socially, when allowed more time to engage the course material (Carroll, 1994; Eineder & Bishop, 1997; Rettig & Canady, 2001; Zepeda & Mayers, 2006). Integrated OE3 programs tend to organize using ‘Copernican-style’ IPM. This scheduling can facilitate longer periods of time-on-task, focused investment, and, as well, more adaptability for extended field trip and experiential activities.

The most salient contribution to future research may be the conceptual division of the ‘Educational Model’ into the two component parts of Pedagogy and Instructional Programming Model. Although many have recognized that the methods for presenting OE3 programming, integrated or not, are incompatible with conventional systems, I believe it to be unique to this study that a formalized division and definition of pedagogy and IPM has been established. With this differentiation of terms, I hope to highlight the similarities, appreciate the differences, and establish the commensurate objectives within traditionally segregated educational approaches. The more precise definition of the conceptual nature of each ‘education model’ may help to establish congruent objectives and increase the overlap of areas in which the two can share common objectives while still maintaining their individual imperatives.
The success of the 21st-century education movement is strongly related to its ability to question the assumptions of its predecessor and define for itself the suitability of various blends of pedagogy and IPM. Albert Einstein is quoted as saying “We can't solve problems by using the same kind of thinking we used when we created them.” In order to effectively reform education for long-term success, it would seem that a systematic deconstruction of the foundations of 20th-century education be conducted. The systems that we then implement should be responsive to the radically different context and anticipate further, currently inconceivable, changes. That being said, this new system can and should included iterations of the 20th-century model where it is deemed to be the most suitable for achieving outcomes but it would also incorporate other options and educational alternatives.

This study assumed that educational models can be tailored to the needs of individual cohorts and demographics, as opposed to standardized for all users. A re-visioning of how pedagogy and IPMs are blended has the potential to provide for maximum adaptability of students, workforces, and economies. Diversity, complexity and change must be embraced as essential elements for promoting resilience within a system, be it social, industrial, or educational. (Jackson, 2003; Meadows, 2008) By blending pedagogies and IPMs into a variety of learning opportunities, Administrators can maximize the educational system’s agility and resistance to catastrophic compromise. In the case of the educational system, the catastrophic compromise involves not providing students with the skills and competencies required to participate in the dominant economies of the future (Goldberg et al., 2001; Salpeter, 2008).
Summary

One of the most salient outcomes of the research was the refinement of the conceptual definition of ‘educational system’ into its proposed constituent elements, pedagogy and instructional programming model. These new definitions can be used to overcome surface-level contradictions and elucidate the similarities between conventional and integrated, and indeed many other, educational models. It has been demonstrated that the commensurate objectives of the nascent 21st-century education movement and outcomes of established OE3 programs can contribute to a framework for a resilient educational system for the 21st-century. The shared constructivist pedagogies that emphasize learner-centric experiential education can inform the incipient movement towards a new ecology of learning.

Industry leaders in the knowledge economy are recognizing the imperative for a workforce equipped with core competencies that are deeply humanistic. Creativity, collaboration, critical thinking, and social, digital, and economic literacies are believed to be vital characteristics of groups of individuals who can drive dynamic innovation and technological advancement. Though these core competencies may drive the future economies, the majority have been long served by the overt and implicit objectives of OE3 programming. This study highlights the significant overlap in objectives and outcomes between OE3 and 21st-century education and cites the potential for integrated programming in general to resonate harmoniously with existing contemporary models. The results of this study provide additional quantitative empirical evidence that supports the continued development and expansion of integrated outdoor, experiential, and ecological instructional programming models that can effectively develop 21st-century core competencies.

Educators and administrations have been presented with a perfect opportunity to reify a
21st-century ecology of learning that promotes diversification of models that meet the needs of students, society, and economies. Integrated OE3 programming is one such pathway that is both backed by cutting-edge research and affirmed by centuries of refined pedagogical wisdom. The demonstrated success of these models in the Yukon provide an exceptional example of a educational paradigm shift towards an shared emphasis on holistic individual, academic, and social wellness, all of which are much needed intangible commodities in the 21st-century.
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Appendices

Appendix A - 21st-Century Core Competencies as Defined in the Survey.
Definitions adapted from original KBAF framework from Assessment and Teaching of 21st-century Skills. University of Melbourne.

Creativity and Innovation
Score your overall educational experience in this past term where:

● 1 represents: Teacher directs study. The instruction and assessment is assumes that there is one specific correct answer that has been determined by someone else. Assigned tasks are prioritized over ‘open’ or student-designed activities.

● 10 represent: Student encouraged to design assignments and projects that interest them. Students generate theories and make models to test hypotheses. Students encouraged to ‘think outside the box’ and are supported in developing their own conclusions. Students pursue promising ideas and plans that interest them.

Communication
Score your overall educational experience in this past term where:

● 1 represents: Class discussions are usually social chit chat. Teacher lectures mostly. Discussion aims to get everyone to some predetermined conclusion. Limited time and space for person-to-person or extended interactions and

● 10 represents: Open, ‘brainstorming’ type discussions aimed at understanding the topic better or adding to it. Discussions are given enough time to achieve a deeper and more complete understanding. Free time and open spaces encourage person-to-person and extended interactions including reflection and debriefing learning. Students taught how to communicate with others effectively, including conflict resolution.

Collaboration and Teamwork
Score your overall educational experience in this past term where:

● 1 represents: Individuals sometimes, but rarely, work in small groups. Group members do only what is necessary to create a finished product or meet the basic requirements. Groups are mostly individuals doing individual work that is put together then submitted.

● 10 represents: Each student aims to enhance and add to the group's knowledge. Team members try to find ways in which their skills can best contribute to group success. Work with networked information and communication technology. Advances in community/group knowledge are prized, over-and-above individual success, while still allowing each participant to contribute in their own way.

Information Literacy and Research
Score your overall educational experience in this past term where:

● 1 represents: Specific questions are answered by finding and copying information. Research reports on the findings of other people. We get most information from websites that come up on the first page of a web search. Wikipedia is usually good enough.

● 10 represents: We learn many different techniques to efficiently and effectively search for, filter, sort, evaluate, and present valid and reliable information. Numerous sources and citations are always required and recording them is a skill that is taught. All claims must be supported. Encouraged to take different or unique research approaches to identify and add to what is already known. Research tests existing assumptions; connects multiple sources to inform perspectives and make original conclusions.

Critical Thinking, Problem Solving and Decision Making
Score your overall educational experience in this past term where:

● 1 represents: Activities are always designed and led by the teacher or instructor. Students work towards predetermined goals set by others. Class decisions are made by someone other than the student and follow rigid guidelines. Students have little input.
● 10 represents: Students encouraged to engage in high-level thinking skills in order to develop authentic/original personal knowledge. Self-initiated problem solving and consideration of what makes for a good idea is encouraged. Participants engage in complex analyses that require them to think about problems from many different perspectives. Students are taught skills that enable them to draw and act upon their own conclusions.

Citizenship – Local and Global
Score your overall educational experience in this past term where:
  ● 1 represents: School lessons and activities may or may not support community organization and behaviour. Doing what is best for you is usually fine for the group too. Learning is mostly about the individual and community values are rarely discussed.
  ● 10 represents: Learners taught to identify as ‘Citizens’ who are capable of contributing to local community development and larger global causes. Regularly working in teams, students encouraged to value diverse perspectives and build shared, interconnected knowledge in formal and informal settings. Students encouraged to demonstrate leadership and support for inclusive rights.

Digital Literacy: Information and Communication Technology (ICT)
Score your overall educational experience in this past term where:
  ● 1 represents: Common applications, web resources and facilities may be used, but not often. Our lessons and activities rarely teach us how to use ICT. Digital Citizenship not taught. Sometimes classes access the internet for email and YouTube but not much else.
  ● 10 represents: ICT integrated into the daily workings of the lessons and activities. Students are active creators and consumers of media. Shared online community spaces built and continually improved by participants (i.e. class Facebook groups, twitter accounts, teacher webpages, etc.) Regular interaction with organizations and resources worldwide through the internet.

Social Literacy - Life and Career Skills
Score your overall educational experience in this past term where:
  ● 1 represents: Career goals being determined by individual's characteristics today. Career possibilities seem 'determined'. Assessment of requirements and probabilities of achieving career goals based on past performance. Feeling that personal success depends help from others or circumstance. Few opportunities to develop 'life skills'. (i.e. conversation and correspondence, scheduling, nutrition, cooking, etc.)
  ● 10 represents: Inspired to engage in continuous, “lifelong” and “life-wide” learning opportunities. Self-identification as a 'knowledge creator', regardless of life circumstance or past performance. Encouraged to feeling that one can do anything they put their mind to. Emphasis on capability. Regular emphasis on development of skills relevant to life outside of school.

Metacognition: Learning to Learn
Score your overall educational experience in this past term where:
  ● 1 represents: Teachers satisfied as long as assignments in on time. Little participation required. I often wonder "When am I ever going to need this." The reasons for learning specific information or doing certain activities is rarely explained. Tasks often done "just because".
  ● 10 represents: Students are taught skills that make them capable of taking on leadership roles for high-level decision making. Regular social (group) as well as individual reflection on events, decisions, communication, etc, is required. Ongoing assessment (debriefing) emphasized as learning opportunity. Reasons for activities and assessment explained in detail. Taught "Why" not just "What".

Accountability: Personal and Communal
(Note: Formerly Citizenship: Personal and Social Responsibility (including cultural competence) but updated to disambiguate from Citizenship: Local and Global)
Score your overall educational experience in this past term where:
  ● 1 represents: 'Consequences' and 'Accountability' are not taught or enforced. Student's decision making only considers themselves. Students require lots of outside assistance to manage themselves. Choices regularly lead to correction by authority figures.
● 10 represents: Team members act to build on and improve knowledge assets (research, social programs, school climate) of different communities. Lessons regularly include and appreciate cultural diversity. Ideas and actions serve and benefit a multicultural, multilingual, changing society. Students taught to be accountable for their choices, which tend to have positive outcomes.

Ecological Literacy: Environmental Education
Score your overall educational experience in this past term where:
● 1 represents: Sometimes the environment comes up but it is usually just the same information that you hear all the time. Classes rarely integrate ecological themes. Connections between topics and the environment are not usually made. The environment is something that exists outside of school and has little to do with our daily learning and activities.
● 10 represents: Environment and ecology themes are a part of everything that is taught. Students regularly go out into nature to learn lessons that relate to the school curricula. The importance of a healthy ecology is a primary focus and we often discuss ways that we can lessen our 'ecological footprint'. Regular opportunities to develop an appreciation for the natural world and we interact with living and non-living components.

Financial Literacy
Score your overall educational experience in this past term where:
● 1 represents: Economics, business models, and how the economy works is not taught. Lessons rarely have anything to do with money, budgets, spending, or costs of doing business. Students do not receive any practical training on how to save money, spend wisely, and manage income and expenses.
● 10 represents: Students are taught how to budget for and purchase goods and services and have the opportunity to apply these skills. Different business models are explored (e.g. non-profit, for profit, government, and private industry) and students interact with representatives from each. Case studies and experiential projects allow students to practice financial planning skills.
Appendix B - Research Introduction Letter to Parents

Third Party Authorized Informed Consent Form
Participation in Graduate Thesis Research

Dear Parent or Guardian:

Hello, my name is Brad Gooderham and I am a graduate student in the Masters of Arts in Environmental Education and Communication program at Royal Roads University. The title of my thesis project is “Student Perceptions of Instructional Programming Models for 21st Century Skill Development.” This study has been granted ethical research approval from Royal Roads University as well as the Yukon Department of Education. The school Principal, has given permission for this study to be carried out in your son/daughter’s school.

I am interested in studying student perceptions of their educational experience after the completion of their fall semester. Some students will have been involved in semester long interdisciplinary programs and others will have taken part in conventional high school programming. Information from both groups will be useful for designing programs that will help students develop the skill sets required for success in the 21st century. Questions relate to their experience with creativity, collaboration, and critical thinking, written/oral/digital/media literacies, citizenship, and ecological education.

The half-hour online survey will include an introduction to the study, questions about their perception of the educational experience, questions related to their impressions of 21st century skill development, and how it has informed their overall impressions of teaching and learning environments. The survey will be anonymous, self-directed and he/she may opt out or withdraw from the activity at any time.

Participation in this study is voluntary and will not affect your son/daughter’s attendance in class or his/her evaluation by the school. All raw data collected will be available only to the research team and is strictly confidential. The students will not be required to provide any information that could lead to individual identification. (e.g. date of birth, address, name, student number, etc.) A copy of the complete thesis will be made available to the public through the study’s website after completion of the Master’s program. Data gathered may be used in future studies, conferences, and publications that expand upon this project.

Please indicate on the attached form whether you permit your son/daughter to take part in this important research. Your cooperation in helping to inform the development of education is very much appreciated. Please feel free to contact me at any time or visit the research website at http://ipmsfor21stc.webs.com/ for additional project information.

Regards,

W. Bradley Gooderham
HBESc, BEd,

Website: http://ipmsfor21stc.webs.com/

Dr. Liza Ireland
MAEEC Program Director (Acting)
Royal Roads University

Dr. Pat Maher
Thesis Supervisor
University of Northern British Columbia
THIRD PARTY AUTHORIZATION AND INFORMED CONSENT FORM

For the Royal Roads University sanctioned study entitled:

“Student Perceptions of Instructional Programming Models for 21st Century Skill Development.”

The completed form must be returned to the school before the student is allowed to participate in the study. Please keep the cover letter for your personal records.

I consent to allow _________________________________ to take part in this study.

(son/daughter's name)

Parent's/Guardian’s signature: ________________________________

Participant’s (Student’s) signature: _________________________________

Graduate Student Researcher Name: Walter Bradley Goodeham

Graduate Student Researcher signature: _________________________________