Bringing A Reggio Emilia Inspired Approach into Higher Grades- Links to 21st Century Learning Skills and the Maker Movement

by

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Supervisory Committee

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Abstract

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The purpose of this project is to examine two educational philosophies: the Reggio Emilia approach to early childhood education and the maker movement, both of which explicitly reference the 21st century learning competencies espoused by the British Columbia government within a constructivist, student-centered learning environment. This project examines the philosophies and beliefs of each approach and concludes that together, they could provide teachers with the necessary tools and environment to teach the key competencies for the 21st century. A website is created as a resource guide for educators interested in creating a Reggio Emilia inspired makerspace. Key areas of the website include a blog documenting the implementation of a genius hour model, Reggio Emilia resources for teachers, makerspace resources for teachers and a collection of online resources to assist teachers in learning more about both approaches. Creating a makerspace based on Reggio-inspired principles would address the collaboration, creation, and innovation needs of our 21st century learners.

Table of Contents

List of Tables

List of Figures

Acknowledgements

I would like to acknowledge and dedicate this project to my husband, Steve, and to our two children, Lucas and Ava. The past couple of years have been a blur of computer screens and papers. As I have been swept along down a river of learning so too have you all unwittingly come along for the ride. There have been many moments where I wasn't sure I would be able to juggle all facets of this journey. Steve, your constant support (both mentally and physically around our home) allowed me to focus on the task at hand and again reminded me of what a great team we make. I hope our next adventure entails less paperwork but still enriches us through challenge. Ava, your peaceful yoga sessions and wise words designed to bring me to a mindful place, helped more than you will know. Lucas, your tech support was crucial to my success and I loved learning to speak your language along the way. To my TIE grad professors, especially Dr. Valerie Irvine and Dr. Tim Pelton, thank you for pushing me to be bold and find my voice. A big thank you also to my TIE grad cohort some of whom I've never met, yet feel so connected to. Lastly, a big thank you to my parents who have always emphasized the value of hard work and a good education.

Chapter 1: Introduction

"Learning and teaching should not stand on opposite banks and just watch the river flow by; instead, they should embark together on a journey down the water."
-Loris Malaguzzi

Statement of the Problem

Reggio Emilia is an educational philosophy for the early years that has been recognized worldwide for its student-initiated, self-directed, inquiry-based, and interdisciplinary approach to education. Over the last five years, the British Columbia (BC) Ministry of Education, educators, and researchers from around the world have identified the need for a significant educational reform that shifts the focus from a teacher-directed model of teaching to a student-centered, constructivist approach to learning. As children move up the grades, the emphasis and time spent on play, personal projects, and exploration decreases, making inquiry-based learning and long-term projects increasingly harder to implement. The addition of a maker space to a school or classroom could address the collaboration, creation, and innovation needs of our 21st century learners. The Reggio Emilia and maker movement philosophies have many parallels and fit solidly into the BC Ministry of Education's (2012) vision of a personalized and constructivist learning environment for BC students. This paper will explore research related to the creation of an educational makerspace informed by Reggio Emilia inspired pedagogy as a vehicle for bringing BC's educational reforms into BC schools.

Societal Foundation of the Study: Changing Educational Landscape

Since the 18th century, many schools worldwide have been identified by their austere facades, rows of desks, and strictly-controlled students. Teachers stood imperiously lording over their pupils and were seen as the gatekeepers of all facts and knowledge. Students were viewed as ruffians needing to be tamed and molded -empty vessels needing to be filled. Hundreds of years later, some of these learning ideas still stand, regardless of the fact that our world has drastically changed. As Robinson (2006), commenting on the state of education, noted "our education system has mined our minds in the way that we strip-mine the earth: for a particular commodity. And for the future, it won't serve us. We have to rethink the fundamental principles on which we're educating our children" (17:38). BC's current education system was designed more for the world of the 18th and 19th centuries than today's world and, in order to meet the evolving needs of the 21st century, a paradigm shift rather than adjustments to the current model is needed. Conceptions of teaching in contemporary times are rapidly changing as citizens come to realize that the current system does not take into account our changing world. Zhao (2012), an educational visionary, believes that "education requires a significant shift in our mindset from employment oriented to entrepreneurship oriented". Education that gives children voice and choice in what they learn engages and inspires children to make works that matter in a global context (Zhao, 2012).

The BC Ministry of Education is currently rethinking the provincial curriculum to ensure that skills needed for future success are built into the core subject areas: "While a solid knowledge base in the basic skills will be maintained, to better prepare students for

the future there will be more emphasis on key competencies like self-reliance, critical thinking, inquiry, creativity, problem solving, innovation, teamwork and collaboration, cross-cultural understanding, and technological literacy" (BC Ministry of Education, 2011, p. 4). The curriculum of the future will be less fragmented with less individual outcomes and instead be focused on 'big ideas' and generating essential questions that lead to deeper inquiry opportunities.

> In a world of continuous change, the ability of individuals to plan and implement their own learning without external direction is the key to success. Students would be empowered – and ideally inspired – to pursue learning both in school (formal learning) and outside of school (informal learning). This would allow educators to take advantage of the innate learning ability of young people in a more open, exploratory learning environment where they learn by doing, not reading and listening. (Premier's Technology Council, 2010, p. 24)

Learning through inquiry, play, and exploration has long held an important place in preschool and primary education and is a basic tenet of the Reggio Emilia educational philosophy - one of the most highly regarded approaches to early childhood education as acknowledged by educators and researchers worldwide (Gandini, 1993). This approach has influenced European and Northern American educators, administrators, researchers, designers, and architects for the last 30 years or more (Millikan, 2003). BC educators at all levels are realizing that children of contemporary times need to be fully engaged participants in a dynamic, evolving educational system that values and responds to their unique needs as learners. In order to address this need, past conceptions of education and a one size fits all curriculum need to change to properly reflect the changing society in which we live. Incorporating learning through inquiry and play into the higher grades in

BC schools will be essential to equip students with the 21st century competencies necessary to succeed. How can teachers bring constructivist learning opportunities up into higher grades in our current education system? Stager and Martinez (2013), proponents of the maker movement in education, which supports student choice and autonomy while learning, believe that the implementation of makerspaces in individual classrooms and schools would create the environment necessary to implement a constructive, inventive curriculum. This curriculum would support students of all ages and their teachers learning together through direct experience with an assortment of materials that include technology as well as using familiar materials in unfamiliar ways. This direction provides the impetus for my project: Could a hybrid of the Reggio Emilia early childhood approach and a makerspace environment be a unique way to bring constructivist, hands on learning into higher grades in a BC school context?

Aims of Study

This study will examine two educational philosophies: the Reggio Emilia Approach to early childhood education and the Maker Movement, both of which explicitly reference the 21st century learning competencies espoused by the BC government within a constructivist, student-centered learning environment. This paper will examine the philosophies and beliefs of each approach in order to identify if, together, they could provide teachers with the necessary tools and environment to teach the key competencies for the 21st century. There is currently little research combining the two educational approaches but it is hoped that, by examining the approaches within the BC new curriculum framework, this project will help to fill a gap and provide a practical resource for teachers wanting to explore inquiry-based, constructivist learning. Creating a

makerspace based on Reggio-inspired principles could address the collaboration, creation, and innovation needs of our 21st century learners.

Personal Foundation of Study

At first glance, a Reggio Emilia-inspired approach to early childhood education and the creation of a 21st century technologically-inspired makerspace seem very far removed. I became interested in the intersection of the two ideas based on my own classroom experience. The school where I work has been studying a Reggio-inspired approach since about 2010. As a grade one teacher, I was able to participate in a number of professional development opportunities that allowed me to visit schools utilizing the Reggio-inspired approach in a North American context. Visits to the Opal charter school in Oregon and the Bishop Strachan School in Toronto demonstrated ways that an Italian constructivist philosophy could be adapted to fit into my classroom and curriculum. In the summer of 2012, I was able to attend a two-week Summer Institute in Reggio Emilia, Italy to see firsthand how young children were put in charge of their own learning. I spent the next few years trying to implement aspects of what I had seen into my Canadian classroom and BC curriculum context. I redesigned my classroom practices by adding collaborative table space, emphasizing the use of natural materials, creating provocations for my students, and changing the way that I observed and documented them at work and play. I became a big believer in doing less direct teaching and instead providing an environment rich in materials and letting my students take a lead in our units of study. Documenting the deep learning that I saw happening became a challenge as traditional assessment models and BC-mandated learning outcomes often did not capture the critical moments of understanding and put greater emphasis on a product rather that the process.

I began to see the value in using technology to video, voice-record, and photograph the learning that occurred in the classroom in order to make the learning visible to students, parents, and administrators. This interest in technology led me to apply for a new Masters cohort in Educational Technology in the Department of Curriculum and Instruction being offered at the University of Victoria that focused on innovation and technology in education. While researching ways that technology could be used to document and enhance the Reggio Emilia-inspired approach, I discovered the Maker Movement, and was immediately struck by the similarities in philosophy and application between the two approaches. At the same time, the BC Education Ministry began to draft a new curriculum for the 21st century that was very much in tune with the Reggio-inspired and makerspace constructivist approach. During the process of researching this paper, I was given the opportunity to move to a new grade three classroom and tasked with ordering all new furniture and materials to create a personalized and constructivist learning environment. As I began to create a Reggio-inspired makerspace for my new classroom, I realized that no materials existed to help BC teachers create such a space even though a Reggio-inspired Makerspace could fill an important need within the new BC education curriculum. I also realized that providing opportunities for open-ended, exploratory play is much harder to justify in the higher grades. It is hoped that this research will help to dispel outdated notions of traditional classroom structure and invite conversations and future research into the value of constructivist learning models in upper elementary grades.

Gaps in Research

When setting out to research a possible connection between the Reggio Emilia approach and the maker movement, I chose initially to search for literature combining the two approaches. Extensive research, with librarian support, could find no qualitative or quantitative peer-reviewed research combining the Reggio Emilia approach and the maker movement in a Reggio-inspired makerspace. There are however blog posts and educators beginning to explore the idea. Gary Stager in particular conducts workshops entitled "digital Reggio" where he advocates for the use of computers, robotics, and digital construction methods in the spirit of Reggio Emilia and explores applying the principles of Reggio Emilia to older grade levels (Stager, 2014). I then set out to research articles on the fundamental principles behind each approach in order to provide a basis of comparison. Much of the literature to date on the Reggio Emilia approach and the maker movement has not set out to critically analyze the approaches but rather to describe their values and possibilities. Research literature on both approaches relies on mostly qualitative methods (ethnographic, case study, interview, anecdotal) rather than quantitative forms of measurement. Many online proponents of the Reggio Emilia approach can, in fact, seem caught up in a religious fervour that becomes more about using decorative baskets and "Pinterest Reggio" than educational reform. The maker movement in education is a new area of study and during the writing of this paper more and more studies were being newly published. Research on educational makerspaces is less prevalent than research on makerspaces in library or after school settings as schools have only recently caught on to the maker movement. Since this literature review was aimed at finding commonalities rather than analyzing the effectiveness of each approach

the validity of the study designs or analysis was not tested but instead this review aimed to summarize the claims made by researchers from papers in peer reviewed journals or in some cases published books by experts in the field.

Search Methodology

From September 2014 to July 2015, I searched the following boolean terms:

- ("reggio emilia" OR reggio) AND ("maker space" OR makerspace OR "maker movement" OR "maker lab") yielded 0 results on UVic Summon, 31 results on Google Scholar reduced to 8 when screened for peer reviewed articles rather than blog posts and erroneous material.
- reggio AND ("educational technology" OR "instructional technology" OR "edtech" OR "online learning" OR "digital pedagogy")
- "maker space" OR “makerspace” OR "maker movement"

I conducted searches for peer-reviewed articles using these terms on the following search engines: University of Victoria Summon, ERIC, Google Scholar, and UVic Space. Manual searches of relevant journals and Google searches for books and online articles were also conducted. Articles pertaining to educational makerspaces were sought over articles pertaining to makerspaces in community or library settings. Efforts were made to include research in the last eight years but it was necessary to include articles pertaining to the underpinnings of the Reggio Emilia approach from earlier years as the bulk of the pertinent research articles were earlier.

Project Description

My project is aimed at documenting my journey in creating a Reggio-inspired makerspace in my grade three classroom. It will also provide practical, easy-to-

implement ideas and templates for BC classroom teachers that identify fundamental ideas of both the Reggio Inspired and Makerspace approaches and demonstrate ways that teachers can weave the teaching of 21st century competencies through the creation of a Reggio-inspired makerspace. Documentation of the learning process is a key feature of the Reggio Emilia approach, so it seems fitting to analyze and reflect on my own journey in order to help others gain insight into the creation of a rather unique makerspace. It is hoped that by stepping back and observing the learning process, I can document my personal reflections through shared photographs, notes, student work and journal entries, in order to provide retrospective and prospective functions and deepen my own understanding as well as that of other interested educators. I created a website and blog that provide resources, pictures and insights into creating a Reggio-inspired makerspace and provide ties to the competency based curriculum being introduced in BC.

Chapter 2: Literature Review

This chapter explores the theoretical underpinnings of the Reggio Emilia Approach, the makerspace movement, and the new BC Education plan (British Columbia Ministry of Education, 2015) in an effort to draw comparisons and similarities that will support teachers in bringing constructivist learning approaches into intermediate grades. While there is a large amount of literature independently addressing the Reggio Emilia and Maker Movement approaches there is a lack of literature at the intersection of these two approaches. Part of the disconnect is that the Reggio Emilia approach is primarily viewed as an early childhood philosophy; minimal research has investigating its use in older grades. This literature review explores possible connections between the Reggio Emilia approach, and the constructivist Maker Movement. Literature describing the fundamental tenets of both the Reggio approach and the Maker Movement will be explored as well as any literature linking the two approaches. This connection is important to explore, as it has exciting implications for bringing the Reggio Emilia early education perspective into the current discussion around creating Makerspaces in schools to promote constructivist learning in BC.

Theoretical Foundations

In order to fully understand the constructivist underpinnings of the Reggio Emilia Approach and Maker Movement approaches, it is important to define constructivism vs. constructionism and to review the historical background of these educational philosophies as it is within the theoretical frameworks that many of the comparisons can be made.

Constructivist approach. The definition of "constructivism" can be difficult to define as it has been co-opted by many different academic disciplines, such as math, science, and political science, and no definition is commonly agreed upon by all branches of academia that use it. White (2011) describes constructivism is relationship to philosophy, developmental psychology, and educational theory, and believes that it references an individual's acquisition of new knowledge through experience and is based on the shared aims of philosophers and psychologists John Dewey, Jean Piaget, and Lev Vygotsky. For the purposes of this study, constructivism in education is defined as an educational theory that emphasizes hands-on, activity-based teaching and learning in which students develop their own frames of thought. Learning activities based on constructivist theory include the following principles: allowing individuals to form their own representations of knowledge; engaging individuals in active experiences that cause them to uncover inconsistencies between current knowledge representation and their own experiences; and above all, constructivist learning must occur within a social context, where interaction between learners, peers and other members of the learning community takes place (Ackermann 2010). In other words, the constructivist approach better enables learners to exhibit their knowledge through demonstration. By interacting with learning materials, a learner is able to develop a level of deeper understanding than a lecture alone is unable to provide (Hershberg, 2014). The constructivist theory, with its emphasis on learner driven hands-on learning where students are actively involved in designing, inventing, building, and then sharing their knowledge is an essential component in both the Reggio Emilia approach and the maker movement.

> What unifies constructivists across the board, is the notion that children are active builders of their own cognitive tools, as well as of their external realities. In other words, knowledge and the world are both construed and interpreted through action, and mediated through tool and symbol use. (Ackermann, 2010, p. 2)

Constructionism approach. Constructionism is a learning theory put forth by Seymour Papert, a protege of Piaget, the inventor of Logo programming language and a makerspace pioneer (Stager, 2013). Papert was inspired by constructivist learning research but expanded on the theory to include the addition of creating a meaningful product. Papert espoused the idea that learning is most effective when, as part of an activity, the learner experiences the construction of a meaningful product (Papert, 1986). Papert stressed that individuals learn in context by manipulating materials and he was particularly interested in the role of new media in human learning (Ackermann, 2010). While Papert agreed with Piaget's stages of development, he did not agree that the stages occurred automatically at a particular age across all knowledge domains. He believed that the computer could help concretize formal learning in a way previously unavailable to learners (Stager, 2011). Understanding the theory of constructionism is essential in recognizing and appreciating the hands-on, building components of an educational makerspace.

The Reggio Emilia Approach

History. The Reggio Emilia approach is an innovative early childhood education philosophy, pedagogy, and curriculum deeply rooted in the historical and cultural context of the town of Reggio Emilia, Italy after the Second World War. The town of Reggio Emilia was destroyed in the war and needed to rebuild both socially and physically. A

local educator, Loris Malaguzzi, was charged with creating early childhood education centers that would inspire and promote community within the town. Malaguzzi (1987) wanted to "give a human, dignified, civil meaning to existence, to be able to make choices with clarity of mind and purpose, and to yearn for the future of mankind" (p. 58). As future leaders of the community, new schools needed to give children legitimate rights so that they "should have opportunities to develop their intelligence and to be made ready for success" (Malaguzzi, p. 58). Malaguzzi's ideas built upon Vygotsky's theories of sociocultural, constructivist learning and Dewey's ideas of art as experience (Cutcher, 2013). The Reggio approach to education is ever evolving and many different writers from many different fields have contributed ideas over the past 30 years including work from Maria Montessori, Lev Vygotsky, Jean Piaget, David Hawkins, Howard Gardner and Jerome Bruner (Cadwell, 1997). This approach is regarded as being situational and very much influenced by the context in which it is adopted and adapted to suit particular cultural and educational settings and cannot be transported wholesale into other cultural settings (Maynard & Chicken, 2010). There is also a history of commitment to and experience in continuous feedback, experimentation, and research which results in the approach being continuously updated and reformed according to the most recent theoretical research (Kocher, 2006). Adaptations outside of the town of Reggio Emilia, Italy are noted as being Reggio Emilia inspired.

Principles and pedagogy of Reggio Emilia. The cornerstone of the Reggio Emilia approach is its construct of a young child as "rich in potential, strong, powerful and competent" (Malaguzzi, 1993, p.10). Children are viewed as entering school with a wide range of experiences and ideas that help to frame their future learning. Howard

Gardner (1998) describes the Reggio system as a collection of schools that cultivate and guide each child's intellectual, emotional, social, and moral potentials. Students are seen as having a hundred languages in which to express themselves and teachers are seen as being co-constructors of knowledge rather than purveyors of wisdom. They work with small groups of children without pre-determined or linear outcomes, but rather follow the interests of the children. Through dialogue and documentation, emphasis is placed on constructing and revisiting ideas and creating a group understanding (Maynard, 2010). Teachers listen and record the learning process through videos, pictures, and note-taking and then use the data collected to help understand and further drive the learning. Teachers learn how to watch children for signs of thinking, document ways to make that thinking visible, and create provocations to guide children in the direction of deeper learning. The educators of Reggio Emilia, Italy teach that the primary role of the teacher is as "researcher" whose job is to observe, document and try to make sense of the thinking of each child (Martinez & Stager, 2013). The classroom environment and materials are also seen as key aspects of the Reggio Emilia philosophy. The environment is viewed as the third teacher (after teachers and parents) and classrooms are filled with interesting artifacts, materials, works in progress, and other evidence of creative, collaborative, inquiry learning opportunities (Martinez & Stager, 2013).

In order to understand and draw parallels between the Reggio approach and the maker movement, it is necessary to describe the fundamental principles that underline the Reggio philosophy. The following six principles are listed by most scholars in Reggio Emilia as the philosophy's fundamental guidelines (Cadwell, 2003; Gandini, 1993);

- The child as protagonist, collaborator and communicator

- The environment as third teacher
- Cooperation as the foundation of the Educational System in Reggio Emilia
- The teacher as partner, nurturer, guide and researcher
- The documentation as communication
- The parent as partner

It is important to note that the principles are interconnected and should not be viewed in isolation, but rather as dependent on and influenced by each other.

The image of the child. At the heart of the Reggio approach is the belief that children are "strong, rich and capable" (Cadwell, 1997, p.5). Reggio Emilia educators celebrate the image of a child as a complex, creative being with an endless desire to know and understand. They affirm and support children's ability to have, and express, their own hypotheses and theories and encourage children to guide their own learning journeys (James, 2015). Children are viewed not as having needs but rather as protagonists with the rights to an education that allows them to collaborate and communicate with others in order to construct their own knowledge (Cutcher, 2013; Kocher, Edwards, Gandini, & Forman, 1998). This socio-constructivist model is rooted in Dewey's constructivist philosophy that children are architects of their own learning and is key to understanding the underpinnings of the Reggio Emilia philosophy (Dodd-Nufrio, 2011). Malaguzzi (1994) believed that developing a child's creative potential is a basic human right and was disdainful of educators who did not see the inherent rights, capabilities, and potential of young children:

> Those you have the image of the child as fragile, incomplete, weak, made of glass gain something from this belief only for themselves. We don't need that as an image of children. Instead of always giving children protection,

> we need to give them the recognition of their rights and of their strengths. (p. 56)

The environment as the third teacher. When one begins to view a child as competent and creative, a value is also placed on the learning environment that supports the development of creativity and free thought. The aesthetic beauty of the classroom environments is one of the first things to strike visiting educators to Reggio Emilia. The classrooms are full of indoor plants, natural light, a purposeful use of space, and an abundance of creative materials. The educators in the preschools of Reggio Emilia place a high value on the aesthetic and physical environment of the school, often referring to it as the "third teacher" (Gandini, 1998, p. 177). The environment is viewed as a living, changing element that supports changing relationships between people and affects how students feel, think and behave (Kocher, 2006). Fraser (2006) describes how the design of learning spaces in Reggio Emilia reflect a philosophy of openness and transparency that invites participants to mingle and share ideas amongst classes. "The support of a complex variety of relationships is the enduring focus of decisions in the schools" with every part of the building serving a purpose (Fraser, 2006, p. 14). A vital part of each school is an 'atelier' or art studio that provides a wide range of media and materials for fostering creativity. The rich, stimulating studios are full of materials that allow students to express their thoughts and feelings through symbolic interpretations, innovative transformation and project work. Materials might include plant and organic items collected from nature, reclaimed and recycled objects from REMIDA, a recycled materials center in Reggio Emilia, or objects donated by students and families. The REMIDA project developed as a partnership with Reggio Schools in 1996 and functions as a storage, display, and supply of recycled and discarded materials to local schools and groups. Local companies donate

industrial and craft ‘waste’ materials such as fabrics, plastic ends, and paper (Eckhoff & Spearman, 2009). REMIDA differs from most recycling centers in its approach to aesthetically displaying materials based on colour, shape and texture. Its collections of materials appear as artworks in their own right and is an integral support to the object-centered inquiry practice of Reggio Schools (Eckhoff & Spearman, 2009). Based on the literature reviewed, it would seem that providing a space that encourages and fosters exploration, autonomy, curiosity, and problem solving coupled with the use of natural lighting and variety of materials helps to foster participation and communication between learners.

Collaboration and student teacher relationships. That emphasis on developing collaborative learning relationships is also evident in the way that Reggio Emilia-inspired educators fill the roles of partner, nurturer, guide, and fellow researcher (Edwards, 1998). Teachers view themselves as co-constructors of knowledge rather than all-knowing leaders imparting wisdom to the masses. Teachers work to provoke “occasions of genuine intellectual growth” (Edwards, 1998) by listening to students, extending their discussions and providing materials to create shared meaning. Stager and Martinez (2013) list the primary role of a teacher in Reggio Emilia as that of a researcher whose goal is to understand the thinking of each child. As opposed to traditional individually oriented educational approaches, Reggio Emilia values social relationships and collaboration as essential aspects of all learning. It is through listening, negotiation, discussion and exploration of divergent viewpoints that knowledge is gained. Participation by children, teachers and parents in a community context allows all participants to connect and learn by interacting with one another and their environment.

Parents are invited contribute to project work by contributing to the building of resources and becoming a part of the learning conversation. Unique to the Reggio Emilia approach is the use of pedagogistas or pedagogical coordinators who support relationships between teachers, parents, community members and students by encouraging discourse and constant reflection (Fraser, 2006). Their role is also to research innovative teaching practices and constantly re-examine and evaluate the value of the students' project work. Students are provided with provocations (materials set up as invitations to explore), open ended questions, and are observed for interests and problems that could lead into long-term research projects. For example, Krevesky et al. (2013) documents a kindergarten project that emerged from student conflict in a play area. Teachers observed students arguing over the use of a yellow door in a building block area. Students were asked to devise a solution to the problem and collectively, they decided to build more doors. In the process of researching doors, they collected data on door materials, size, appearance, and function. In small groups, students organized and shared data and used that information to design their own doors. With assistance, the designs were turned into real wooden doors for future use in the block area. In contrast, a traditional classroom model might have had the teacher solve the conflict by focusing on modifying the student behaviour and thereby missing the learning opportunity.

Documentation as communication. An important tool used to re-evaluate and analyze student work is done through the process of pedagogical documentation. Reggio-inspired documentation is credited with inspiring modern physical and digital portfolio assessments. Documentation takes the focus away from solely summative and standardized measures of student achievement and moves it toward a more qualitative

and formative understanding of student understanding (Turner & Wilson, 2010). Reggio-inspired teachers routinely record the thinking and learning processes of children by transcribing, photographing and videoing group discussions and project work. Teachers strive to represent the thought processes, beliefs, and assumptions that students bring to their work. Representations of student thinking using quotes from children and pictures representing the evolution of their understanding are displayed as posters or books within the classroom or school setting. There are multiple purposes for documentation within a Reggio inspired classroom including communicating learning to parents/teachers/community, demonstrating to children that their work is valued, assessing teaching and learning, creating a historical archive, and fostering dialogue with other educators (Gandini, 1993). When shared amongst educators, documentation becomes a tool for teacher research, reflection, collaboration and decision-making. Turner and Wilson (2010) in their round table discussion with Reggio Emilia thought leaders found that documentation is not just a teaching tool but, a pedagogical philosophy of knowing and valuing children. Documentation was also seen by those Reggio scholars as a way to challenge one's ideas and a way to enable a new, adaptive form of teaching and learning that values constructing community and educating citizens (Turner & Wilson, 2010).

Digital Reggio. At first glance, the 50-year-old teaching and learning communities of Reggio Emilia seem to have little in common with the digital, online communities that students now encounter. However, advocates of the Reggio Emilia Approach pride themselves on constantly reinventing, analyzing, and incorporating new ideas into their teaching as opposed to traditional teaching models that often use a 'one

size fits all' approach. This constant reflection also applies to continually growing in the knowledge and the application of technology.

> "In terms of Reggio and technological play specifically, Malaguzzi viewed computer literacy as just another of the hundred languages of children. He saw potential for children's self awareness, pleasure, and gratification in learning how to manipulate, respond to and communicate with computers". (Alper, 2011, p. 11)

Carlina Rinaldi, a Reggio scholar, sees technology as a "fundamental support [to learning] if we let the computer and other forms of technology become tools, media capable not simply of adding but of multiplying, able that is to create something new and unpredictable" (2006, p. 139). Rinaldi sees the use of digital technology as a way to increase creativity in children if it is used to enhance and inform learning rather than as a stand-alone tool. In Reggio classrooms, digital tools are not isolated in a computer lab, rather they are available for use with non-digital materials and used in a project context (Alper, 2011). It is through this thoughtful revisiting of pedagogy that embraces new tools and ideas, while always placing children and creativity first, that the Reggio Emilia Approach remains relevant to current educational discussions.

Maker Movement

History. Just as the Reggio Emilia approach evolved as a response to changing societal times, the Maker Movement, began as a grassroots movement of tinkerers, hackers, designers, and inventors, seeing a need for innovative spaces that took advantage of new opportunities provided by emerging technologies. Halverson and Sheridan (2014) describe the term 'Maker Movement' as referring to "the growing number of people who are engaged in the creative production of artifacts in their daily lives and who find

physical and digital forums to share their processes and products with others" (p. 5). In 2005, Dale Dougherty founded *Make* magazine with the idea of inspiring people to find and form communities of like minded tinkerers that would help people to start a hobby and learn new skills (Dougherty, 2012). Since the first Maker Faire (a community event where 'makers' share ideas and conversations) in 2006, a growing number of researchers and educational leaders see in making the potential to engage young people in personally compelling, creative investigations that foster 21st century learning competencies and bring rich engineering and design activities into K-12 education (Blikstein, 2013; Martin, 2015; Martinez & Stager, 2013). Making reflects the playful constructionist learning theory advanced by Seymour Papert (1980) and is seen by Martinez and Stager as a return to the progressive education of the 1960's and 70's that valued a hands-on style learning. The addition of readily available modern technology in conjunction with constructionist learning theory formed the basis of Papert's Constructionist Learning Laboratory at the Maine Youth Center and was his "first attempt to design an educational environment based on the theory of constructionism from scratch" (Stager, 2013, p. 487). Stager (2013) credits Papert with being the original inspiration for integrating the world of tools, toys, and technology and a major contributor to the theory behind the maker movement. In 2005, the Massachusetts Institute of Technology (MIT) in association with Neil Gershenfeld created the first fab lab in an educational setting in order to create a pedagogical environment that would allow people to solve their own problems by creating the tools required (Halverson & Sheridan 2014). Paulo Blikstein's Fab Lab school project now adapts the maker model to K-12 settings worldwide and encourages innovation through its emphasis on the principles of robotics, engineering, and design.

The educational value of the maker movement is beginning to grow with recognition of its benefit in schools coming from most notably, President Obama in 2014, when the White House hosted the first ever Maker Faire and implemented policies and provided funds to equip schools and entrepreneurs with tools and funding to create new makerspaces.

Guiding principles and pedagogy of makerspaces. Makerspaces, also referred to as hackerspaces, fablabs, and innovation labs, can be found in community centers, libraries, schools, and specialist laboratories. Regardless of where they are located, they are united by their common objective to provide a space that emphasizes a 'do-it-yourself' philosophy while promoting inquiry-based studies that promote a rich engagement and curiosity for Science, Technology, Engineering, Arts and Math (STEAM) disciplines (Dougherty, 2013). Similar to the Reggio Emilia approach, makerspaces are learner-centered and encourage participatory and collaborative learning through experiential and hands on learning that results in the creation of a product. This study will primarily look at resources related to educational makerspaces and explore aspects that have been identified as being pertinent to an educational setting.

Maker mindset. An essential aspect of the maker movement (Dougherty, 2013; Martin, 2015) is the values, beliefs, and dispositions of the maker. Dougherty (2013) describes the maker mindset as a growth mindset that encourages students to believe they can learn to do anything" (p.10). Martin (2015) builds on this definition and identifies play, fun, and interest as critical elements in the value of educational makerspaces. Martin (2015) also further links the maker mindset to Dweck's (2006) theory of a 'growth mindset,' that views learning and intelligence as not predetermined, but rather as

talents and abilities that are developed through effort and persistence. Students with a growth mindset embrace challenges and see failure as an important part of learning and the creative process. Failure is embraced in maker culture and seen as a way to deepen understanding and problem solving skills. Martin (2015) states that although this 'failure positive' element seems incongruous to school settings, as most traditional educational approaches avoid failure at all costs, he argues that it is this growth mindset advocating persistence, and challenge that validates making as a valuable learning activity.

Making as relationship building. As with the Reggio Emilia approach, learning in makerspaces often happens in a collaborative, participatory manner and involves students sharing ideas and building upon the ideas of others rather than learning directly from a teacher. Martin (2015) suggests that maker participants create a "community infrastructure" by exchanging information, educating each other, asking for feedback, and feeling connected to each other's projects. This is a sharp contrast to the often competitive and repetitive nature of traditional classroom learning where the goal is often to memorize facts and outdo one's classmates. In one of the few case studies, Sheridan et al. found that members of a making community often took on leadership and teaching roles in the course of their making. Litts (2015) conducted a study on three youth makerspaces in library, museum, and mobile settings and concluded that makerspaces are "heavily rooted in and shaped by the community within which they are situated" and that this freedom leads to fluidity and flexibility when designing and establishing a youth makerspace (p. 350). Like a Reggio-inspired classroom, there is no one way to create a makerspace. The communities and members of both Reggio-inspired spaces and makerspaces create something uniquely theirs as students build a relationship with each

other and the materials. The role of the teacher/ facilitator in makerspaces is also flexible and open to interpretation, as the constructivist nature of makerspaces does not advocate for a specific method of teaching, but supports a variety of "progressive, child-centered, open-ended, project-based" models that, as with the Reggio Emilia approach, place the learner at the center (Martinez & Stager, 2013). Martinez and Stager (2013) point out that constructivist makerspaces are at odds with the predominant teaching theory of instructionism, or direct instruction, they claim is underlying most educational institutions. They argue that educators in the 21st century will need to 'unlearn' their preference for lecture and testing approaches, that do not encourage critical thinking and creativity, and embrace an approach that situates teachers as "ethnographers, documentarians, studio managers and wise leaders" (p. 76). Although much literature is available that supports this outlook, there is little evidence-based research on the educational approaches used in these institutions or on its effectiveness.

Making as a way to learn. As making in a school setting is a relatively new phenomenon, research is just beginning to be published on the benefits of makerspaces in the learning process. The few research studies that have been done (Sheridan, Halverson, Brahms, Priebe, & Owens, 2015; Halverson & Sheridan, 2013) focus on the engagement, innovation and relationship building aspects of the movement. Sheridan et al. (2015) conducted a comparative case study looking at the learning opportunities provided in three makerspaces in community settings and, despite differences in location and participants, found unifying characteristics that created a making 'ethos.' All three spaces were found to fuel engagement and innovation, have a marked diversity of learning arrangements and have a focus on the learning process rather than the product. The

researchers found educational value in the makers finding problems and projects to work on; iterating through designing and problem solving; collaborating as members of a community; taking on leadership and teaching roles; and sharing inventions and new skills with a wider world (Sheridan et al., 2014). Bevan et al. (2014) also documented dimensions of learning in a museum makerspace and concluded that tinkering and making are potentially powerful contexts for learning but although they are rooted and supported in pedagogical theory, tinkering and making often challenge traditional ideas of what good learning looks like as it is often messier and noisier than traditional passive learning. Martin (2015) further adds to the discourse on the educational benefits of makerspaces and concludes that "bringing making into school settings has the potential to bring the creative, playful, engineering- and design- relevant learning activities of making to a wider and more diverse audience than ever before..[to the] benefit [of] both the Maker Movement and to the schools and classrooms that embrace making" (p. 37).

Importance of the learning environment and materials. One of the most discussed and readily identifiable features of the Maker Movement is the celebration and emphasis placed on the use of a wide variety of materials and digital tools. Three-dimensional (3D) printers, laser cutters, and other computer controlled tools figure predominantly in community maker settings while educational makerspaces often focus on student interest and smaller scale computing such as lego robotics, Makey Makeys, Arduinos and Raspberry Pi's. Although, as new technologies come down in price, and become more readily available they (3D printers in particular) are showing up in many educational makerspaces. As with Reggio Emilia inspired spaces, many makerspaces also include textiles, reclaimed and recycled materials, Lego, and outdated or damaged

hardware that can be deconstructed. According to Martin (2015), makerspace learning environments give youth substantial say in what and how they make and this free choice "can soften deficit based views of youth that emphasize what they cannot do rather than their competencies" (p. 35). By giving students autonomy and control over their learning and tools, Martin's research concludes that students are more motivated, engaged, and demonstrate increased levels of persistence and resourcefulness (Martin, 2015). While tools are an important aspect of making, Martin (2015) warns that tool-centric approaches to integrating making into education will fail if the elements of community and mindset are not also present. Just as the environment is seen as an important, but not stand alone, piece of the Reggio Emilia philosophy, creating a meaningful learning environment in a makerspace is about much more than just providing materials.

Documentation. The role of documentation in makerspaces is a largely un-researched and unexplored area that bears consideration. As maker culture grows in educational settings it makes sense that educators will need to have some way to make visible the learning that they see occurring during maker activities in order to justify inclusion into the regular curriculum. This is an area that could benefit from a melding with the Reggio Emilia approach with its history of insightful pedagogical documentation. Currently, makers share their ideas and experiences informally through conversations, YouTube channels, web sites and at local and national maker events. Sheridan et al. (2015) describe how skills and knowledge are treated as tools that allow makers to build on each other's ideas, and access new communities and learning opportunities. Martinez and Stager (2013) recommend the use of digital cameras or video cameras as ways to record the story of a makerspace project and state that documentation,

such as that used in Reggio Emilia-inspired programs, should be used as much more than simply a grading tool but as a way to "make private thinking public or invisible thinking visible" (p. 162). Documentation of project work can serve as a way to inform teaching practice, commemorate significant moments, communicate learner activities to a wider community and invite others to engage (Martinez & Stager, 2013). While documenting learning is an important educational component, Sheridan et al. (2014) warn that although it might be easier to design, teach, and study making in a more 'constrained' or defined manner involving specific making activities, the learning that they observed in their study went far beyond a checklist or rubric. They noted that, to truly understand the learning benefits of a makerspace one needs to consider and create a feeling of self-empowerment, a strong supportive community and a sense of identity as a maker. Educators who try to document projects in a step-by-step manner, without considering these aspects, will be missing the crucial constructivist underpinnings of the maker movement. The tension felt between traditional testing methods and student initiated learning experiences could become an obstacle to the implementation of makerspaces and will be an important area for future study.

Transforming Practice

Both the Reggio Emilia approach and the maker movement seem uniquely positioned to address the transformation that is occurring in education today. The changing flow of information, from individual, wise elders to global knowledge databanks and the ubiquitous use of digital devices able to access that information, have resulted in a change in the learning profile of students entering school. People of all ages have made technological devices part of their day to day world and have filled their

homes with a variety of gadgets that did not exist a few years ago. Many children of today grow up with an unparalleled access to media and now come to school with a learner profile that is unique to their generation and with a different set of literacy skills than did previous generations (Alper, 2011). Twenty-first century learners are digital natives who have grown up immersed in technology and, more than ever, they are globally aware, creative and innovative as they take on a new role in this knowledge age. They are not only consumers but also creators and distributors of media, tools, and technology (Alper, 2011). Just as teachers need to adjust to a new role regarding information keeping so do they need to adjust their perception of their students and their needs.

BC Ministry of Education's new Education Plan. Recognizing that our changing knowledge economy demands that teachers reframe their traditional roles as information keepers and become information guides and framers to ensure the success of their students in their own pursuit of knowledge, the BC government has been undergoing a consultative process to transform the BC education system (BC Ministry of Education, 2012). The process began in 2010 with consultations with provincial partners, school district-hosted sessions with local stakeholders, provincial and regional conferences and meetings, conversations with international experts, and online dialogue. These consultations were complemented by inquiries into best practices in BC, other parts of Canada, and the world. In addition, in the fall of 2011, an invitation was extended to stakeholders to respond to the recommendations and actions set out in the BC Education Plan (BC Ministry of Education, 2012). Based on the research and input received, the BC Ministry of Education (BCME) created a Curriculum and Assessment

Framework Advisory Group that recommended important changes to curriculum and assessment (BCME, 2012). According to the new BC Education plan "this means student-centered learning that is focused on the needs, strengths and aspirations of each individual young person. Students will play an active role in designing their own education and will be increasingly accountable for their own learning success. It's all about putting students at the centre of education" (BCME, 2011, p.5). The following set of priorities and principles were set to guide changes to the BC provincial curriculum (BCME, 2012).

- **The Educated Citizen:** Provincial curricula should address the competencies implicit in the description of the Educated Citizen as presented in the Province of British Columbia's Mandate for the School System.
- **Learning Standards:** Provincial curricula should continue to mandate learning standards—what students are expected to know, understand, and be able to do. These learning standards should be fewer than prescribed in the current curriculum, rigorous, and they should emphasize higher- order concepts over facts to enable deeper learning and understanding.
- **Required Learning:** Curriculum should offer increased flexibility to allow students to pursue their passions and interests and to enable different and individual ways of learning. The amount and nature of required learning should change as students progress from Kindergarten to Grade 12.
- **Competencies:** Provincial curricula should focus on the development of cross-curricular and subject-specific competencies.

- **Flexible Instructional Design:** Provincial curricula should support creative approaches and be available in ways that support teachers in organizing learning standards in various configurations: in integrated or thematic units; in project-based learning approaches; in challenges (inquiries); by areas of learning; and, by competencies. Standards could be combined and integrated in various ways to create courses or learning experiences depending on student need and local context.
- **Implementation Support:** Support materials should be developed to support curriculum implementation. Curriculum resource materials developed in the field or by the Province should provide guidance for learning that is student-initiated, self-directed, inquiry-based, and interdisciplinary.

In summary, the BC government is looking to implement a competency-based curriculum that has less emphasis on specific prescribed learning outcomes for each subject and instead views education through a flexible, constructivist framework that takes into account student passions and interests. Allowing individual students to plan and implement their own learning would allow educators to create a more open, exploratory learning environment where students learn by doing, not just reading and listening (BCME, 2010).

Twenty-first century learning competencies. At the heart of the changes being proposed by the BC government is a shift away from a one-size- fits-all pre-packaged system of education to a belief that every learner deserves a chance to realize their full individual potential and contribute to society. The BC Ministry of Education (2011) has

identified the following eight competencies as integral to their plan to meet the needs of our changing students and society.

1. Collaboration and teamwork
2. Creativity and inquiry
3. Social responsibility and self-regulation
4. Healthy living
5. Global and cultural understanding
6. Technological literacy
7. Innovation
8. Critical thinking and problem solving

These competencies form the basis for a more personalized and constructivist approach to education and is aimed at empowering students to follow their own passions and aspirations while developing their own educational goals and journey. The BC Education Plan claims that this puts children at the centre of a more personalized approach to learning that still covers basic, core skills while allowing students more choice regarding "how, when and where learning takes place and there will be more flexibility about how students are organized for learning" (BCME, 2011, p.4). The BCME states that the best outcomes for learning in the future will be achieved through "learner-centred approaches that are sensitive to individual and group differences, that promote inclusive and collaborative learning, that harness students' passions and interests" (BCME, 2015). The Reggio Emilia approach and the philosophy behind the creation of makerspaces seem uniquely positioned to address this forward-thinking educational mandate.

Bringing constructivist learning opportunities up the grades. How can an Italian early childhood approach to learning and a hands-on maker culture be relevant to the current discussion surrounding shifts in the educational landscape? The answer becomes clear when viewing the challenge facing teachers of intermediate and senior level students as they attempt to justify and incorporate a constructivist, experimental approach that often looks like 'play' into a competencies-based educational setting. While makerspaces have been embraced by primary, middle, and senior schools, researchers are also beginning to see the value of implementing the Reggio Emilia learning philosophy into higher grades. Stager (2012) states that it is "only an accident of bureaucracy that the Reggio approach is so closely associated with preschool education [as] its powerful ideas have application to education at all levels" (p. 8). Eckhoff and Spearman similarly advocate for arts educators of all ages to examine the collaborative learning, long-term project and inquiry-centered aspects of the Reggio approach as warranting consideration (2009). Resnick (2007) argues that a Kindergarten approach to learning based on "a spiraling cycle of Imagine, Create, Play, Share, Reflect and back to Imagine- is ideally suited to the needs of the 21st century" (p. 1) and is critical to the development of creative-thinking skills in older students. Resnick further asserts that the Reggio Emilia approach's emphasis on reflection, iteration, and design thinking are critical aspects to developing the creative process of learners of all ages and throughout their lives. Martinez and Stager (2013) believe that the "brilliant educators of Reggio Emilia, Italy, teach us that a well-designed, open-ended, learner definable prompt is the best starting place for project-based learning" (p. 59). Viewed through a high-school lens, Cutcher (2013) concludes that the Reggio Emilia approach could be used as a prototype

for secondary education, even though the contexts of early childhood and adolescence are so different. In her article "Art spoken here: Reggio Emilia for the Big Kids" Alexandra Cutcher asserts that the practices and philosophies of Reggio Emilia could demonstrate to educators at all levels the value of "aesthetic awareness creativity, critical thinking, collaborative learning and inquiry" skills which are essential to navigate and thrive in contemporary times. New (2015) cites Reggio Emilia's interpretation of teachers as researchers, use of long-term projects, importance placed on environment, capacity for making ideas visible and its emphasis on relationships as integral to current 21st century school reform discussions. The book, *Visible Learners, promoting Reggio-inspired approaches in all schools* makes the case that the Reggio Emilia-inspired focus on group learning and documentation practices can be applied to all teaching levels and subjects (Krechevsky, Mardell, Rivard, & Wilson, 2013). When switching to a more student-centered approach, educators can also benefit from learning with adopters of the Reggio Emilia-inspired approach who have already encountered the difficulties in giving up the power and control associated with many traditional classrooms (McNaughton & Krentz, 2015).

Tying it all together - Direct links between Reggio Emilia and maker movement. Reviewing the literature on the Reggio Emilia approach and the maker movement allows parallels to be drawn that could support and justify the creation of a Reggio-inspired makerspace. However, perhaps due to the newness of the maker movement and the lack of knowledge about the Reggio Emilia approach outside of early childhood education, there currently exists a dearth of research combining the two approaches. Martinez and Stager (2013), staunch proponents of educational makerspaces,

were among the first to link the approaches and see the Reggio Emilia approach as a tried and true model of learning through making and engineering. They state that it "may represent the world's most mature model of sustained constructionism and progressive education" and believe that the lessons of Reggio Emilia "have profound implications for every level of education, not just preschool" (Martinez & Stager, p. 23). They suggest that educators interested in creating makerspaces pursue Reggio Emilia resources. Stager (2012) also directly links Seymour Papert and his theory of constructionism to the town of Reggio Emilia in Italy. While Stager is uncertain if Papert actually met Malaguzzi, his research acknowledges that Papert visited the Italian town and was influenced by the complex, authentic learning environment of the Reggio Emilia preschools. Stager further links Papert's Constructionist Learning Laboratory, his first attempt to design an educational environment from scratch based on the theory of constructionism, to the Reggio Emilia Approach:

> The CLL was much more heavily influenced in its design and activity by the early childhood centers of Reggio Emilia, Italy...students needed ownership of the pursuit and agency over the project. As in Reggio Emilia, most student projects emanated from what a student wished to create or a subject they wished to learn more about (2013, p.488).

Stager (2013) proposes that advocates of constructionism and by relation, makerspaces will benefit from alliances with other progressive educational theories, such as the Reggio Emilia approach, as a way to build larger audiences and learn from each other.

Intersection of Reggio Emilia approach and maker movement. While there is yet to be any research directly comparing the foundational beliefs and elements of the Reggio Emilia approach and the maker movement, this paper is hoping to inspire further

investigation into this area. When presented side by side, the parallels of both approaches are clearly apparent (see Table 1). Both approaches are deeply rooted in a constructivist framework that emphasizes the learner as capable, competent, and able to guide and contribute to a personalized learning journey. Children are encouraged to develop individual understandings of the world through active exploration and social interaction. Both approaches advocate for the construction of deep and meaningful learning opportunities through collaborative and social relationships between students and teachers. Teachers are viewed as guides and fellow researchers rather than experts and set the stage for students through the use of displayed provocations or materials.

Reggio Emilia Approach	**Maker Movement**
constructivist framework- Children lead the learning	based on constructivist framework- emphasis on constructionism
learning as social process	community of learners
image of the child as competent, capable of guiding own learning	child viewed as an inventor, researcher
teacher as a fellow researcher	teacher as a guide
progettazione (long term project work)	long term, hands-on project work
environment as the third teacher (atelier)	emphasis on materials/space (makerspace)
documentation of children's thoughts	making learning visible

Table 1. Direct comparison of Reggio Emilia approach and maker movement philosophies.

The classroom environment and materials provided to students, in both approaches, are viewed as integral to deeper learning opportunities and are designed to invite open-ended exploration that welcomes failure and invites iterations. Long-term project work that delves into 'big ideas' is key to developing deeper understanding, with

the teacher in both approaches setting the stage by providing provocations in the form of materials to capture the interest and imagination of the learner. Both approaches could also augment each other in certain areas. The Reggio approach to documentation could help provide an emphasis on and a way for students in educational makerspaces to clearly make their learning visible. Conversely, the introduction of new technology and hands on engineering opportunities that a makerspace provides could be a valuable 21st century addition to a traditional Reggio-inspired approach.

Recommendations for Future Research

Despite the fact that the Reggio Emilia approach and the maker movement have emerged from different paradigms, they are both situated in constructivist theory, and based on the research literature studied for this review, there appears to be a great potential for future research studies investigating the effectiveness of combining the main tenets of the Reggio-inspired approach with the creation of a makerspace in an educational setting. The creation of a Reggio-inspired makerspace could be an effective and innovative way to teach the key competencies of "self-reliance, critical thinking, inquiry, creativity, problem solving, innovation, teamwork and collaboration, cross cultural understanding, and technological literacy" referenced in the BCME's Education Plan (2012). This study has demonstrated that the emphasis in both approaches on self directed, hands-on learning, orientations towards iterations and new forms of collaboration would offer a platform with which we can meld current discussions regarding future curriculum design. Questions surrounding the implementation and use of Reggio-inspired makerspaces within the current educational framework should be explored as well as quantitative studies on the efficacy of this approach in teaching the

key competencies. There is also potential to add to the discourse on educational makerspaces by exploring ways that unstructured play or tinkering opportunities can be provided to older students. Additionally, the potential for the Reggio approach to enrich teaching and learning for older students could yield material of interest to educators and administrators as they grapple with applying a constructivist lens to future educational initiatives.

Chapter 3: Professional Project

Background

Currently in BC, Canada we are undergoing a huge shift in our educational curriculum away from rigid, outcomes based learning to a more fluid, big ideas, core competency based approach. Personalizing education for our students has become a priority in our province and has wide spread implications for teachers at all grade levels. As I moved from a grade one classroom to a grade three classroom I wanted to keep my learner centered, Reggio-inspired approach and found myself asking - how can teachers bring these types of learning opportunities up into higher grades in our current education system? While conducting the research for my literature review, I found myself constantly examining and reflecting on my own practice and grade three classroom environment. The papers I read, and schools I studied were so inspirational that I wanted to immediately implement changes. Creating a Reggio inspired makerspace in my own school is my ultimate goal. However, constraints such as lack of space and timetabling issues immediately became apparent. We do not have any extra classroom space in my current school and while the administration is very forward thinking, the benefits of creating an innovative makerspace are still being evaluated. I immediately saw that I would need to start small and gradually build up to my grand vision of a K-5 innovation space that incorporates aspects of both the Reggio Emilia approach and the Maker philosophy. I began looking for a way to bring a focus on the 21st-century competencies through constructivist/constructionist experiences within my own classroom for my students on a regular basis. I was also conscious of the fact that as a university prep school, many parents in my school still need to be reassured about the value of 'play' and

tinkering in higher grades. I stumbled upon the 'Genius Hour' idea– time set aside, in class for students to inquire into a personal passion or an area of interest. It originated from a work practice developed at search-engine giant, Google. Google allows its engineers to spend 20% of their time working on a project of their choosing. The idea is very simple; allow people to work on something that interests them, and productivity increases. I began to see that a Genius Hour could be the perfect vehicle to introduce a modified Reggio-inspired makerspace. Within a Genius Hour model students take ownership of their learning and develop knowledge through a passion project that they are intrinsically interested in and are in charge of designing and modifying. This model fits nicely with research stating that giving students autonomy and control over their learning and tools helps students to be more motivated and engaged, and also demonstrate increased levels of persistence and resourcefulness (Martin, 2015). Genius Hour is designed to spark curiosity and engage students in design thinking – through questioning, planning, creating and improving. I immediately saw parallels between the constructivist Reggio inspired approach that encourages the joy of learning and the constructivist maker movement that provides opportunities for learners to tinker, experiment, iterate and collaborate in a personalized context. I approached my administration over the summer about piloting a program with my teaching partner in grade 3 that would draw upon the resources of the school technology integrator, program specialist and librarian to provide a consistent time for students to explore their passions. The goals of the pilot were:

- To provide opportunities for students to develop and practice the 21st century competencies of creativity, communication, critical thinking and collaboration

- To promote, support, and model creative, innovative thinking and inventiveness
- To allow students an opportunity to discover/investigate their passions and reflect on/share their learning with others
- To provide students with an opportunity to develop skill sets that are valuable in any learning situation (research, experimentation, problem solving and reflection)
- To teach students the value of making mistakes and revisiting failed ideas (resilience and perseverance)
- To provide an opportunity for students to share their learning processes and new understandings with others
- To explore connections between our Reggio inspired approach, including the environment as 'the third teacher', and a STEAM (Science, Technology, Engineering, Art, Math) based Makerspace

My colleagues and I were very eager to create a project that required us to live by the same principles that we were trying to foster in our students. We were taking existing knowledge and reframing it to create something unique to our school and students; taking a risk with our teaching and collaborating as a team to create a unique learning experience, and reflecting and improving weekly as we discussed our project. While supporting our discussions with research-based literature, it was important for me that, despite the fact that this was my master's project, my role was as a documenter and provocateur rather than leader. The varied viewpoints and opinions of my colleagues provided inspiration for new approaches, challenged existing biases and deepened my own understandings, values and beliefs regarding constructivist learning.

Taking inspiration from my literature review on the value of Reggio Emilia style documentation, as a way to challenge one's ideas and enable a new, adaptive form of teaching that values constructing community, I chose to make our learning visible and move the focus "toward a more qualitative and formative understanding of student understanding" (Turner & Wilson, 2010). I decided that creating a Reggio-inspired makerspace website with a blog reflecting on our experience would be an appropriate vehicle to share and chronicle our insights. This journey of self-reflection and documentation coupled with the creation of a new website embodied the basic tenets of both the Reggio Emilia Approach and the Makerspace philosophy and could potentially serve as a valuable teaching tool for other educators. Documenting activities and learning experiences in multiple rooms with a large number of teachers and students while also leading my own group was a challenge. During our Genius Hour I would be dashing around trying to ask thought-provoking questions of my students while at the same time photographing, videoing and recording quotes from students in three other locations. I am sure I missed many nuggets of learning. To combat this feeling of missing out I organized weekly meetings to share and reflect on how we felt the previous lesson had gone. Those discussions were invaluable in keeping us all focused on the same outcomes and allowing us to adjust and change aspects of the project that weren't working. Scheduling these meetings also became a challenge as the year progressed and ideally meeting time would be built into a school schedule so that important conversations aren't missed.

Project

This part of the Chapter will present key components of a website created as a resource guide for educators interested in creating a Reggio Emilia inspired makerspace. The figures in this chapter are screen captures of the pages found at http://reggioinspiredmakerspace.weebly.com. Key areas of the website include a blog documenting the implementation of a genius hour model, Reggio Emilia resources for teachers, Makerspace resources for teachers and a collection of online resources to assist teachers in learning more about both approaches. In the following sections of this chapter the contents of the website will be described.

Website

The website is organized under the following headings: Home, Blog, Reggio Emilia Resources, Makerspace Resources, More. Figure 1, shows the Home page as it appears on the website. The Blog tab provides a link to a continually evolving blog that documents the implementation of a genius hour model. Under the Reggio Emilia Resources tab you will find sections on books for teachers and Reggio Emilia inspired blog links as well as background information on the Reggio Emilia Approach. Under the Makerspaces tab you will find sections on books for teachers, books to inspire students, makerspace visuals, makerspace resource links as well as a background page on the maker movement. The More tab provides further information organized under the headings: online resources, inspirational videos, and links to 21st century competencies.

Figure 1. Home page of the website. *http://reggioinspiredmakerspace.weebly.com*

Blog tab. The blog component of the website chronicles the journey that our school team has undergone with our students. It is a work in progress that will continue throughout the year and includes reflections on individual lessons and copies of resources used. The blog is aimed at documenting the process of setting up a constructivist learning opportunity in the face of limited space and material resources. It is designed to make our thinking visible and "to serve as a way to inform teaching practice, commemorate significant moments, communicate learner activities to a wider community and invite others to engage" (Martinez & Stager, 2013, p. #). By sharing our experience, and making connections with other teachers trying out similar ideas, we are working to provoke "occasions of genuine intellectual growth and shared meaning" - cornerstones of

the Reggio Emilia philosophy (Edwards, 1998, p. 197). Creating our own community of teachers and learners, all beginning this journey together, encourages discourse, constant reflection and helps adults and children alike to view themselves as co-constructors of knowledge. The blog includes reflections from both students and teachers and includes pictures, resources and comments from interested educators following our journey. Figure 2 shows the first blog entry and details the importance of 'the environment as the third teacher.' The entry provides images of specific classroom adaptations that were made to increase collaborative learning areas, and the creation of alternative work-spaces that allowed for movement and choice. Tables are used to enhance group work and care was taken to design a calming and inspiring working space. Colours in the room were kept muted and the 21st century competencies are posted.

Figure 2. Blog entry detailing classroom environment.
http://reggioinspiredmakerspace.weebly.com/blog

The next few blog entries (Figures 3, 4, 5) detail how we introduced the concept of a genius hour to our students and include a step-by-step lesson plan, including links to resources for parents that other teachers could easily follow.

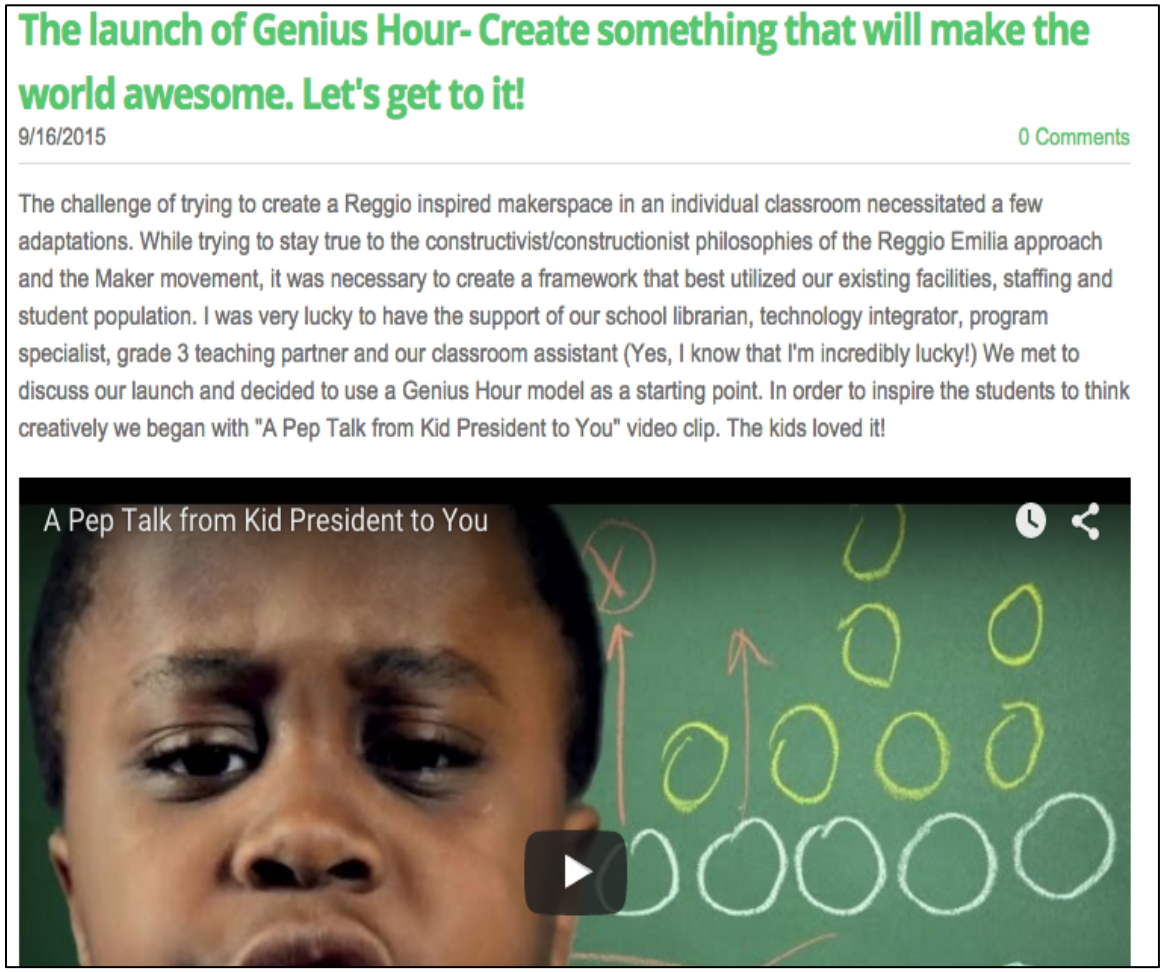
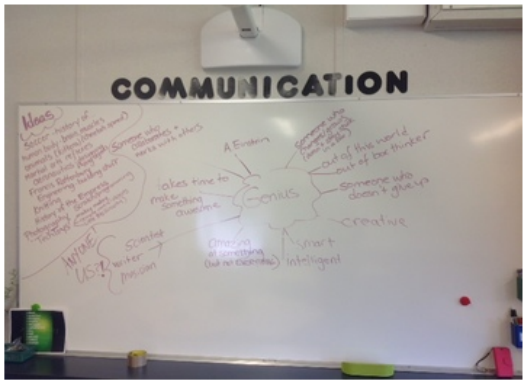


Figure 3. Launch of genius hour *(part 1 of 3). http://reggioinspiredmakerspace.weebly.com/blog*

Our next step, now that we had students riveted and excited, was to introduce the idea of Genius Hour. We began by asking the children "What is a genius?" "What does a genius do?" The responses were more than we expected. Students thought that a genius was:

- Someone really smart and intelligent
- Someone creative
- Someone who takes time to make something awesome
- Albert Einstein
- An out of this world/ out of the box thinker
- Someone amazing at something (but not everything)
- A person who changes and grows (doesn't stay stuck in a box)
- Someone who collaborates and works with others

I am continually amazed by the depth of response that young children will give when you take the time to discuss and analyze an idea rather than simply telling them the answer.

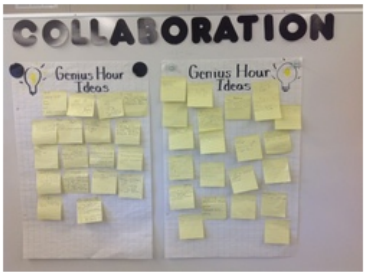


We then asked the children if they thought that they could be a genius. We asked "How can you make a difference in the world- what will you do?"

As a team we told the children that we were implementing a 'Genius Hour' every week into our school schedule where the teachers would support the students in following a passion or interest. We briefly discussed some opportunities that teachers could support eg- robotics, programming, arts, science, lego and research options and then asked the students to think of something they might be interested in learning more about. Students were tasked with a 'speed sharing' activity where they paired up with another student

Figure 3 (part 2 of 3). Launch of genius hour. *http://reggioinspiredmakerspace.weebly.com/blog*

After 10 minutes of sharing ideas, students were instructed to write down their top three ideas onto a sticky note and place it on our poster paper. We reviewed the ideas with the whole group and tried to point out commonalities when we saw them. Ideas were very wide ranging from wanting to know more about haunted places to the history of soccer. There was also a large group interested in technology and building with Lego. We thanked the students for their input and told them that we would review the ideas and re-group in a week for further planning and brainstorming.



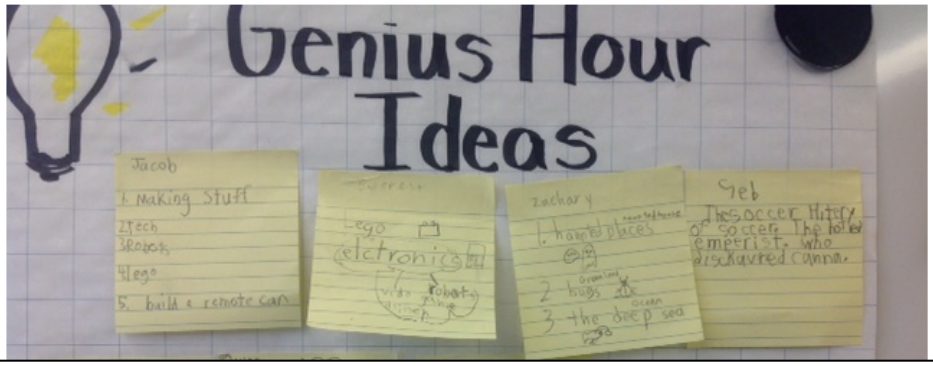
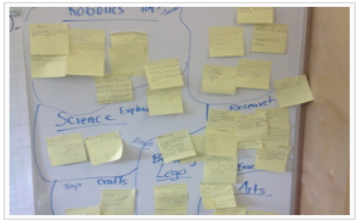
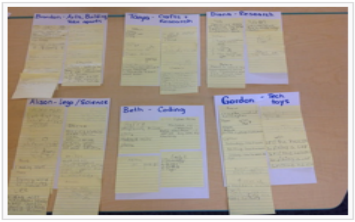


Figure 3 (part 3 of 3). Launch of Genius Hour. *http://reggioinspiredmakerspace.weebly.com/blog*

So many ideas.....

9/20/2015 0 Comments





Now that we had all these amazing ideas we sat down as a team and looked for patterns or natural groupings that we could make. Ideally, in a maker space setting, students would independently choose their topics based on available materials but due to necessity we are starting with ideas first and bringing in materials later to support student learning. Having six teachers allowed us to group students into the following groups:

- Research questions
- Hands on crafts
- Tech toy exploration
- Coding
- Lego/science exploration
- Arts/drama

Each teacher chose a group based on their own interests and passions and received a folder with the names and interests of their group.

Figure 4. Organizing the ideas. http://reggioinspiredmakerspace.weebly.com/blog

Genius Hour Pilot Project

We are very pleased to be piloting a new SMUS learning project in grade 3 this year called "Genius Hour".

What is Genius Hour?
Genius Hour is time set aside in class for students to inquire into a personal passion or an area of interest. It originated from a work practice developed at search-engine giant, Google. Google allows its engineers to spend 20% of their time to working on apet project of their choosing. The idea is very simple; allow people to work on something that interests them, and productivity increases. Grade 3 students will pursue their passion projects during two, shared, one hour blocks each 10 day cycle.

Why is Genius Hour important in an educational setting?
Students take ownership of their own learning. They learn about something that they are intrinsically interested in and are in charge of designing and modifying the project. Genius Hour sparks curiosity, and engages students in design thinking. Through questioning, planning, creating and improving, students learn the value of learning from mistakes. Genius Hour encourages the joy of learning and provides an excellent opportunity for learners to tinker, experiment, iterate and collaborate in a personalized context.

Goals of this pilot:

- To provide opportunities for students to develop and practice the 21st century competencies of creativity, communication, critical thinking and collaboration
- To promote, support, and model creative, innovative thinking and inventiveness
- To allow students an opportunity to discover/investigate their passions and reflect on/share their learning with

Figure 5. Parent information letter. *http://reggioinspiredmakerspace.weebly.com/blog*

The next blog entries Figures 6, 7 and 8 address issues relating to motivating and organizing students during genius hour. There are links to inspiring videos and a planning form to help keep students on track.

Where do good ideas come from?

10/12/2015 0 Comments

Our next lesson began by showing the video 'Obvious to you. Amazing to others' by Derek Sivers. The message being that we often judge our own ideas harshly but not holding back and sharing your ideas can result in valuable inspiration.

Students were then divided into groups and set off with their mentor teacher to flush out their passion project. As a group, we had toyed with the idea of being completely constructivist in nature and letting students naturally discover their projects, but again due to our space and materials limitations we decided that students would need a little scaffolding to help them prepare for the next lesson. We provided each student with a planning form to fill in.

Not surprisingly, some students knew exactly what they wanted to study and eagerly filled in the form, while others had trouble coming up with an idea. I had read from my research that an open ended model of learning can result in a flip in achievement. Top students in a traditional setting often struggle with the vastness and unpredictability of a passion project while students who might resist pen and paper learning thrive on exploring their own ideas. We certainly saw this phenomenon in our setting. Some of our students were paralyzed by the idea that there was no 'right' answer and that there was a very real potential of failure as part of the learning process. Other students, eagerly embraced the notion of free choice and came up with much better ideas than we could have provided them with. I was left wondering how can we as teachers inspire all our students- serious and playful-to take risks in their learning?

"Constructionism is not interested in pitting serious against playful, but instead finds ways to live at the intersection of the two" - Paulo Blikstein (2015)

Figure 6. Where do good ideas come from? *http://reggioinspiredmakerspace.weebly.com/blog*

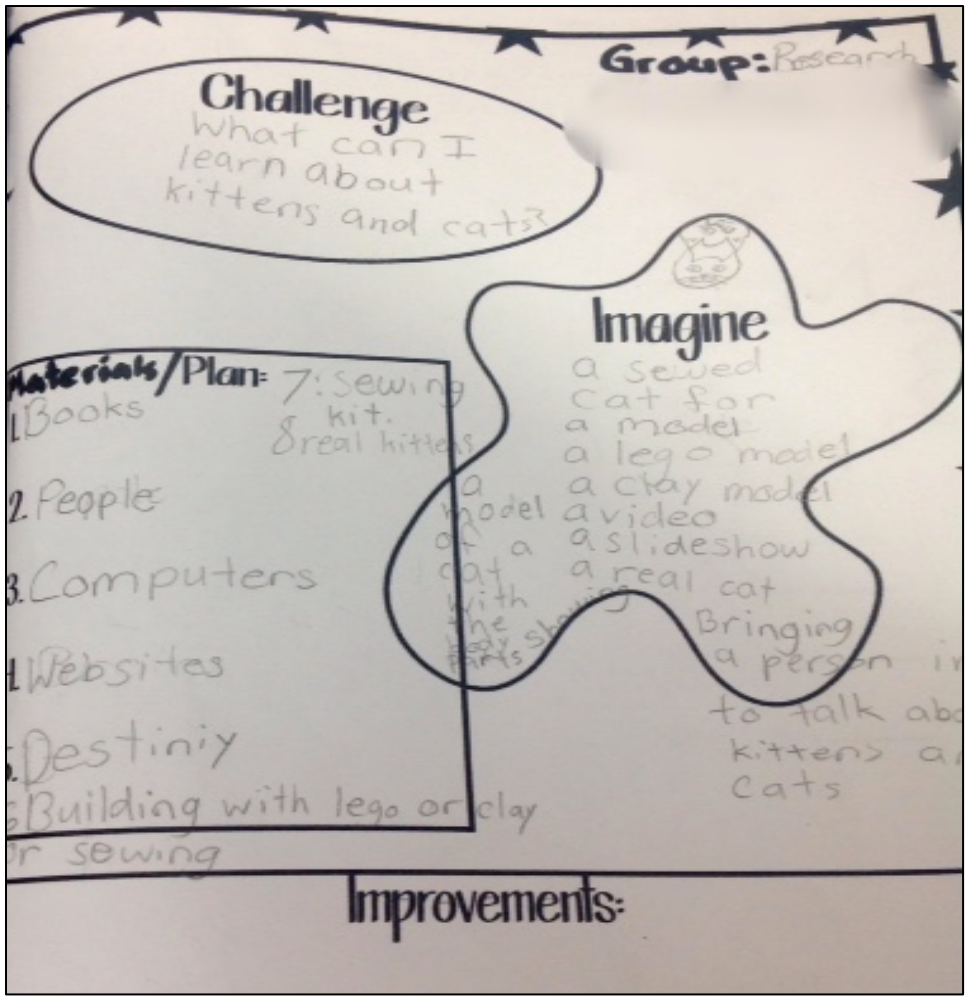
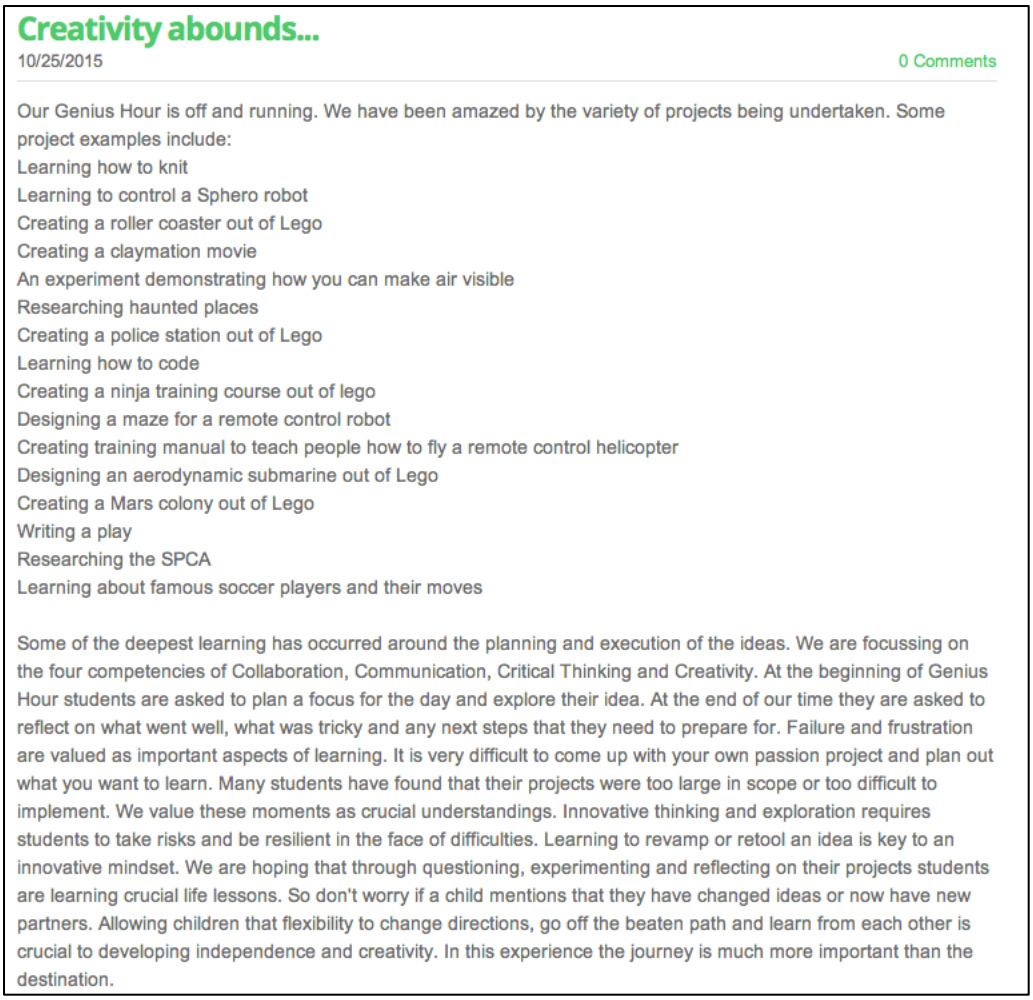


Figure 7. Example of student planning sheet. *http://reggioinspiredmakerspace.weebly.com/blog*

Figure 8 details some of the projects that students chose to research as their passion projects and addresses some common issues that arise as students learn to take risks with their learning.



Creativity abounds...

10/25/2015 0 Comments

Our Genius Hour is off and running. We have been amazed by the variety of projects being undertaken. Some project examples include:
Learning how to knit
Learning to control a Sphero robot
Creating a roller coaster out of Lego
Creating a claymation movie
An experiment demonstrating how you can make air visible
Researching haunted places
Creating a police station out of Lego
Learning how to code
Creating a ninja training course out of lego
Designing a maze for a remote control robot
Creating training manual to teach people how to fly a remote control helicopter
Designing an aerodynamic submarine out of Lego
Creating a Mars colony out of Lego
Writing a play
Researching the SPCA
Learning about famous soccer players and their moves

Some of the deepest learning has occurred around the planning and execution of the ideas. We are focussing on the four competencies of Collaboration, Communication, Critical Thinking and Creativity. At the beginning of Genius Hour students are asked to plan a focus for the day and explore their idea. At the end of our time they are asked to reflect on what went well, what was tricky and any next steps that they need to prepare for. Failure and frustration are valued as important aspects of learning. It is very difficult to come up with your own passion project and plan out what you want to learn. Many students have found that their projects were too large in scope or too difficult to implement. We value these moments as crucial understandings. Innovative thinking and exploration requires students to take risks and be resilient in the face of difficulties. Learning to revamp or retool an idea is key to an innovative mindset. We are hoping that through questioning, experimenting and reflecting on their projects students are learning crucial life lessons. So don't worry if a child mentions that they have changed ideas or now have new partners. Allowing children that flexibility to change directions, go off the beaten path and learn from each other is crucial to developing independence and creativity. In this experience the journey is much more important than the destination.

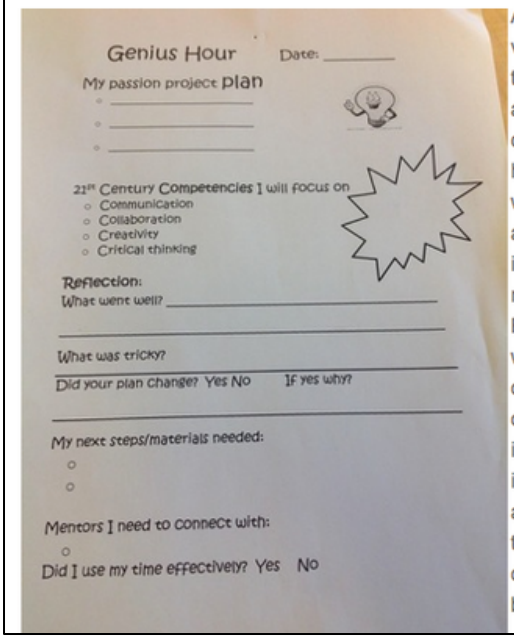
Figure 8. Passion project examples. *http://reggioinspiredmakerspace.weebly.com/blog*

Figure 9 highlights a planning sheet that students were given during the creation process to help keep them focused on the 21st century competencies and as a reflection tool to help them plan materials and document their progress. It also provides an affordable storage option for teachers looking to store passion project materials.

Getting organized

10/15/2015 2 Comments

Once the children had a plan we quickly realized that organization of materials was going to be of paramount concern. We needed a place to store individual and group project materials such as wool, lego, science equipment, papers ... in inexpensive, readily accessible containers. Ikea provided the perfect solution- The GLES box. A plastic, stacking container that costs only $1.75. We quickly bought 30 of them and labeled them with student names. They store easily in our classrooms and help to keep students organized :)



An issue that we wrestled with was how to keep the student's voice and choice and a constructivist model while still ensuring that students were using their time wisely. We decided to have a planning page that helped the children plan, focus on competencies and enable them to reflect on their learning. We have the 4 C's posted in our room so the children are familiar with the language and know that they are an important part of any project. The star box is for any aha moments that come up in their work. The reflection piece is based on a coaching model that we use at our school for students and staff from the Roy Group http://www.roygroup.net. So far the form has worked well for some students and not so well for others. We quickly realized that students wouldn't take the time to do this on their own so built in a 5 min reflection and next steps time into each Genius Hour. Since we only meet once a week it is important for students to plan their next steps and make arrangements to bring in needed materials. Some of our teachers feel that it is too constricting for some groups that don't seem to need the support and have chosen not to use it, but overall I think it helps the students to keep a focus.

Figure 9. A reflection sheet for students. *http://reggioinspiredmakerspace.weebly.com/blog*

Resource tabs. Providing resource links to both the Reggio Emilia and makerspace philosophies is an essential component to this project as there is very limited published information linking the two approaches. I was very aware that people drawn to the site by the reference to makerspaces would be unlikely to know or understand the

Reggio Emilia philosophy and vice versa. By providing a basic overview and latest research on both approaches I hope to inspire further dialogue and investigation into the commonalities between the two philosophies and encourage other teachers to explore the creation of Reggio Emilia inspired makerspace.

Reggio Emilia resources tab. Figure 10 shows a list of books available to educators interested in learning more about the Reggio Emilia approach. The books chosen address different aspects of the approach including documentation, bringing Reggio approaches up the grades and using materials to inspire learners.

Figure 10. Reggio inspired books for educators.
http://reggioinspiredmakerspace.weebly.com/reggio-emilia-resources.html

Figures 11 through 14 provide a background of the Reggio Emilia philosophy including detailed explanations of the main guiding principles: the image of the child, the environment as the third teacher, collaboration and student-teacher relationships, and documentation as communication. The intersection between the Reggio approach and maker culture is also explored.

The Reggio Emilia Philosophy- How it connects to maker culture

The Reggio Emilia approach is an early education theory and practice developed in the town of Reggio Emilia, Italy. It has been recognized as one of the highest quality early childhood programs in the world. Teachers and researchers around the globe have identified the need for significant educational reform that shifts the focus from a teacher-directed model of teaching to a student-centered, constructivist approach to learning. Introducing aspects of the Reggio Emilia approach to students of any age would be a way to create a personalized learning environment.

In order to understand and draw parallels between the Reggio approach and the maker movement, it is necessary to describe the fundamental principles that underline the Reggio philosophy. The following six principles are listed by most scholars in Reggio Emilia as the philosophy's fundamental guidelines (Cadwell, 2003; Gandini, 1993).

- **The child as protagonist, collaborator and communicator**
- **The environment as third teacher**
- **Cooperation as the foundation of the Educational System in Reggio Emilia**
- **The teacher as partner, nurturer, guide and researcher**
- **The documentation as communication**
- **The parent as partner**

It is important to note that the principles are interconnected and should not be viewed in isolation, but rather as dependent on and influenced by each other.

Figure 11. The Reggio Emilia philosophy. *http://reggioinspiredmakerspace.weebly.com/reggio-emilia-resources.html*

The image of the child

At the heart of the Reggio approach is the belief that children are "strong, rich and capable" (Cadwell, 1997, p.5). Reggio Emilia educators celebrate the image of a child as a complex, creative being with an endless desire to know and understand. They affirm and support children's ability to have, and express, their own hypotheses and theories and encourage children to guide their own learning journeys (James, 2015). Children are viewed not as having needs but rather as protagonists with the rights to an education that allows them to collaborate and communicate with others in order to construct their own knowledge (Cutcher, 2013; Kocher, Edwards, Gandini, & Forman, 1998). This socio-constructivist model is rooted in Dewey's constructivist philosophy that children are architects of their own learning and is key to understanding the underpinnings of the Reggio Emilia philosophy (Dodd-Nufrio, 2011). Malaguzzi (1994) believed that developing a child's creative potential is a basic human right and was disdainful of educators who did not see the inherent rights, capabilities, and potential of young children.

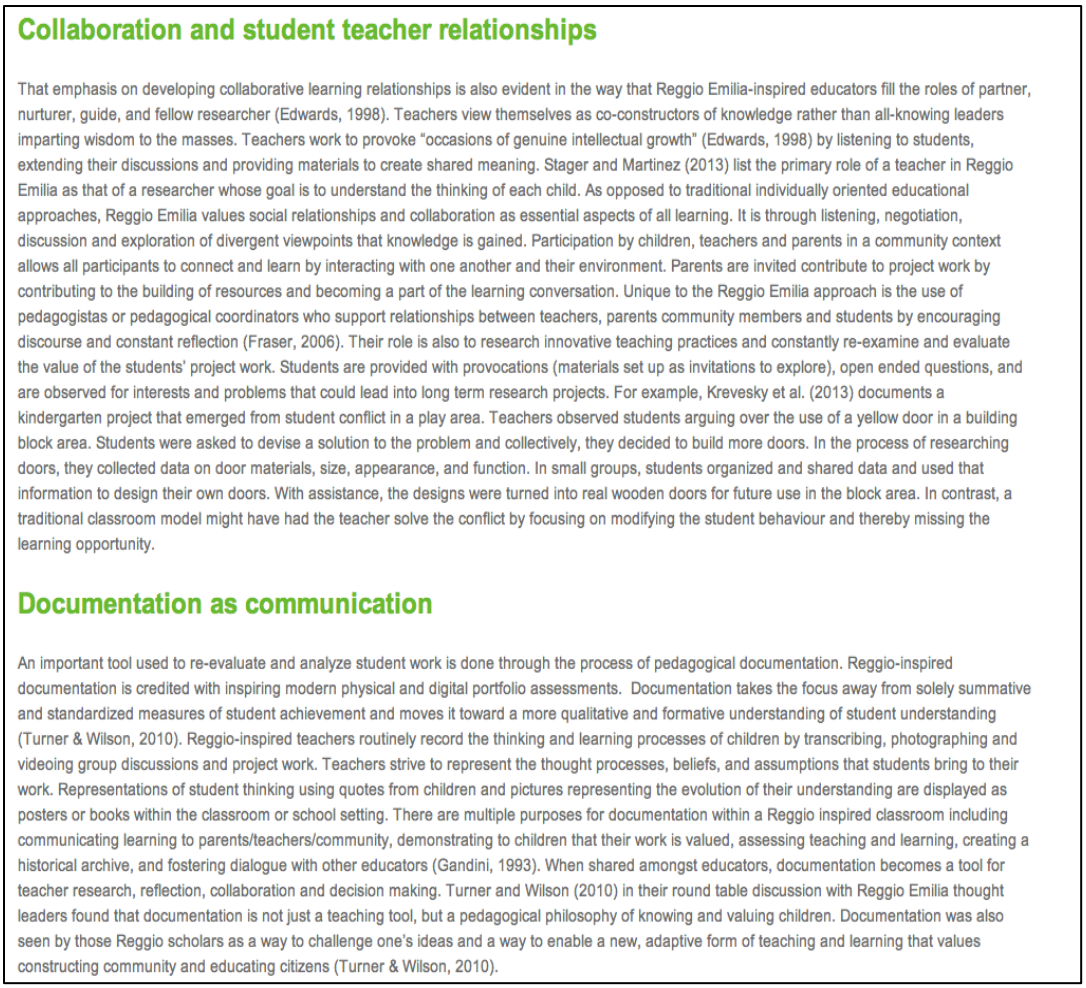
> Those you have the image of the child as fragile, incomplete, weak, made of glass gain something from this belief only for themselves. We don't need that as an image of children. Instead of always giving children protection, we need to give them the recognition of their rights and of their strengths. (Malaguzzi, p. 56)

The environment as the third teacher

Providing a space that encourages and fosters exploration, autonomy, curiosity, and problem solving coupled with the use of natural lighting and variety of materials helps to foster participation and communication between learners.

When one begins to view a child as competent and creative, a value is also placed on the learning environment that supports the development of creativity and free thought. The aesthetic beauty of the classroom environments is one of the first things to strike visiting educators to Reggio Emilia. The classrooms are full of indoor plants, natural light, a purposeful use of space, and an abundance of creative materials. The educators in the preschools of Reggio Emilia place a high value on the aesthetic and physical environment of the school, often referring to it as the "third teacher" (Gandini, 1998, p. 177). The environment is viewed as a living, changing element that supports changing relationships between people and affects how students feel, think and behave (Kocher, 2006). Fraser (2006) describes how the design of learning spaces in Reggio Emilia reflect a philosophy of openness and transparency that invites participants to mingle and share ideas amongst classes. "The support of a complex variety of relationships is the enduring focus of decisions in the schools" with every part of the building serving a purpose (Fraser, 2006, p. 14). A vital part of each school is an 'atelier' or art studio that provides a wide range of media and materials for fostering creativity. The rich, stimulating studios are full of materials that allow students to express their thoughts and feelings through symbolic interpretations, innovative transformation and project work. Materials might include plant and organic items collected from nature, reclaimed and recycled objects from REMIDA, a recycled materials center in Reggio Emilia, or objects donated by students and families. The REMIDA project developed as a partnership with Reggio Schools in 1996 and functions as a storage, display, and supply of recycled and discarded materials to local schools and groups. Local companies donate industrial and craft 'waste' materials such as fabrics, plastic ends, and paper (Eckhoff & Spearman, 2009). REMIDA differs from most recycling centers in its approach to aesthetically displaying materials based on colour, shape and texture. Its collections of materials appear as artworks in their own right and is an integral support to the object-centered inquiry practice of Reggio Schools (Eckhoff & Spearman, 2009). Providing a space that encourages and fosters exploration, autonomy, curiosity, and problem solving coupled with the use of natural lighting and variety of materials helps to foster participation and communication between learners.

Figure 12. The image of the child and the environment as the third teacher principles. *http://reggioinspiredmakerspace.weebly.com/reggio-emilia-resources.html*



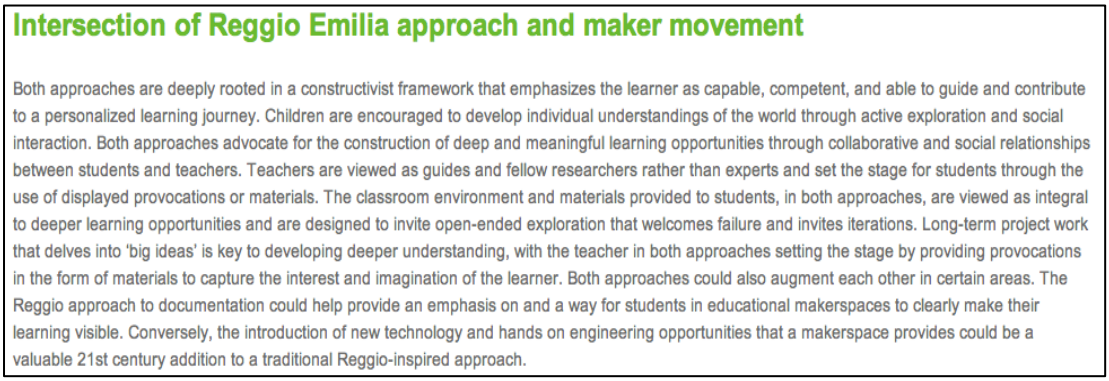
Collaboration and student teacher relationships

That emphasis on developing collaborative learning relationships is also evident in the way that Reggio Emilia-inspired educators fill the roles of partner, nurturer, guide, and fellow researcher (Edwards, 1998). Teachers view themselves as co-constructors of knowledge rather than all-knowing leaders imparting wisdom to the masses. Teachers work to provoke "occasions of genuine intellectual growth" (Edwards, 1998) by listening to students, extending their discussions and providing materials to create shared meaning. Stager and Martinez (2013) list the primary role of a teacher in Reggio Emilia as that of a researcher whose goal is to understand the thinking of each child. As opposed to traditional individually oriented educational approaches, Reggio Emilia values social relationships and collaboration as essential aspects of all learning. It is through listening, negotiation, discussion and exploration of divergent viewpoints that knowledge is gained. Participation by children, teachers and parents in a community context allows all participants to connect and learn by interacting with one another and their environment. Parents are invited contribute to project work by contributing to the building of resources and becoming a part of the learning conversation. Unique to the Reggio Emilia approach is the use of pedagogistas or pedagogical coordinators who support relationships between teachers, parents community members and students by encouraging discourse and constant reflection (Fraser, 2006). Their role is also to research innovative teaching practices and constantly re-examine and evaluate the value of the students' project work. Students are provided with provocations (materials set up as invitations to explore), open ended questions, and are observed for interests and problems that could lead into long term research projects. For example, Krevesky et al. (2013) documents a kindergarten project that emerged from student conflict in a play area. Teachers observed students arguing over the use of a yellow door in a building block area. Students were asked to devise a solution to the problem and collectively, they decided to build more doors. In the process of researching doors, they collected data on door materials, size, appearance, and function. In small groups, students organized and shared data and used that information to design their own doors. With assistance, the designs were turned into real wooden doors for future use in the block area. In contrast, a traditional classroom model might have had the teacher solve the conflict by focusing on modifying the student behaviour and thereby missing the learning opportunity.

Documentation as communication

An important tool used to re-evaluate and analyze student work is done through the process of pedagogical documentation. Reggio-inspired documentation is credited with inspiring modern physical and digital portfolio assessments. Documentation takes the focus away from solely summative and standardized measures of student achievement and moves it toward a more qualitative and formative understanding of student understanding (Turner & Wilson, 2010). Reggio-inspired teachers routinely record the thinking and learning processes of children by transcribing, photographing and videoing group discussions and project work. Teachers strive to represent the thought processes, beliefs, and assumptions that students bring to their work. Representations of student thinking using quotes from children and pictures representing the evolution of their understanding are displayed as posters or books within the classroom or school setting. There are multiple purposes for documentation within a Reggio inspired classroom including communicating learning to parents/teachers/community, demonstrating to children that their work is valued, assessing teaching and learning, creating a historical archive, and fostering dialogue with other educators (Gandini, 1993). When shared amongst educators, documentation becomes a tool for teacher research, reflection, collaboration and decision making. Turner and Wilson (2010) in their round table discussion with Reggio Emilia thought leaders found that documentation is not just a teaching tool, but a pedagogical philosophy of knowing and valuing children. Documentation was also seen by those Reggio scholars as a way to challenge one's ideas and a way to enable a new, adaptive form of teaching and learning that values constructing community and educating citizens (Turner & Wilson, 2010).

Figure 13. Collaboration, student teacher relationships and documentation as communication. *http://reggioinspiredmakerspace.weebly.com/reggio-emilia-resources.html*



Intersection of Reggio Emilia approach and maker movement

Both approaches are deeply rooted in a constructivist framework that emphasizes the learner as capable, competent, and able to guide and contribute to a personalized learning journey. Children are encouraged to develop individual understandings of the world through active exploration and social interaction. Both approaches advocate for the construction of deep and meaningful learning opportunities through collaborative and social relationships between students and teachers. Teachers are viewed as guides and fellow researchers rather than experts and set the stage for students through the use of displayed provocations or materials. The classroom environment and materials provided to students, in both approaches, are viewed as integral to deeper learning opportunities and are designed to invite open-ended exploration that welcomes failure and invites iterations. Long-term project work that delves into 'big ideas' is key to developing deeper understanding, with the teacher in both approaches setting the stage by providing provocations in the form of materials to capture the interest and imagination of the learner. Both approaches could also augment each other in certain areas. The Reggio approach to documentation could help provide an emphasis on and a way for students in educational makerspaces to clearly make their learning visible. Conversely, the introduction of new technology and hands on engineering opportunities that a makerspace provides could be a valuable 21st century addition to a traditional Reggio-inspired approach.

Figure 14. The intersection of the Reggio Emilia approach and maker movement. *movement.http://reggioinspiredmakerspace.weebly.com/reggio-emilia-resources.html*

Figure 15 provides direct button links to Reggio Emilia inspired blog sites that would be of interest to anyone wanting to begin incorporating Reggio Emilia principles into their classroom. They provide teachers with pictures of classroom environments and ideas for incorporating the principles of Reggio into a variety of school settings.

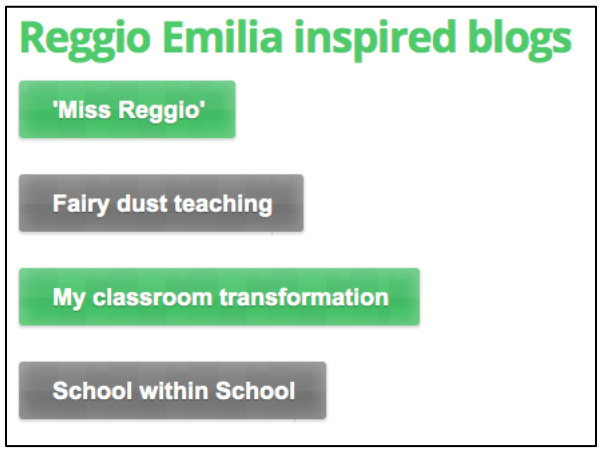


Figure 15. Reggio Emilia inspired blog links.
http://reggioinspiredmakerspace.weebly.com/reggio-emilia-resources.html

Makerspaces resources tab. Figure 16 illustrates a section of books for teachers and students related to makerspaces. The teacher references include books on how to set up a makerspace, how to incorporate tinkering and constructivist activities into classroom practice, and philosophical background on the approach. The student books were chosen to inspire students to create and design their own creations and feature characters who are inventive and creative.

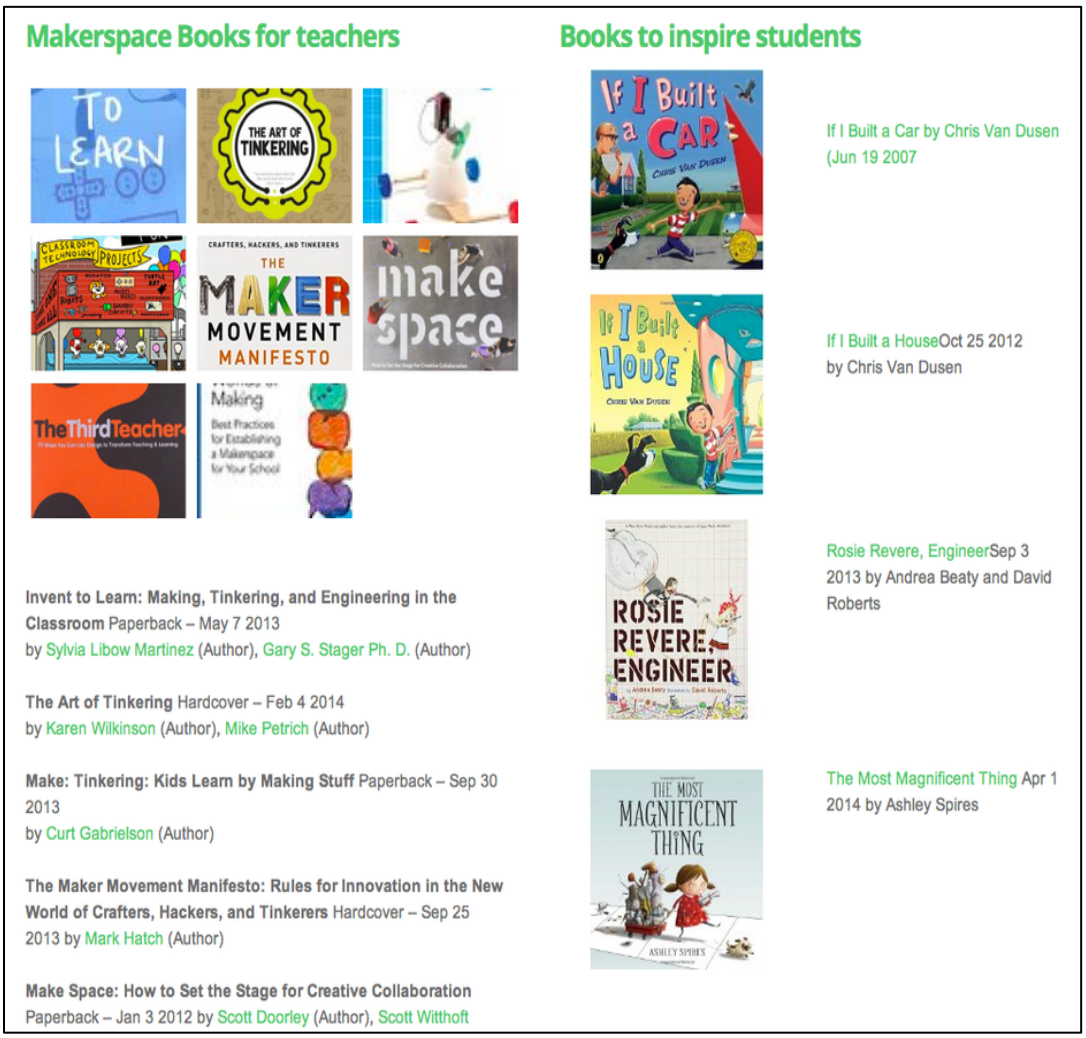
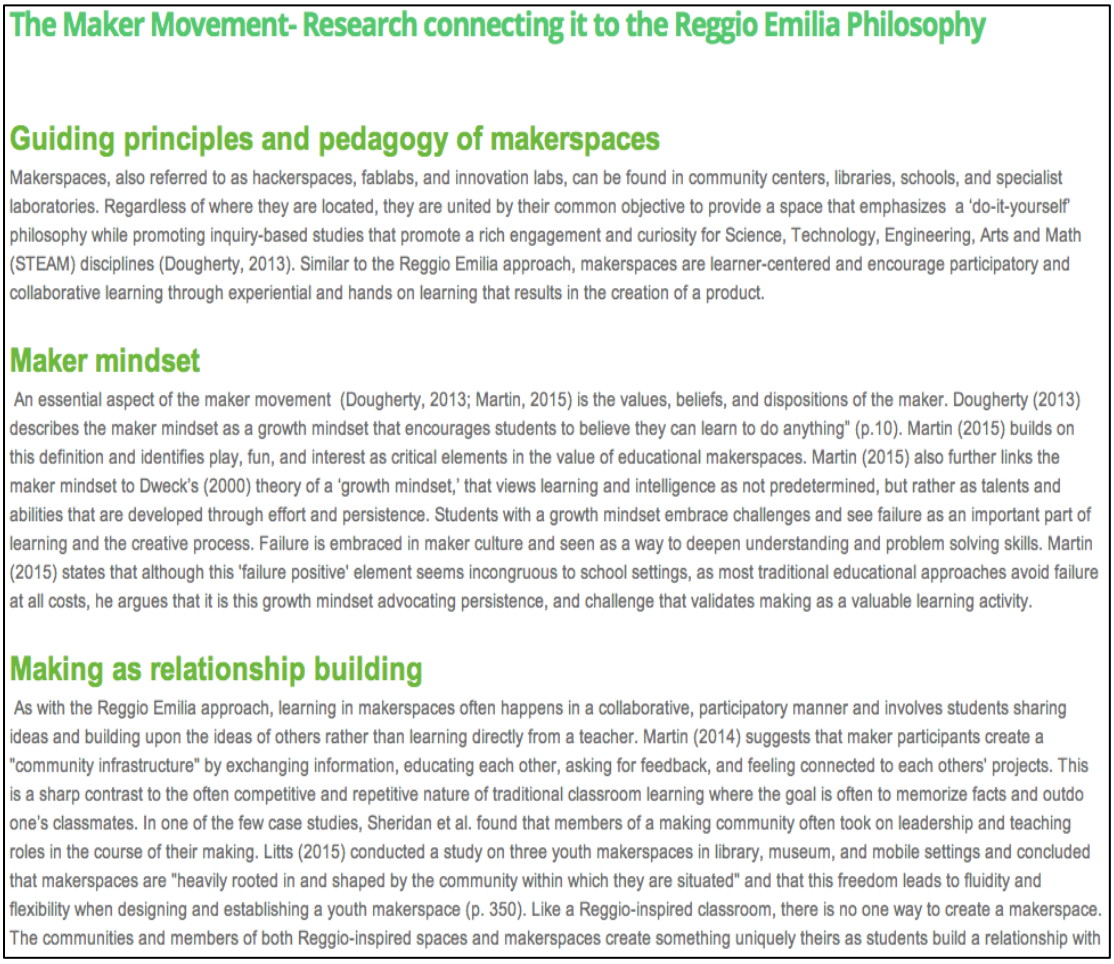


Figure 16. Makerspace books. *http://reggioinspiredmakerspace.weebly.com/makerspace-resources.html*

Figure 17 provides information linking the guiding principles and pedagogy of makerspaces with the Reggio Emilia approach. Similarities in philosophy, mindset and relationship building are discussed and contrasted against traditional teaching methodology.



The Maker Movement- Research connecting it to the Reggio Emilia Philosophy

Guiding principles and pedagogy of makerspaces

Makerspaces, also referred to as hackerspaces, fablabs, and innovation labs, can be found in community centers, libraries, schools, and specialist laboratories. Regardless of where they are located, they are united by their common objective to provide a space that emphasizes a 'do-it-yourself' philosophy while promoting inquiry-based studies that promote a rich engagement and curiosity for Science, Technology, Engineering, Arts and Math (STEAM) disciplines (Dougherty, 2013). Similar to the Reggio Emilia approach, makerspaces are learner-centered and encourage participatory and collaborative learning through experiential and hands on learning that results in the creation of a product.

Maker mindset

An essential aspect of the maker movement (Dougherty, 2013; Martin, 2015) is the values, beliefs, and dispositions of the maker. Dougherty (2013) describes the maker mindset as a growth mindset that encourages students to believe they can learn to do anything" (p.10). Martin (2015) builds on this definition and identifies play, fun, and interest as critical elements in the value of educational makerspaces. Martin (2015) also further links the maker mindset to Dweck's (2000) theory of a 'growth mindset,' that views learning and intelligence as not predetermined, but rather as talents and abilities that are developed through effort and persistence. Students with a growth mindset embrace challenges and see failure as an important part of learning and the creative process. Failure is embraced in maker culture and seen as a way to deepen understanding and problem solving skills. Martin (2015) states that although this 'failure positive' element seems incongruous to school settings, as most traditional educational approaches avoid failure at all costs, he argues that it is this growth mindset advocating persistence, and challenge that validates making as a valuable learning activity.

Making as relationship building

As with the Reggio Emilia approach, learning in makerspaces often happens in a collaborative, participatory manner and involves students sharing ideas and building upon the ideas of others rather than learning directly from a teacher. Martin (2014) suggests that maker participants create a "community infrastructure" by exchanging information, educating each other, asking for feedback, and feeling connected to each others' projects. This is a sharp contrast to the often competitive and repetitive nature of traditional classroom learning where the goal is often to memorize facts and outdo one's classmates. In one of the few case studies, Sheridan et al. found that members of a making community often took on leadership and teaching roles in the course of their making. Litts (2015) conducted a study on three youth makerspaces in library, museum, and mobile settings and concluded that makerspaces are "heavily rooted in and shaped by the community within which they are situated" and that this freedom leads to fluidity and flexibility when designing and establishing a youth makerspace (p. 350). Like a Reggio-inspired classroom, there is no one way to create a makerspace. The communities and members of both Reggio-inspired spaces and makerspaces create something uniquely theirs as students build a relationship with

Figure 17. Guiding principles of the maker movement. *http://reggioinspiredmakerspace.weebly.com/maker-movement-background.html*

Online resources. Figure 18 shows a Symbaloo collection of online resources that has been created as a repository of interesting articles, videos, blogs and websites

that would help an educator explore important aspects of creating a unique innovation space.

Figure 18. A Symbaloo collection of resources.
http://reggioinspiredmakerspace.weebly.com/online-resources.html

Figure 19 is a screenshot of a page that houses a collection of video clips that can be used by teachers to inspire and motivate students. Video topics include: creativity, collaboration and group work, thinking outside the box and the power of failure.

Figure 19. Inspirational videos link.*http://reggioinspiredmakerspace.weebly.com/inspirational-videos.html*

Figure 20 Provides links to websites that reference 21st century learning and learning competencies. Direct button access is included for links to the BC Ministry of Education, and other Canadian and international links to competency based educational initiatives.

Figure 20. Links to 21st century learning and competencies. *http://reggioinspiredmakerspace.weebly.com/links-to-21st-century-competencies.html*

Conclusion. This website is designed for use by teachers wanting to learn more about creating a Reggio-inspired makerspace. The blog addresses how teachers with limited space and materials can still incorporate constructivist learning opportunities into their schedule and invites comments from other teachers trying similar initiatives. It is designed to be an ongoing repository of ideas and documentation of our process. It is hoped that by providing information on both the Reggio Emilia and makerspace philosophies educators will begin to explore the connection for themselves and view a Reggio inspired makerspace as a unique way to bring inquiry-based, constructivist learning opportunities into higher grades.

Chapter 4: Reflection

Project Reflection

This project began as an inquiry into the benefits of providing open ended, constructivist learning opportunities in older grades. As students progress in our current educational system, the time set aside for playful exploration and self-directed learning often decreases and is replaced with testing and teacher driven curriculum. Having been a grade one teacher for over 12 years, I have received much training in early childhood educational methods and in my own experience have seen the immense value of unstructured 'play' as a vehicle to develop learning competencies and drive deeper learning. In particular, the Reggio Emilia approach to early childhood education has been recognized worldwide as an outstanding model of constructivist learning. My interest in innovation and technology also introduced me to the maker movement and its emphasis on hands-on learning and design thinking. At the same time, current educational reforms are taking notice of the importance of student centered learning in all grades as a way to develop innovative, collaborative students with the critical thinking and communication skills needed for the jobs of the future. The intersection and similarity of these approaches was immediately apparent to me and I wanted to research how they could be combined to serve the needs of my students in grade three. This project was designed to document the experience of creating a Reggio-inspired makerspace in two grade three classrooms despite space and material restrictions. It was aimed at providing practical, easy-to-implement ideas and templates for classroom teachers that identify fundamental ideas of both the Reggio inspired and makerspace approaches and demonstrate ways that teachers can weave the teaching of 21st century

competencies through the creation of a Reggio-inspired makerspace. By creating a website and a blog documenting the experience I was able to analyze and reflect on the journey in order to help others gain insight into the creation of a rather unique makerspace. By stepping back and observing the learning process, I documented personal and group reflections through shared photographs, notes, student work, and journal entries, in order to provide retrospective and prospective functions and deepen my own understanding as well as that of other interested educators. The website and blog provide resources, pictures and insights into creating a Reggio-inspired makerspace and provide ties to the competency based curriculum being introduced in BC.

Educational Journey

Undertaking my Master's of Education (M.Ed.) degree has been a much bigger and all encompassing undertaking than I had ever imagined. I began my project with a quote by Loris Malaguzzi (1993): "Learning and teaching should not stand on opposite banks and just watch the river flow by; instead they should embark together on a journey down the water" (p.56). When I chose that quote, at the very start of my research, I had no idea of the thrilling, wild water adventure that I would be immersed in. As I began anticipating my educational journey I envisioned spending a few hours a week reading and writing as a side project to my job - a mere hobby to interest me. What transpired was a complete professional transformation that included changing the grade I taught, and a passionate re-design and consolidation of values that I hold near and dear to my heart. I underestimated the value of reading the latest professional literature and peer-reviewed studies to my daily practice and had no idea of the connections and opportunities that establishing an online personal learning network could contribute to

my professional growth. As I opened my teaching to new ideas and looked outside of my own classroom, I gained confidence in approaching other educators and academic thinkers, engaged in dynamic, passionate conversations with innovative educators, and began to find my voice. This chapter will explore some key impacts that my M.Ed. program has had on my professional thinking and practice, future possibilities for growth, and key recommendations to other educators looking to explore inquiry-based, constructivist learning opportunities.

Professional Thinking

The opportunity to think and reflect on my own philosophical values has been one of the most important aspects of my M.Ed. journey. As a teacher for over 16 years, I instinctively knew what 'felt right' when I was teaching, but often didn't have the theoretical background to fully understand why certain techniques or lessons were more effective than others. The literature that I have read as part of my M.Ed. course work has not only opened my eyes to new and innovative teaching methods but has helped me to re-examine my beliefs and justify the value of constructivist learning opportunities. I have also experienced first hand, through working collaborative with my colleagues, the importance of creating learning communities that encourage discourse and constant reflection. It was through my discussions with my colleagues that my best ideas emerged. In examining and evaluating our collective work we created a "community infrastructure" mentioned by Martin (2014) that allowed us to support each other through the challenges that naturally occur when trying to create a personalized, fluid and flexible learning environment. Having joint responsibility for the 'genius hour' pilot project allowed us all to share our strengths, abilities and passions in an exciting and supportive

way and gave us the freedom to explore new ways of teaching without the fear of judgment. Hearing the viewpoints and concerns of my colleagues helped me to articulate my ideology more clearly and pushed me to consider and explore avenues that I hadn't considered. This culture of collaboration and open communication benefited not only the teachers involved but allowed us to 'practice what we preach' in relation to the new BC Education Plan and its focus on inclusive and collaborative learning.

Reflecting on our journey and documenting our progress on my blog was also transformative in terms of my professional thinking. It is not often that I find the time to sit and analyze the pros and cons of a lesson and look past the surface level to the deeper learning that is occurring. I found myself using skills that I had developed through my documentation training in the Reggio Emilia philosophy to try to isolate important events, quotes and experiences while also being mindful that the purpose of the blog is to help other teachers wanting to try something similar. By creating a website to document our project, I was able to actively demonstrate and practice many aspects of constructivist learning theory such as forming my own representation of my learning, uncovering inconsistencies between current knowledge and my experiences, and interacting in a social context with members of a learning community (Ackermann, 2010; Gredler 2001). Through sharing our experience, and actively interpreting it, I developed a deeper level of understanding of both the Reggio Emilia and makerspace philosophies. My project work also reinforced my belief that providing open-ended learning opportunities that incorporate tinkering and play are essential for developing creative and innovative mindsets in our students. Seeing very bright grade three students, who are already so conditioned by school to give the 'right' answer, paralyzed by indecision and fear of

failure when given an open ended learning prompt, strengthens my resolve to create time and space for my students to be in control of their learning. Focusing on the core competencies of collaboration, creativity, critical thinking and communication help to justify the value of this time. If, as educators, we want children to be inventive and resourceful, we need to provide opportunities for open-ended learning that challenges students to come up with their own questions and solutions.

Professional Knowledge

During the research process for my literature review, my background knowledge of the underpinnings of the Reggio Emilia philosophy and the makerspace philosophies was greatly enhanced through the reading of research papers from all over the world that otherwise I would never have accessed. As I immersed myself in the research, I was able to make connections between articles and make links between existing and new ideas. I now have a much better understanding of the new BC curriculum and was pleasantly surprised to discover that the emphasis on the core competencies is perfectly in line with the teachings of Reggio Emilia and makerspaces. This renewed my confidence that bringing the Reggio Emilia philosophy up the grades through a makerspace model would align very well with current pedagogical discussions. Reading about best practices from around the world also inspired me daily to try new things in my classroom and reinforced an innovative mindset in relation to my own teaching. The ever evolving nature of research was rather daunting at times as I kept finding more and more articles and just when I thought I had found them all, another makerspace article would be published. Being on the forefront of a new educational initiative was exciting, but also created some research headaches. Similarly, the piecemeal unveiling of the BC Ed Plan, which by its

nature is constructivist as partners join to create a collaborative education model, caused some confusion as new updates were constantly being released. Attending my Master's classes almost entirely online gave me renewed appreciation for the power of distributed learning experiences. Despite never having met most of my cohort, I became invested in the lives and projects of my fellow students, built a common trust, and benefited from their collective expertise. My use of Twitter, Blue Jeans Network, and other online platforms grew exponentially through my course work and introduced me to the power of a personal learning network from around the world. As a result of my research, I was also given the opportunity to attend the Fablearns conference at Stanford University in the Fall of 2015. Meeting the researchers that I had quoted in my literature review (Bilkstein, Halverson & Litts) and being in workshops with leaders in the maker movement field, such as Sylvia Martinez, was truly inspirational and reinforced my belief that my work is valuable and relevant to today's educational discussions.

Despite our experience being unique to our context, I believe that our experience is relevant and applicable to other classroom teachers wishing to focus on competency based lessons that value voice and choice. Since beginning my Masters work, I was chosen to join a personalization team at my school looking at finding innovative and student centered ways to provide voice and choice to students K-12. The genius hour model that we are implementing in grade three has generated much interest school-wide and we are looking to see if we can expand into other grades next year. The challenges that we have faced in motivating and encouraging students to take risks with their learning highlights the need for a dedicated space and material rich environment to be truly successful. School administration has seen the enthusiasm and rich learning

opportunities that can be offered within a constructivist model and are eager to support our future endeavors. In fact, I have just received word that we have been given funding to start creating a space for next September. I look forward to applying my research this project and being on the forefront of a potentially new type of makerspace that has potential to be influential in current pedagogical discussions.

Key Recommendations

Change is never an easy proposition in any job, yet it can be even trickier in a classroom setting where the futures of children are seemingly at stake. The pendulous nature of education often leads to skepticism as new ideas and directions seem to swing back and forth and the old becomes new again. It is through collaboration, voice and choice that educational reforms will work. Teachers will need to reframe their role in the classroom and work collaboratively with peers and students to create new communities of learning that emphasize the skills necessary for the students of today to be successful tomorrow. The following suggestions may be a good place to start:

1. Create collaborative learning groups in your school designed to explore innovative ideas focused on developing core competencies.
2. Explore resources related to the Reggio Emilia approach and the makerspace movement.
3. Explore a constructivist teaching and learning approach that embraces voice and choice for students and teachers through direct experience with an assortment of materials.

"Stand aside for a while and leave room for learning, observe carefully what children do, and then, if you have understood well, perhaps teaching will be different from before."

Loris Malaguzzi

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