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Steam Integration at Aro Academy

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Running head: STEAM INTEGRATION

WESTERN UNIVERSITY

Steam Integration at Aro Academy

by

LeeRon Shulman Kaye

AN ORGANIZATIONAL IMPROVEMENT PLAN

SUBMITTED TO THE SCHOOL OF GRADUATE AND POSTDOCTORAL STUDIES

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE

DEGREE OF DOCTOR OF EDUCATION

LONDON, ONTARIO

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Abstract

This organizational improvement plan centers around a problem of practice at a faith-based independent elementary school in Ontario. Faced with several organizational challenges including declining enrollment and pressure by stakeholders to ensure curriculum delivery remains relevant for 21st Century learners, there is a goal of embedding Science, Technology, Engineering, Arts and Math (STEAM) integrated learning in a meaningful way. The school has made physical space and has the technology available to support instructional change including a dedicated Maker Space and Robotics Room. A robotics specialist and an administrator supervising innovation have been hired to support teachers but integration in the past two years has been slow. There are divisions between the English and the faith-based teachers that are pronounced.

STEAM will be a driver for design thinking and 21C skill development across both the English and the faith-based teaching groups and the Design Thinking Cycle will guide the process. Many aspects of change management are addressed, including managing resisters, conflict teams and how to implement a lateral leadership model when historically the organization has been hierarchical in nature.

Using a Logic Model to identify and articulate the problem of practice and choosing transformational leadership alongside incremental change theory provides the theoretical frame for this process. The Design Thinking cycle provides the conceptual frame as it articulates the change and ultimately the goal for all stakeholders. This problem of practice seeks to build staff capacity and cohesiveness through a process of lateral leadership. Ultimately a final curricular document that outlines STEAM learning at each grade level will be created by members of the STEAM Team and staff will have

built capacity. Equity issues such as religion, gender and internal bias will be made transparent and problem solving around these issues will be paramount. Ultimately, the document will be continually revised to react to the global market and as each new technology emerges onto the global landscape and job market the school must pivot and redesign the nature of the STEAM curriculum to reflect these shifts.

Keywords: STEAM (STEM), Design Thinking, organizational change, change management, educational change, 21st Century skills, instructional change

Executive Summary

This organizational improvement plan centers around a problem of practice in an elementary, faith-based private school in a large city in Ontario established as a community over 100 years ago. There are three distinct elementary schools at two campuses and a fourth campus was closed in the fall of 2019. Current enrollment overall is 950 students and there is a sense of urgency around remaining instructionally and curricularly relevant amidst declining enrollment. Other drivers are the time constraints of a half day of Ontario curriculum delivery and half day of faith-based programming. As well, input from parents and the Board of Directors indicates a desire for integrated and more innovative learning.

STEAM Programs are beneficial in developing skills in critical thinking, perseverance and collaboration (Cleasby & Evans, 2017). Using the Launch Cycle for iterative design thinking (Spencer & Juliani, 2016) and drawing from themes and frameworks in organizational change theories and transformational leadership literature we emerge with a flexible, living plan to move practice forward and create an enduring integrated curriculum to formally embed STEAM learning into the fabric of the school.

Key to this strategy is the formation of STEAM Teams that will plan and deliver STEAM units of study integrating the Ontario Curriculum Big Ideas and the design thinking framework for problem solving. With these teams it is anticipated there will be an opportunity for lateral leadership, more voices to come together in a more equitable way and a new curricular policy document unique to our program will emerge. The nature of the document is that it will progress with time and continue to be responsive to the global competencies and emerging technologies.

This issue for teachers is significant. There is often the sense that STEAM is an add-on, something that adds to their workload rather than replacing old work with new, integrated work (Miller, McLeod & Rowan, 2015). They sense that it is organizationally difficult to manage the multi-disciplinary nature of STEAM at first but is an iterative process for teachers as well as for students. STEAM learning, however is not just about the subjects specifically but about the learning process of inquiry, resilience, imagination, questioning, problem-solving, creativity, productive struggle, invention and collaboration. “STEAM becomes an organizing principle upon which to build the interconnectedness of subject” (Myers & Berkowicz, 2015, p. 8) and provides a conceptual framework for this problem of practice.

Part of teaching and learning must be helping students find interests and skills that will lead to jobs in the workforce. We know that as of 2017, jobs involving computers and IT are the most STEM-ready employment. The OECD (2019b) states that the look of work has changed making career choice especially important moving forward. They cite remote working, ‘gig’ or single contract work, and global competition as threats to job security. What we must keep at the forefront of our mind when deciding what our teaching and learning should look like, is the notion that there is little connection between job aspirations of students age 7-17 and the real job market (OECD, 2018).

The PDSA (Plan, Do, Study, Act) Cycle for change will undergird the Design Thinking Cycle used for organizational improvement at Aro Academy. Used extensively in educational change management, the PDSA has provided a framework to look at problems, consider stakeholder input, find meaningful data, and revisit in order to pivot when outcomes are not as hoped. However, the Design Thinking for school leaders’

model is a perfect fit for this organizational change. STEAM, the Launch Cycle and Design Thinking go together to create the conditions for a new kind of schooling. Using the Design Thinking Cycle allows the school to model the change they wish to see in the instructional staff and directly addresses the iteration mentioned above.

The finished curricular document will act as new policy that will provide a proxy for the sentiment that STEAM has become embedded in the instructional fabric of Aro Academy. Professional learning communities and STEAM Teams will work on improvements and revisions as student interest and external forces demand them. STEAM Teams should be well positioned to reflect and respond to shifting global job markets and trends in education. The Horizon Report (Freeman, Adams Becker, Cummins, Davis & Hall Giesinger, 2017) stresses the urgency of student technological literacy which should currently focus on coding, innovation in STEAM and robotics. However, creating tech literate students is a moving target with analytics technology and virtual reality arriving at education's doorstep immediately. Over the next couple years, the technology focus is predicted to shift to artificial intelligence and the internet of things (Freeman et al., 2017). As each new technology emerges onto the global landscape and job market the school must pivot and redesign the nature of the STEAM curriculum to reflect these shifts.

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I would like to thank my husband, Scott. You have taken the term “best” to a whole new level—the best partner who has supported me in every aspect of my life, the best father who has taken care of our children throughout this journey, and best friend who dedicated many hours of listening to me and helping me navigate the last few years. Thank you for all your sacrifices.

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Acronyms and Glossary of Terms

CDL Coordinator: A teacher position at Aro Academy. This person oversees all the special education programming at the school. CDL is the Centre for Diverse Learning.

Design Studio: At Aro Academy there is a room designated the ‘Design Studio’. It is a specialized space to allow students to explore all aspects of the design process. It includes space for robotics, technology, green screens, collaboration with peers, virtual reality space and flexible spaces for ongoing brainstorming solutions to problems.

Design Thinking: At the heart of design thinking is a way to engage students (and leaders) in procedural knowledge for complex problem solving. Using the concepts of design thinking to solve a real-life STEAM problem would be useful as it provides students with a framework to address their problem (OECD, 2019). This kind of knowledge can be transferable to other problems in other areas of students’ lives. Design Thinking as it relates to Aro Academy uses the Launch model as a framework for this problem solving and solutions-based thinking.

Global Competencies: The OECD (2018) has shifted the PISA test from one of purely academic knowledge to embrace the trend of globalization and to assess skills beyond those in academia. As globalization and jobs change, “the development of social and emotional skills, as well as values like respect, self-confidence and a sense of belonging, are of the utmost importance to create opportunities for all and advance a shared respect for human dignity” (OECD, 2018, p. 2). Global competence then, is defined as the ability to look at “local, global and intercultural issues, to understand and appreciate the perspectives and world views of others, to engage in open, appropriate and effective interactions with people from different cultures, and to act for collective well-being and

sustainable development” (OECD, 2018, p. 7). It is the knowledge, skills, attitude and values to be a globally competent citizen. Specifically, the PISA will measure reasoning, communication, conflict resolution, adaptability and perspective taking as key markers of global competence (OECD, 2018). STEAM is a vehicle to have students work on, and expressly learn about, these essential skills.

The Launch Process: The Launch Model of problem solving includes the goal of having students test and re-test their solutions to problems of individual, local and even global concern. By sparking curiosity in the iteration process and learning from failure, it becomes a real way of “solving problems that encourages risk taking and creativity” (Spencer & Juliani, 2016, para. 3). In the Launch Cycle itself, students **Look**, **Listen** and **Learn**, **Ask** questions, **Understand** the problem, **Navigate** many ideas through brainstorming and analysis, **Create** prototypes, and **Highlight** issues to iterate and pivot to another solution. This is the acronym LAUNCH (Spencer & Juliani, 2016).

Learning Skills: Drawing on employability skills information nationally and globally, the Ministry of Education identifies learning skills as an essential piece of a student’s education; one that will serve students beyond the classroom and into the world of university and of work (Ontario Ministry of Education, 2010). These skills contribute directly to student success in all areas of academics and beyond and include responsibility, initiative, organization, independent work, collaboration and self-regulation. These are reported on through a Ministry Report Card. These skills were drawn, in part, from OECD recommendations about global skill requirements for the future (Ontario Ministry of Education, 2010).

Maker Mindset: A way of thinking that, when engaged, has students use problem solving models taught in STEAM learning to solve problems and engage in positive, resilient strategies. The LAUNCH Cycle described above is an example of students engaging in Maker Mindsets.

Maker Space: At Aro Academy there is a room designated the ‘Maker Space’. It is a large space designed specifically to spark creative ways to solve integrated multi-subject problems. It includes a kitchen space, a breaker space where broken items can be taken apart and explored, a LEGO wall, a building space with hundreds of manipulatives and tools, and more. The Maker Space and the Design Studio are situated across from each other so exploring and learning can be continuous.

OECD: Organization for Economic Cooperation and Development.

STEM and STEAM Learning: The OECD has identified a trend towards thinking of the world as a set of related systems that interact with each other, rather than discrete units of understanding. STEM and STEAM learning are designed to bring together real-life problems and the inter-related academic strands of Science, Technology, Engineering, the Arts, and Mathematics. For the purpose of this paper, STEAM and STEM will be interchangeable with an understanding that STEAM will be a focus at Aro Academy.

Chapter 1: Introduction and Context

The organization at the centre of the OIP is an elementary, faith-based school in a large city in Ontario, established as a community over 100 years ago. For the purposes of privacy, the school is referred to as Aro Academy and the people described herein remain anonymous. The school is part of a trio of schools, located on two campuses, with a total population of 950 students. The problem of practice has emerged largely as a response to declining enrollment overall and the closure of a third campus this year. The school itself is committed to innovative teaching while maintaining traditional cultural and religious practice.

Organizational Context

Currently, the school population at the South branch of the school is just over 400 students from nursery to grade 5 (i.e., ages 3 to 11 years old). There is a North branch as well, that houses just over 200 students, from kindergarten to grade 5, as well as a middle school at the North branch, with 350 students in grades 6 - 8. Most of the students from the South branch continue to the North branch for their middle school years. The school does not go beyond grade 8 but many students continue at a neighbouring faith-based secondary school for their high school experience. Students here spend half the day learning Ontario Ministry of Education Curriculum and the other half day in religious studies. In this dual-curriculum structure, teachers are expected to present the full curriculum in the half day that is allotted to them. As well, a significant drop in enrollment over the years has prompted a closure of the third campus for the 2019/2020 school year.

It is relevant that the school itself is steeped in tradition that is both cultural and

faith-based and that many aspects of the socio-political context of the faith are contentious in the wider secular community. This community has historically had issues with marginalization and faith-based discrimination. Families who choose to send their children here are often alumni, or they hear from other parents about the school as a safe, caring, nurturing and academically rigorous place to be. They are, for the most part, wealthy enough to pay for this experience. Tuition for grade school students is just under \$17000 a child. Because it is faith-based, there are some larger faith organizations that subsidize students who cannot afford the full tuition. It is a focus for families and the wider community, that their child experience cultural celebrations, learn the language and be positioned positively towards a specific country. Beyond this, parents expect a rigorous, forward-thinking, academic and inquiry-based learning experience for their children.

Some tension arises among staff, who are governed by two discrete collective agreements: the general studies teachers and the faith-based teachers. The faith-based curriculum would also lend itself to innovation, while still tending to tradition. However, there is conflict that arises with the faith-based teachers that often prevents these wider discussions about replacing old practice with new and discussion becomes bogged down in the minutiae of the contract. On the other hand, the general studies teachers feel the pressure to address many subjects and expectations in a compressed time environment. At the southern campus, teachers have a real motivation to learn how to teach in an integrated way and tend less towards operationalizing the collective agreement in a confrontational way.

Vision, Mission, Values, Purpose and Goals

The stated school mission reflects a commitment to educational excellence and innovation and to the traditions of the culture and the faith of which they are a part. The vision at the Southern campus includes the development of students' knowledge, creativity, higher-order critical thinking, collaboration with peers and the wider community, and communication skills. There is a stated expectation that the school aims to exceed the Ontario Ministry of Education's curriculum expectations and is committed to recruiting and developing educational excellence through teachers who are provided significant and ongoing professional development. Indeed, teachers here are expected to, and frequently do, work hard to improve students' learning experiences through a wide variety of enrichment opportunities, guest experts and high expectations (Aro Academy, 2019). This mission and value statement provide foundational support for the need to be ever-reflective and engage in positive change, thus, setting the stage for innovative cross-curricular learning. One such example of this is STEAM learning. STEAM learning is a goal of the school organization. It can be characterised as an integrated way of teaching multiple subjects through real-life problem solving and innovative thinking. Both the religious studies and general studies teachers will be challenged to partner together, as they have not done in the past, to create exciting integrated units, while looking at the traditional faith-based curricula in a new light. Overall, STEAM will be a driver for design thinking and 21st Century skills across both campuses and both teaching streams.

Defining STEAM and STEM

There is some discussion as to whether STEM or STEAM is a program or a curriculum and what the difference between these two acronyms are. STEM education is

an “interdisciplinary approach to learning which removes the traditional barriers separating the four disciplines of science, technology, engineering and mathematics and integrates them into real world, rigorous and relevant learning experiences for students” (Vasquez, Sneider & Comer, 2013, p. 4) STEAM is a similar approach to integrated teaching of Science, Technology, Engineering, the Arts and Mathematics. For the purposes of clarification, much of the current research cites STEM learning (Science, Technology, Engineering and Mathematics—without the Arts). For integration and engagement, schools have embraced the arts as ‘jumping off’ points and positive frameworks to embed STEM into the curriculum. For example, a typical STEAM unit would start with a mentor text, which is a book that sparks the problem or imagination at hand before introducing the other subjects. Drama, visual arts and music play an important role in STEAM literacy in K-8 education. It is important to note that STEAM itself is a vehicle to teach students how to problem solve in the real world with multi-faceted problems, different entry points, restricted resources, and many possible outcomes. However, for the bulk of the professional citations, STEAM will be referred to as STEM learning and these terms can be understood interchangeably in this paper. Pedagogically, practice at Aro Academy will include The Arts, especially Language, but it is key that the science and math concepts are deeply taught through project-based learning of STEAM. The Organization for Economic Cooperation and Development (OECD, 2019b) lists STEM as a particular expertise that opens doors to many rich job opportunities.

Organizational Structure and Leadership Approaches

The school has a traditional organizational structure for an independent school

with an off-site Head of School, governed by a Board of Directors and a site-based Principal and Vice Principal. Administration has worked hard to build positive relationships with teachers, by creating some lateral and distributed leadership opportunities, such as a Centre for Diverse Learning (CDL) Coordinator to oversee special education, a Lead Teacher in charge of scheduling, and teacher-driven STEAM committees. Since the school is facing a restructuring, senior staff and administration have worked towards changing its image in the wider community. There are a significant number of independent/private, faith-based schools in the city and it is essential to be innovative in order to stand out and attract clientele. One of the ways in which it has done so is the implementation of a new School Improvement Plan (SIP) in September 2018. The SIP goals include: (a) fostering a culture of care and well-being for staff and students; (b) promoting academic excellence in all subjects, helping students to achieve their personal best; and (c) developing a Maker Mindset in students through cultivating 21st century skills. This is outlined in Table 1.

The mission statement also acknowledges that the organization itself has a responsibility to provide the professional development required to create highly skilled teachers of STEAM. Much research points to the provision of ongoing, targeted and responsive professional development that must be implemented to assist teachers in the delivery of this type of instruction and combined curricula (Yager & Brunkhorst, 2014; Berkowicz & Myers, 2015, 2016; Vander Ark & Ryerse, 2016). Indeed Guzey, Moore and Roehrig, in Yager and Brunkhorst (2014) discuss creating professional development that becomes increasingly teacher-led and resource responsive. At Aro Academy, a comprehensive set of PLCs have been created and the organization has hired experienced educators to be coordinators of innovation at the board level, to assist in this

implementation.

Table 1

School Improvement Plan commitment to 21st Century Achievement Goals

Aro Academy School Improvement Plan			
Culture of Care and Wellbeing	Literacy – Omni-Literacy	Achievement	Evidence of Impact
Establish a culture of well-being and care by providing opportunities that support individual students' positive sense of self and others.	All classes will support high levels of achievement in literacies that include: English, Hebrew, French, Jewish Heritage, Math and Science, developing clear communication, critical thinking and shared problem solving.	Engage students in an authentic, inquiry-based learning environment to enable students to develop 21C Global Competencies and a Maker Mindset (i.e., design thinking, project-based learning, experiential learning, exploring technology etc.)	How are we accountable for this goal as we move through each month? How do we document student achievement? How do we address gaps?

We know that STEAM programs are beneficial in developing skills in critical thinking, perseverance, and collaboration (Cleasby & Evans, 2017). It has been important for all stakeholders including the Board of Directors, Administration, Staff, parents, and students to recognize the value in STEAM education. Part of this project is responding to the desires and requests from parents and our Board of Directors to be more innovative in our teaching practice at the school. Our opportunity to incorporate new, deeper learning for our students was hastened by some reduction in enrollment, the loss of one campus and a need to remain relevant while continuing to inculcate tradition. This year, our thematic focus is *Innovating Tradition* through a deep love and respect for the cultural learning the students benefit from, and an understanding that to have deep learning that

responds to the needs of students today and in the future, innovative teaching practice must be at the forefront of the curricula. The leadership team is well positioned to create distributed leadership opportunities in the fulsome development of a STEAM program that provides rich learning for our students. Challenges and issues remain and include confidence of teaching staff, provision of ongoing professional development that responds directly to teacher needs and, at times, issues with collective agreements and union pushback on school initiatives.

Leadership Position and Lens Statement

The single most important factor in school effectiveness is the principal (Edmonds, 1979; Hallinger & Heck, 1996; Hoy & Smith, 2007 cited in Hauserman & Stick, 2013). The principal provides instructional leadership and is pivotal to creating organizational conditions under which teachers work best. According to Hoy and Smith (2007, as cited in Hauserman & Stick, 2013), transformational leadership by a principal increases teacher efficacy. Hattie (2012) states that it is the teacher efficacy that is the single-most impactful and equalizing factor in the classroom and across classrooms. In this way, principals can greatly impact the instructional program. At Aro Academy, teachers are generally motivated and interested in increasing their knowledge and capacity, and they have a principal that supports and nourishes this capacity and lateral leadership. The project seeks to further improve teacher efficacy by engaging teachers directly in the change process, building positive professional relationships and following through with a sense of urgency around improving practice. A simple cyclical design process can be viewed in Figure 1 that can be applied to both the school and teacher change, and the instructional implications for students as well.

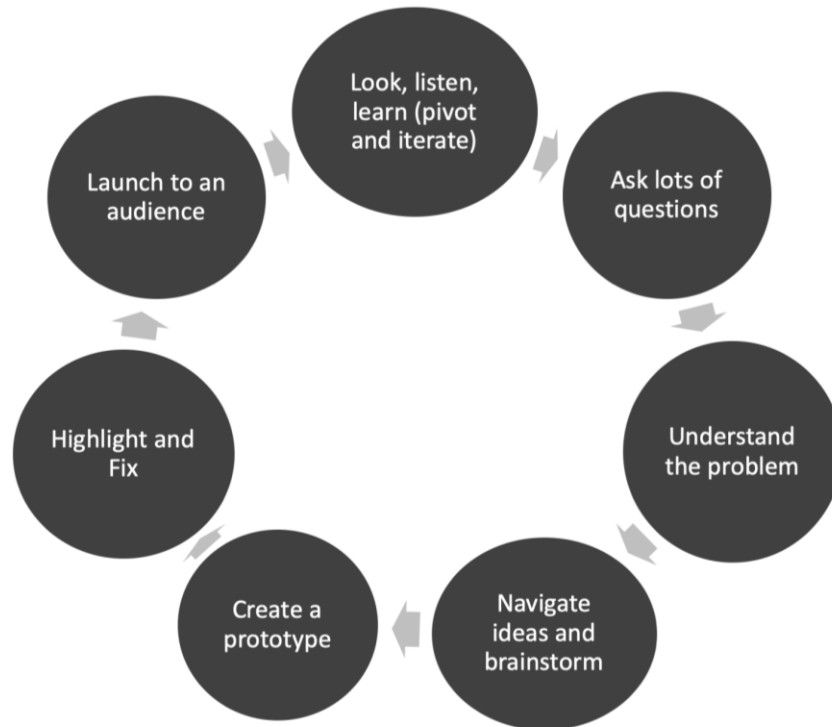


Figure 1. The Launch Cycle for Iterative Design Thinking. Adapted from: Spencer & Juliani (2016).

Organizational Design Change Strategy provides a framework to analyze change strategies in complex environments (Hage & Finsterbusch, 1989). It outlines a systematic framework of questions throughout the process of change management. Organizational Design Change Strategy sits on a continuum between Organizational Development Change Strategy and Organizational Theory Change Strategy. The three strategies share a common goal of managing specific change points related to innovation and production (Hage & Finsterbusch, 1989). This clearly links to Aro Academy's goal of becoming more innovative and responsive in a global marketplace in order to set our students up for future successes. Organizational Design Change Strategy aligns directly with our focus on leadership through a Design Thinking lens. Hage and Finsterbusch (1989) note that when organizations design their change from within their particular context, decentralize power

structures, provide leadership across the organization, communicate well and provide both job independence and equality, innovation is increased. Innovating practice in a faith-based setting is the focus for Aro Academy's goal of STEAM integration into curriculum and classroom. Organizational Design Change Strategy provides a way to determine the effectiveness of change management and "system embeddedness" (Sutter, Goldman, Martimianakis, Chatalalsing & DeMatteo, 2012, p. 59) which is the way knowledge about the change is mobilized throughout the organization.

As Branch Principal for 3 years now, I have the ability and responsibility to influence school policy in order to align with the school's goals and to provide relevant programming for a 21st Century environment, such as education in STEAM. Prior leadership also set the stage for improvements in teaching innovatively at the school. Subsequently, the previous principal is now Head of School so continues to be supportive of these goals. Myers and Berkowicz (2015) talk about the essential nature of STEM to 21C learning. They describe the "tipping point" (Myers & Berkowicz, 2015, p. 7) as being a number of factors that make this kind of integrated, forward-thinking learning essential: increasingly diverse learners, career readiness, technology and its ability to permeate boundaries, the need for creativity and partnerships, and a global economy (Myers & Berkowicz, 2015). All these factors are at play here at Aro Academy. Articulating these reasons will be an early task in implementation and in many cases are already at the forefront of teacher understanding. To start, the specific questioning framework provided by Organizational Design Change Strategy will help develop a thoughtful and responsive foundation for change that focuses on "cognitive, emotional and social-

environmental issues” (Suter et al., 2012, p. 58) within a complex educational environment. The questions focus on several areas of organizational change including fundamental assumptions, major concepts variables and ideas, closing gaps in performance goals, change points (e.g. employee attitudes, culture and climate), and intervention strategies (Hage & Finsterbusch, 1989).

A framework of leadership that resonates with me, and aligns with the design frameworks above, is transformational leadership through incremental change.

Hauserman and Stick (2013) cite Burns (1978) who defines transformational leadership as “an effort to satisfy followers’ needs and to move followers to a higher level of work performance and organizational involvement by displaying respect and encouraging participation” (p. 187). This leadership model is aligned with the continuous incremental change context of building relationships, engaging lateral leadership, encouragement and trust building.

Truly working for change involves building trusting and positive relationships. Carter, Achilles, Feild and Mossholder (2013) remind us that “continuous incremental change context comprises frequent, purposeful adjustments that are small but ongoing and cumulative in effect” (p. 942). Indeed, the Design Process involved in STEAM mirrors this leadership style, encouraging iteration, bold moves that embrace and respond to failure, pivoting for improvements as they arise and this kind of change allows, “the work to move forward while maintaining coherency in purpose [compelling] employees to constantly adjust to maintain process effectiveness as well as positive social interactions among team members” (Carter, Achilles, Feild & Mossholder, 2013, p. 942). Importantly, Carter et al. (2013) note that if you want a staff that is resilient to change efforts,

particularly frequent ones, then trust and positive manager-staff relationships are essential. Conflict, uncertainty and lateral power distribution are all areas of focus and support within Organizational Design Change Strategy. In places like schools where there are complex relationship structures, large amounts of information to manage, competing agendas and the real and perceived power hierarchy, the structure, transparency and mechanisms to handle conflict make this framework a fine starting space (Hage & Finsterbusch, 1989).

It is an aim of this OIP to have educators see the connection between what we are asking students to do in our spaces dedicated to the teaching of STEAM, including our Maker Space and Design Studio, through integrated, hands-on exploration in class, and their own teaching practice. Using design thinking as a filter or framework for change and an Organizational Design Change Strategy to support the complexities of school change, it may be possible to model and address the change through the very teaching methods we are looking to encourage and enhance at the school.

Transformational leadership as a framework for change is also a sound one, because ultimately, we are looking to improve student outcomes at our school and beyond. Philbin (1997) studied transformational leadership and student performance in high schools in the United States. The two important problems that were addressed were the existence of a relationship between principals' behaviours that were considered transformational, and in what ways, if any, student learning was enhanced on the annual achievement. As well, the survey focused on the teachers and their relationship to the principal because of that transformational leadership, or lack thereof. The study explored whether teachers were happy to extend themselves at work, whether they liked their job

and whether they perceived themselves to be effective and having good practice.

Ultimately, Hauserman and Stick (2013) noted that all principals in the study were seen to have some characteristics of transformational leadership and the more highly rated the principal was, the more teachers reported being happier and more productive at work.

Looking to other areas of study to articulate the importance of transformational leadership that is incrementally addressed, helps to solidify the multi-setting importance of this kind of leadership. This research is from an economic and quality management perspective and the authors arrive at an interesting finding that can be transferred to teachers generally. Indeed, quality management should be a focal point of educational improvement because the literature around ongoing learning and improvement is “often considered a key characteristic of learning organizations” (Garvin, 1993; Senge, 1990 cited in Huang, Rode & Schroeder., 2011, p. 1105). Further, Winter (1994, cited in Huang et al, 2011) states that in general, this kind of continuous learning and improvement highlights an organization’s ability to incrementally improve and demonstrate innovation in their change processes. They argue that part of this is the “continual updating of organizational routines as a result of ongoing knowledge gathering and dissemination processes” (Huang et al., 2011, p. 1105). This is an interesting point as iterating routines and consistently updating them to be more responsive and more effective, using information from all levels of the organization, is key to incremental and ongoing organizational change (Huang et al., 2011).

A significant issue will be the difficulty in changing comfortable practice.

Teachers are busy and reluctant to make large changes for fear of classroom management issues or assessment of something multi-subject and complex (Geng, Jong & Chai, 2019).

Wu and Albion (2018) explore the STEM anxiety of preservice teachers in Australia and note that resistance is likely founded in a lack of curricular confidence, particularly in areas of science and mathematics. Sometimes teachers feel that their grassroots knowledge of the classroom and curriculum is not always recognized or rewarded, and they are faced with reform downloaded from above, to which they become resistant. Huang et al. (2011) go on to argue that the learning of organizational routines like those involved in continuous improvement ultimately, “play a crucial role in an organization’s ability to adapt to a rapidly changing...environment” (p. 1105).

Further to the idea of schools as learning organizations and returning to Hauserman and Stick (2013) who identify the way leadership influences vision, ultimately, schools that were identified as ‘high functioning’ had transformational leaders and thus, impacted the school with a positive school culture. This echoes Skalbeck’s (1991, cited in Hauserman & Stick, 2013) conclusion that it is the vision of the principal articulated with staff and the relationships he or she builds that create a culture of collegiality. That environment then supports teacher efficacy, emboldening teachers to focus in on student needs and their professional practice. Lateral leadership shifts “the emphasis from a supervisor being the sole decision maker to greater teacher involvement (which) foster(s) reflection and positive change among teachers” (Hauserman & Stick, 2013, p. 189).

By framing this OIP with a transformational and incremental change lens and by seeking information from other organizations who have successfully implemented significant curricular change, it is possible, in part, to address the Leadership Problem of Practice. Design Thinking and Organizational Design Change Strategy are leadership

lenses that will also act as a framework for change management.

Leadership Problem of Practice

This problem of practice has emerged and re-emerged over the past three years. In order to propel change, physical space has been created for STEAM. A Design Studio and Maker Space have replaced two classrooms and physically articulate the importance of this integrated programming. The spaces are well stocked with a wide variety of technologies, learning materials, a kitchen, greenspace, robotics lab, a breaker space and more. As well, teachers have had in-service training opportunities and access to staff on site that are able to provide curriculum and resource support. The opportunity for STEAM integration has been available, but it is still only a very few educators that initiate work in these areas. Throughout this process, teachers have continued to identify that they do not feel that they have enough time and/or expertise to successfully integrate STEAM into their classrooms and in the Makerspace. This year, staff have requested a ‘planning’ Professional Learning Community (PLC) to create usable STEAM units. Herein lies the problem of practice: *How do we make an organizational shift to manage and produce STEAM learning as a key instructional strategy in every classroom?*

By utilizing a transformational leadership lens with an incremental organizational focus, it is possible to continue to support staff in this change. Carter, Armenakis, Field and Mossholder (2013) stress that incremental change and the speed of that incremental change is less important than relationships between manager and employee. Positive and trusting relationships will be essential to change practice in the classroom. Carter et al. (2013) articulate the tensions that exist as an employee works to shift their practice; practice that has been modified by them over time to create efficiencies specific to their

job. When asked to implement new requirements staff “often experience difficulties and tensions in maintaining prior levels of performance” (Carter et al., p. 942) which in turns creates a sense of a change being additional work.

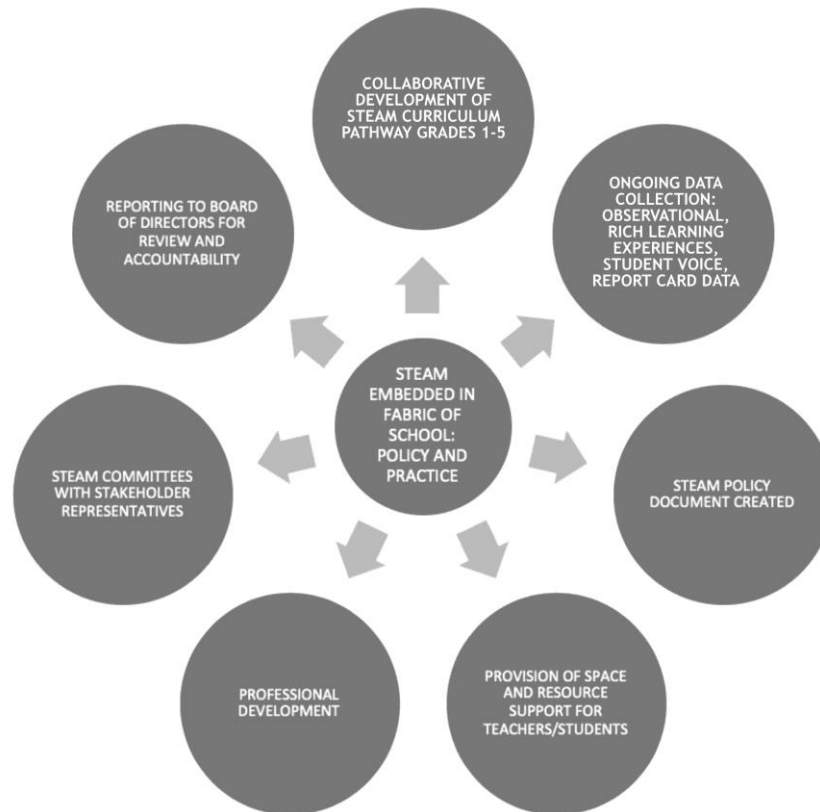


Figure 2. Multiple components of a STEAM embedded program at Aro Academy. Shulman Kaye (2020).

This issue for teachers is significant. There is often the sense that STEAM is an add-on, something that adds to their workload rather than replacing old behaviours with new, integrated ones (Miller et al., 2015). They sense that it is organizationally difficult to manage the multi-disciplinary nature of STEAM at first but is an iterative process for teachers as well as for the students. Continuing to stress to teachers that it is “not about the subject but about the learning process of inquiry, imagination, questioning, problem

solving, creativity, invention, and collaboration [illustrates that STEAM will be] an organizing principle upon which to build the interconnectedness of subjects,” (Myers & Berkowicz, 2015, p. 8) and provides a conceptual framework for our problem of practice.

Figure 2 illustrates the problem of practice and the action items, specific details, data gathering and management necessary to explore this issue in the context of Aro Academy. Returning to what Myers and Berkowicz (2015) term the ‘tipping point’ (p. 7) as being a critical number of factors that make 21C integrated learning essential including: increasingly diverse learners, career readiness, technology and its ability to permeate boundaries, the need for creativity, partnerships and a global economy (Myers & Berkowicz, 2015). At Aro Academy, this tipping point is enhanced with a sense of urgency about enrollment, continuing tradition and providing students with the most relevant, highest quality education possible.

Framing the Problem of Practice

As educators, it is the responsibility of the schools, curricula and staff to ensure that students become educated citizens. Part of that is helping them to find interests and skills that will lead to jobs in the workforce. We know that as of 2017, jobs involving computers and IT are the most STEM-ready employment. The OECD (2019b) state that the look of work has changed, making career choice especially important moving forward. They cite remote working, ‘gig’ or single contract work, and global competition as threats to job security. They also found little connection between job aspirations of students age 7 - 17 and the real job market (OECD, 2018). According to Diversity in STEAM Magazine (2018), the computer field, has an astonishing 1 million projected positions between 2014 and 2024. Other areas such as architecture, surveying, and

cartography have tens of thousands of openings as well. An important aspect of schooling today is creating equitable situations for all our students. Like many places, in the STEM workforce, women continue to be underrepresented.

Girls' education and equity are an important aspect of any school, and as a school it is our obligation to help equalize the opportunities for salary and employment outcomes for women compared to men. We know that engaging girls in STEM will help to accomplish this. Reinking and Martin (2018) engaged in a scoping literature review to explore why there is still a large gender gap in STEM careers. They noted that 80% of engineers graduating from university today are still men (Reinking & Martin, 2018). One main theory for this divide between girls and boys into these careers is socialization into traditional gender roles. Reinking and Martin (2018) argue that schools can have a significant impact on this from a very young age. They state that, "if stereotypes and mindsets are changed, there could be a significant increase in girls' sense of belonging in STEM professions" (Reinking & Martin, 2018, p. 150). Schools have a responsibility to create a new sense of what an engineer might look like, or a mathematician or a scientist. Inclusivity for gender, diversity and ability is essential to bridge this gap.

STEAM provides "a vehicle to free educators from 19th and 20th Century thinking, morphing how we have structured schools, teaching and learning," (Myers & Berkowicz, 2015, p. 7). Making STEAM is the driver of a transformative leadership approach that is expanded upon throughout the project, and with the goal of shifting the culture and innovation level at Aro Academy. An aim of this OIP is to have educators see the connection between what we are asking students to do in the Maker Space and Design Studio and through integrated, hands-on exploration in class, and their own teaching

practice. This can be most frightening for teachers who feel obligated to maintain order and provide a significant number of rote learning skills to students. One online response by a teacher to the question of why they have such a hard time releasing control for inquiry learning articulates this well, “I was afraid that my students would not stay on task, would not learn as much, would not be able to do as well on the assessments and would have ore opportunity to fool around” (NSTA, 2011, para. 2). One study in Hong Kong identified that after professional development in STEM, only 5.5% of teachers felt that their ability to implement this learning was sufficient. The majority of those reporting a lack of readiness cited classroom management as one of the top three reasons (Geng, Jong & Chai, 2019). Encouraging maker thinking in teachers is a significant piece of the desired change and provides a conceptual understanding of the challenges ahead.

Creators of the Launch Process, illustrated in Figure 1, have articulated their understanding of the many challenges teachers face in education today. Spencer and Juliani (2016) note that other school pressures and scarcity of materials can be a barrier. Indeed, “the creative process can seem confusing. Curriculum can feel limiting. Those challenges too often bully creativity, pushing it to the side as an ‘enrichment activity’ that gets put off or squeezed into the tiniest time block” (Spencer & Juliani, 2016, p. i). However, they caution that these skills and processes are so important that if we do not take on this challenge, we are compromising the future of our children.

Design Thinking will itself provide a guiding framework that institutes organizational change that reflects the structural and instructional change at the heart of the problem of practice (Gallagher & Thordarson, 2018). The concepts of leaders as storytellers, producers, architects and mindset influencers, will be thoughtfully embraced

as change is managed, supported, and encouraged at Aro Academy. Ideally, the change process will mirror the development of risk-taking staff and engaged, enriched, inquiring students.

Change Drivers and Challenges in the Problem of Practice

Three change drivers have been identified to assist in the implementation of a curricular shift of this magnitude: The STEAM Team, supportive parents and financial support through the Board of Directors. Table 2 illustrates the importance of the following resources that are required to address this shift: Financial, human, curricular and data resources.

Table 2

Resource challenges in the implementation of the problem of practice

Resources Required	Details
Financial Resources	Supporting technology and supplies associated with hands-on, inquiry-based learning such as STEAM requires a commitment to technology funding. This can be quite expensive. Space and access to appropriate supplies add additional pressure on a school.
Human Resources	Buy-in from staff using teachers who are ready and able to integrate STEAM learning in their classrooms. Professional development for those who are not ready for implementation.
Curricular Resources	No specific STEAM or STEM resources exist at the Ministry level. A curriculum aligned with the developmental benchmarks for each grade would ensure that STEAM is addressed meaningfully at each level.
Data as a Resource	Tracking and identifying change require a focused effort on data collection and assessment. This can include student achievement, engagement feedback from students and staff, and from parent feedback.

Despite efforts to ensure that stakeholders are involved and that a core change message is created and sent out, there will naturally be limitations and/or implementation issues. Leadership at the school will commit to identifying and articulating other possible limitations and/or implementation issues so that they can be addressed as they arise. This can best be accomplished through open lines of communication between staff and administration, and to listen attentively and be responsive to resisters.

One major limitation is time. Due to the dual-curriculum nature of Aro Academy, teachers have a very limited amount of time in which to deliver any curriculum. Even with ideal buy-in, teachers have articulated that the time constraints may prevent ideal STEAM integration. However, this limitation may be a false concern because of the integrative nature of STEAM. True integration of this kind of learning would result in a curriculum that provides seamless multi-curriculum coverage for teachers. The real issue here might be the perception of STEAM as an add-on rather than a replacement of practice (Miller et al., 2015).

Another limitation that has been touched on is the important matter of funding. In order to secure the funding necessary, The Board of Directors' approval will be necessary, and as the school's funds are themselves limited, prioritization may lead to limitations to the funding for STEAM programming, despite full support of the Board for STEAM education.

Our lack of STEAM policy, as well as lack of teacher professional knowledge, and the potential for teacher push-back against change, also serve as potential limitations to this organizational change plan. Through the steps detailed above and the propensity as an organization to be able to pivot as situations arise, this organizational change plan

could be operationalized. A guiding STEAM curriculum and continuum as policy would be helpful.

Factors Shaping the Problem of Practice

It is important to consider the broader socioeconomic context in which the school and the problem of practice exist. In a private school, which is dependent on parent tuition and involvement, a key factor in all major decision-making is the parent buy-in and influence. This makes any change in programming, including STEAM integration, a balancing act, to ensure overall satisfaction across a diverse and varied parent body. Key to this will be demonstrating our focus on *Innovating Tradition* through forward thinking teaching STEAM strategies while maintaining deep respect for, and commitment to, faith-based learning.

Many parents in this school community have expressed a desire to see their children learning cutting-edge 21st Century skills. These parents are a part of the drive for increased STEAM integration. However, many other parents are reluctant to accept any change in curricula that they have already chosen as satisfactory. This fear of change is exacerbated by the fact that the school has been a pillar of traditional education in the community for over 100 years.

As a private school that does not receive government funding, the school is sometimes limited in terms of budget. In order to increase STEAM programming, the school would need the funds for acquiring and maintaining/repairing technology, as well as for providing professional development and skills training for teachers, at a minimum.

On the other hand, when we consider the workplace into which the students will be graduating, it becomes clear that the costs involved in increasing STEAM integration

are necessary in order to provide our graduates with the skills to be competitive in the 21st Century workplace. Shifting hiring practice to reflect a preference for candidates proficient in STEAM, technology and an understanding of cross-curricular practice and clear educational trends has been a focus this year.

Guiding Questions Emerging from the Problem of Practice

Contextual factors create a number of challenges for this problem of practice. Reduced enrollment over the last few years, that has resulted in a campus shut down and amalgamation, has created a sense of urgency for change. Trying to find ways to engage students and ensure parents and potential parents know that Aro Academy is at the forefront of instructional excellence is a key driver for this change. However, challenges such as: financial limitations, approval and support from the Board of Directors, a divided teaching staff with some reluctant change participants, and professional learning will need to have strategic, targeted action items for resolution.

Some of the guiding questions that emerge in this context are:

1. Are there other, similar contexts where schools have addressed this type of change? How can we leverage successes and challenges to benefit our program?
2. What exists that will benefit and move this change forward and what challenges remain? The current context at the southern campus of Aro Academy includes several physical STEAM spaces that truly illustrate the commitment of the school to STEAM as an embedded instructional strategy. How do we ensure these spaces are utilized to their fullest extent, with more than just one-off, single STEAM activities? Gallagher and Thordarson (2018) suggest that true integration doesn't happen until physical, financial and human commitments are made to truly

address the barriers to successful integration.

3. What kind of change management will be effective for our religious studies teachers to cooperate with our general studies teachers to implement STEAM learning across the school day? What case studies and discussions about a divided team could assist us in an effective implementation strategy? Organizational Design Change Strategy has several team-based procedures for conflict resolution and Hage and Finsterbusch (1989) note that positive relationships are essential to the success of any organization.
4. What kinds of human, physical, time, and financial resources will be required for this change to be embedded in practice? Suter et al. (2012) discuss change theories like Organizational Design Change Strategy as providing important answers to the issues of what resources are to be allocated before the change process begins. For changes to stick they argue there must be a “systemic theory driven approach to implementation” (Suter et al., 2012, p. 62).

Additional Challenges

Key to addressing the problem of practice, will be ensuring that embedded, deep learning in mathematics, the sciences and global competencies overall, will engage students and improve their overall omni-literacy across subjects and in competencies like teamwork, cooperation, organization, and time management. Omni-literacy refers to the concept of the educated citizen; where having general knowledge across several subjects contextualizes problems and allows students a depth of knowledge to draw from when solving cross-curricular, real-world problems. Aro Academy’s focus on learning spaces as the third teacher is in line with The Horizon Report (Freeman et al., 2017) which suggests

that:

as schools adopt more offerings that focus on increasing students' literacy in coding, and on informing them to be cognizant of how important learning in STEAM will be in their future, they also need to be aware of the trends that are leading to a growing focus on measuring learning in unique ways and a need for redesigning learning spaces to better engage students in creative and digital experiences. (p. 6)

As an organization that depends on stakeholder investment and interest, it will be important to explore how it will be made evident that this change is beneficial. Many of the Board of Directors have been pushing for STEAM-driven instruction for some time, feeling it is pivotal learning for their children. This is in line with research that suggests schools should be responsive to the "coming trends in technology for education with more efficiency and effectiveness" (Freeman et al., 2017, p. 6) which includes STEAM. However, outcomes of teacher efforts here will need to be included in an effective communication plan to ensure all stakeholders understand the importance and benefits of moving forward with this problem of practice.

In thinking about the challenges inherent in inclusive leadership, Bolman and Deal (2013) explore the effects of a lack of leadership transparency. Decisions must not even appear 'top down' when someone other than the 'leader' is going to implement the change. Building on the ways Aro Academy has started to embrace lateral and shared leadership, the success of this project will lie in its acceptance of school leaders of all varieties. Indeed, bringing together religious study and general study teachers and creating collaborative leadership from within both divisions will add a layer of

accountability and engagement. It will be essential to appeal to the religious studies teachers' sense of faith. Embedding new practice must not eliminate or weaken the application of faith-based content. Bolman and Deal (2006) explore leadership styles beyond the "caregiver and the analyst" (p. 3) and identify the wizard and warrior styles necessary to truly have a sense of the political and cultural aspects of the organization that influence decision making. They argue that, "leaders must have the ability to adapt to different situations, because an organization's challenges come mainly from inside rather than outside forces" (Bolman & Deal, 2006, p. 5).

Resources are a key concern of stakeholders. By addressing teacher concerns around resource management, it is expected that implementation should improve. By alleviating identified stressors to implementation, successes and challenges can be more reflectively addressed in the context of the content and instructional capacity of the teacher. Fullan (2013) outlines the ways teachers will disconnect from change if they feel there is a lack of support coupled with too much pressure.

Located in the guiding questions are several persistent challenges, however, more generally change challenges will also be change management and fatigue, resistant staff and staff in conflict, and identifying and mobilizing the most effective change tools for this group of teachers and for this context. Cawsey, Deszca, and Ingols (2016) concur, arguing that change leaders recognize the "impact and pervasiveness of organizational control systems...and they understand which tasks are key at *this* point in time given *this* environment and *this* organizational strategy (p. 30). Cawsey et al. (2016) further discuss organizational inertia that works against the pace of change and identify resistance as both, "a problem and an opportunity" (p. 30) noting that change resisters often have

unique or different perspectives about the proposed change that need to be acknowledged and resolved. Further advice suggests that there is an important balance between the process of change and the focus on results, and between tweaking small goals and staying the course for the long-term goal (Cawsey, Deszca & Ingols, 2016). These important reminders about the paradoxes involved in institutional change are illustrated in Figure 3.

In Figure 3, a change leader must balance many competing components of successful change and understand stakeholder positions to truly grapple with the complexity of change. Indeed, “when organizations enhance their effectiveness, they increase their ability to generate value for those they are designed to serve” (Cawsey et al., 2016, p. 31).

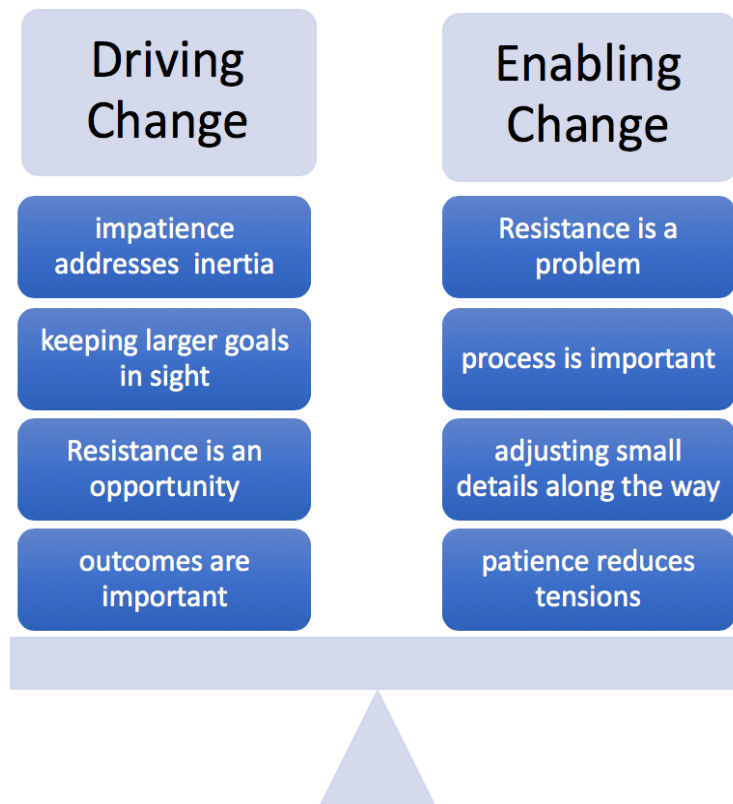


Figure 3. Change leader paradoxes as identified in and adapted from Cawsey et al. (2016) Shulman Kaye, 2020.

Leadership-Focused Vision for Change

Inclusive leadership styles will guide this change. Fullan (2013) states that leading change in complex and dynamic places like schools is largely about the clarity of focus and communication. He articulates the policy drivers that truly allow systems to change; for example, capacity building, teamwork, pedagogy, systemic policies, and “how to avoid the pitfalls of those policies that are easier to measure but destined to stall change (e.g., punitive accountability, individualistic solutions, technology and ad hoc policies)” (Fullan, 2013, p. vii).

The gap between the present and the envisioned state is partially sketched out with several structures that have been put in place and act as the foundation for STEAM integration into all classrooms. For example, the Maker Space, the Design Studio and professional development around the Launch Phase of iteration and design thinking are both visible and familiar to staff and students. Further instructional movement and embedding process will evolve in the solutions of practice and leadership moves.

Fullan and Sharratt (2012) discuss the importance of being focused in change. The STEAM focus will address all three of the organization’s goals for school improvement thus reducing additional system demands downloaded to teachers. As well, in order to focus “teachers need to combine technical expertise with a strong emotional connection to what they are looking at (in order) to make important things personally important to the individual on both cognitive and affective grounds” (Fullan & Sharratt, 2012, p. 1). The leadership consideration here is linking the importance of STEAM for all learners, including those who historically struggle or who are marginalized. By linking the STEAM pedagogy to the moral imperative of differentiating instruction to be considered inclusive educators, teachers are provided with an important and holistic reason for

change.

In conjunction with the knowledge about effective drivers and emotional connections in schools specifically, Nadler and Tushman's (1999) Congruence Model provides a model for gap analysis in the context of this OIP. The Congruence Model of Organizational Behaviour views an organization as an open system that is "driven by an articulated strategy (and) the more closely each component of the organization is aligned with the others and with the strategy, the more effective the overall performance" (p. 47). Nadler and Tushman (1999) suggest that effective organizations create both formal and informal structures addressing strategic directions from multiple angles. Using the Congruence Model alongside Fullan's (2012) effective drivers, and Fullan and Sharratt's (2013) attachment and focus advice, allows for these new perspectives from which to examine and engage in the problem of practice in order to analyse what is already being done and what is yet to be done in this change process. It is important to remember that any measurement or climate tool must be administered with the understanding that it is the culture that acts as the variable. Fullan (2013) discusses the capacity of a high-quality tool being limited by, or enhanced and embraced by, the culture and context in which it is used (p. 30). He adds that, "a tool is only as good as the mindset using it" (p. 30).

Priorities for Change

Working to balance stakeholder and organizational interests lie largely along fiscal lines, rather than theoretical conflict. Stakeholders, as previously identified, include the Board of Directors, students, staff, the larger religious organizations that provide peripheral and student funding, as well as existing and potential families, have all contributed to the overarching organizational improvement goals of student well-being,

omni-literacy and Maker Mindset. The priority of embedding STEAM must be balanced with the realities of declining enrollment and limited funding and yet, paradoxically, are urgently needed to ensure the organization pivots in such a way that it continues to be a pillar of the community for another hundred years. It will be important moving forward to ensure that the commitment to this change is focused. Fullan and Sharratt (2013) articulate the importance of focus as tough fiscal decisions are made about resources and ensuring that the focus is not distracted or redirected despite the many things that complicate the environment in a school.

Further than this, Nadler and Tushman (1999) discuss the successful organizations of the future and the role of innovation in those successes. They argue that innovation in “strategy development and organization design (are critical) and the ability to quickly and creatively develop and implement new strategies and the organization designs to make them work, will become a major source of competitive differentiation” (Nadler & Tushman, 1999, p. 52). This speaks to the importance of school structure and governance changing to meet the needs of learners in the future and being responsive to the need for “an unprecedented premium on knowledge workers, a new class of affluent, educated and mobile people who view themselves as free agents in a seller’s market” (Nadler & Tushman, 1999, p. 48). As institutions, we must take our lead from how we create and produce the educated citizen of the future. We do not yet know what jobs will be available in the future, but we have a sense of the global competencies and skills they will need to move forward. Freeman et al. (2016) identify STEAM education as a current and future hallmark of transformational education. They note that many models of STEAM learning promote character development including grit and design creativity. These

principles encourage learners to work hard towards their goals and bring their ideas to fruition...while businesses seek pipelines for highly skilled, global citizens” (Freeman et al., 2016, p. 10).

Design thinking is a key element of STEAM pedagogy and has been discussed in terms of shifting teaching strategies. However, Gallagher and Thordarson (2018) explore the idea of leading complex change using design thinking as a leadership move. They theorize that all meaningful change will come from new, more empathetic and engaged design-thinking inspired leadership that ‘bubbles up’ from the experience of teachers and empathy for the student experience, to create and iterate new possibilities for the future. By thinking of students, parents and teachers as “end users” of the pedagogy of the school, “developing a keen empathy for their experience is likely to produce new insights about the nature of the change required and the urgency of such change” (Gallagher & Thordarson, 2018, p. 30). For example, Gallagher and Thordarson (2018) suggest several strategies for developing a new insight and stepping back from personal perspective in order to see something from the perspective of the end user. Included in these strategies are shadowing a variety of end users for a full day, especially students, interviewing for empathy, active listening and vulnerability. One example illustrates a principal seeing the day students and parents receive their teachers and timetables in a new way. By sitting away from the school in her car, she was able to see students and parents seem happy with their friends and timetables, but some walk away with tears and anger that she had not seen before. It prompted a whole new look at ways this process can be less painful, and more family driven. They go on to say that the most important part of leadership by design thinking is to build empathy by honing “your powers of observation and

cultivat(ing) the ability to see what others overlook” (Gallagher & Thordarson, 2018, p. 23).

The priority for change in this case is to use the very strategy of design thinking in the problem of practice to leverage change for students through teachers changing their instructional focus to STEAM. Design Thinking is a key aspect of STEAM pedagogy and by utilizing the same thinking for change readiness and improved engagement and buy-in, teachers experience its benefits first-hand. While this seems recursive, what better way to demonstrate the power of this kind of thinking on overall change? The beauty of iteration in change management is the messiness of the process; allowing thinking and possibilities to be boundless. The concept of thinking beyond one perspective to address difficult problems and the articulation of all possibilities from within an environment of trust will be key to developing a leadership strategy based on design thinking.

The key question underlying the problem of practice must be: How might we (the organization) use time and resources differently to better meet the needs of the students? (Gallagher & Thordarson, 2018) This leads naturally into a discussion about change readiness.

Organizational Change Readiness

Cawsey, Deszca and Ingols (2016) discuss the characteristics of an organization that is ready for change. This includes the flexibility and adaptability of the culture, the engagement and involvement of leadership in change, how members feel about leadership and the experience members may have had with change in this organization and beyond. At Aro Academy, leadership is fully engaged in promoting change and instructional risk-taking, but despite two years creating an environment and building trust that supports that

instructional change, there are still significant barriers to true implementation and engagement. This appears to be a launch issue, meaning staff are willing to try activities and enjoy them, but truly making STEAM learning their own and embedding it in their long-term planning as a key element of curriculum delivery, remains largely elusive.

There are several potential reasons for this, suggested here:

- Failure on the part of leadership to clearly articulate the gap between the current state of the organization versus the goal state/vision for the organization;
- Teachers are still grappling with the work involved in this type of change and/or do not feel they have the capacity to do it;
- Teachers are unsure if they think this is the right direction for the organization;
- Teachers feel they will not be able to teach and assess in a way that is comfortable for them;
- The divide between the general and religious studies teachers are standing in the way of true implementation on either side.

Cawsey et al. (2016) argue that if the ‘why change’ question is a “precondition to being able to define the desired future state or the vision,” (p. 105) like Lewin’s stage theory of change, there must be an “unfreezing” with the status quo. Part of this, according to Cawsey et al. (2016) is the creation of a dissatisfaction of the status quo amongst those who must change their behaviours and actions. Indeed, the “what’s in it for me/us” question must be addressed to ensure change readiness (Cawsey et al., 2016, p. 107).

The important piece here is that this STEAM shift is supported pedagogically by research, school and executive leadership (i.e., Board of Directors, parents) and by the on-site teacher-leaders and administrators. What may need to happen to encourage change

readiness is ensuring that the benefits of this change for all stakeholders has been clearly communicated (Carter, Armenakis, Feild & Mossholder, 2013).

Beyond Armenakis' (cited in Cawsey et al., 2016) factors for readying an organization for change; including, the need for change identified in terms of a gap between the current and desired state, people believe in the change, members believe they can accomplish the change, key individuals in the organization support the change, and the 'why should we' question has been asked, Cawsey et al. (2016) provide a rating survey to predict an organization's readiness for change. Dimensions of readiness in this survey include previous change experience, executive support, credible leadership and change champions, openness to change, rewards for change and measures for change and accountability. This tool would be very useful at Aro Academy to provide some data on where the implementation issues truly exist.

Cawsey et. al. (2016) illuminate why some change strategies work at one time but will not work again into the future. The 'failure of success' is an interesting phenomenon that capitalizes on the establishment of the retention of old patterns of behaviour and resistance to evidence that new change is needed. It seems to be a self-fulfilling prophecy as organizations meet successful change once, it becomes hard to embrace that method of success for a different goal.

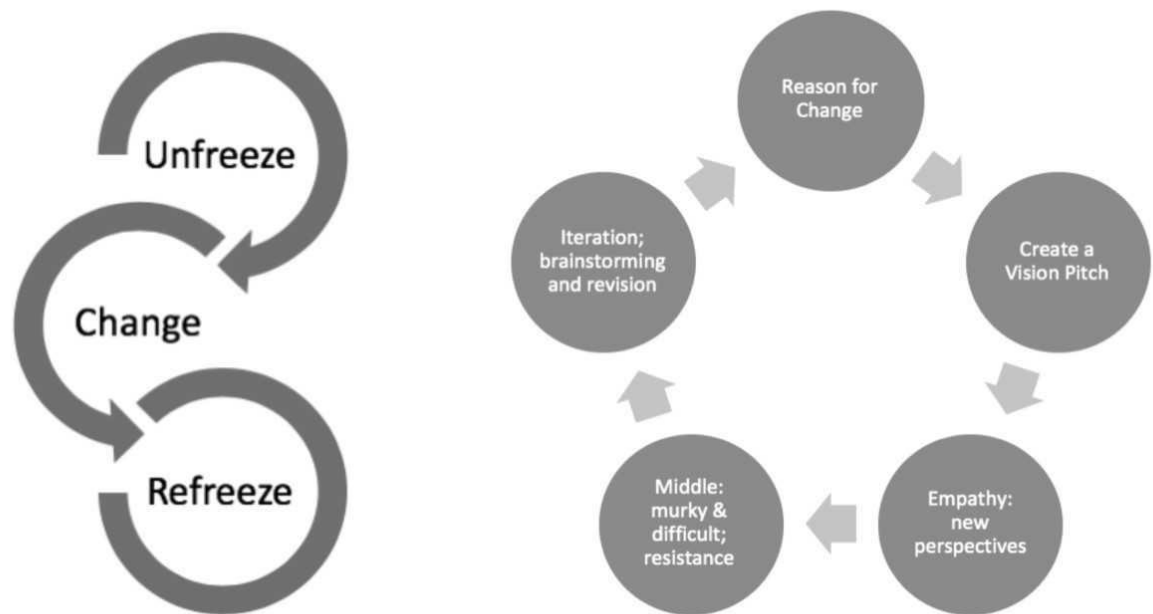


Figure 4. Adapted from Lewin's Stage Theory of Change (Cawsey et al., 2016, p. 45) and from Design Thinking for School Leaders (Gallagher & Thordarson, 2018, p. 156). Shulman Kaye, 2020)

This articulates why it may be important to engage Design Thinking as a leadership framework for moving forward and for promoting change readiness at Aro Academy. Indeed, models such as Lewin's Stage Theory of Change (Cawsey et al., 2016) is a simplified version of the design model; Unfreeze, Change, Refreeze and seems very simplistic but several things happen at each stage that mirror those changes outlined in design thinking. Lewin's model is illustrated alongside the design thinking framework from Gallagher and Thordarson (2018) in Figure 4.

To see these two models side-by-side, it is easy to see the connections. In Lewin's 'unfreeze' stage, something happens to demand a new look at current practice (Cawsey et al., 2016). At Aro Academy, the 'unfreeze' is the ongoing issue of enrollment decline and parent pressure to teach in a more holistic way. In Design Thinking, the reason for change

is similar and suggests a problem of practice that has an urgent need for the organization attached to it. In the case of Aro Academy, the urgent need is an instructional shift to 21st Century learning that will benefit students and keep the Academy on the cusp of new and exciting, innovative teaching practice.

As well, embedded in Lewin's 'unfreeze' is the ability of the leader to articulate why the change is important. This is covered in the "create a pitch" portion of the design thinking process. Articulating why change is necessary is important for engaging stakeholders at all. However, in design thinking, it's important that the process includes lateral involvement in the understanding of the problem through empathy building, perspective taking and vulnerable brainstorming (Gallagher & Thordarson, 2018). These models work together with only one key difference; In Lewin's model, the re-freeze suggests change is done. In Design Thinking, successes are celebrated and then continually revisited to make ongoing changes in order to stay current. It is more reflective of a school environment that needs to continually move practice forward to stay relevant for students and families.

Organizational readiness at Aro Academy is ongoing and inconsistent and reflects the complexity of the change process overall. With two years striving to embed STEAM, many are ready to do the work but feel they need more direction, support and colleague buy-in. A new strategy for change management is needed at this time that will help move teachers towards that readiness. Fullan and Sharratt (2012) have noted the importance of a moral imperative for teacher change involvement that goes beyond test scores or ongoing school reform initiatives and includes issues of equity and inclusivity of ethical practice. Design Thinking is a recursive way to address this problem of practice, as its framework

lies in the desired change, but incorporates many traditional models of change, with added elements of iteration and empathy that provide traction to answer the question of ‘why’ this work is necessary from both a personal and professional standpoint.

The Horizon Report focuses in on global trends in educational technology that are set to impact teaching and learning over five years (Freeman et al., 2017). Two of these are two important drivers for change: Authentic learning is good practice and Inter- and multidisciplinary learning breaks down silos. Indeed, with respect to this OIP, the report assures us that this direction is aligned with global trends. STEAM learning provides “hands on experiences (that) enable students to learn by doing (and) cultivate self-awareness and self-reliance...makerspace is a vehicle to stimulate these immersive opportunities” (Freeman et al., 2016, p. 4). STEAM also makes “clear connections between subjects like science and humanities, and engineering and art, demonstrating to students that a well-rounded perspective and skill set are vital to real-world success” (Freeman et al., 2016, p. 4).

Conclusion

The educational, social, and political context of improving educational outcomes for students is not just essential for a private school like Aro Academy to stay viable into the next century, it is also an educator’s moral imperative to prepare students for the future. Indeed, in terms of STEAM learning this includes literacy in all the subjects but more than that, provides a way to develop and assess learning skills for global competencies. These are what will make students ready to be global citizens.

The local context in which this OIP is necessary exists in this larger framework, presenting an urgency of action. The issue of embedding STEAM has become a problem

of practice as implementation and engagement has been difficult to take root in teaching staff. Despite positivity for the concept of STEAM, staff have balked at changing practice beyond some single-event programming with concerns about workload and curriculum coverage.

Moving into Chapter 2 and beyond, it is understood that this shift will not happen without careful and purposeful change management. Change is difficult and this has been evident here at the school as we have stalled implementation over two years now. Change management then becomes a focus for it is not only managing resistant staff or communicating enough. It is something that needs careful planning, shared leadership for buy-in, and continued resilience through implementation dips and other issues as they arrive. Moving forward it will be building relationships, having challenging conversations, interrupting current practice and creating a space where there is safety, and results, through change.

Chapter 2: Planning and Development

Chapter 1 introduced the Aro Academy group of faith-based schools and described a problem of practice that involves the embedding of significant instructional change to embrace STEAM learning. In this chapter, a plan for improvement through specific leadership models and a conceptual framework, in concert with the unique context of Aro Academy, emerges. Using transformational leadership strategies and incremental moves to engage in change, exploring a logic model when asking ‘what do we do’, and ultimately the principles of Design Thinking are leveraged to inform the approaches for implementing a solution to this problem of practice. The ethical challenges inherent in change including girls in STEM, social justice and design thinking,

and the complexities of religion and inclusion, will also be explored. The chapter will conclude with an analysis of a variety of leadership approaches for implementing change considering the specific challenges inherent in Aro Academy's problem of practice.

Leadership Approaches to Change

In Fullan's (2013) *Motion Leadership*, he borrowed a concept called 'simplexity' (p. vii). From a leadership perspective, this means that there are simple things that a leader needs to know and understand to be a leader and more complex ones. The simple parts are things like the goals of the organization, historical information, context specific information about the organization, etc. The complex part is the relationship and team building needed to ensure that the desired change has the support and passion behind it to move forward (Fullan, 2013). Part of simplexity is planned accountability that is supportive and reciprocal. In one case study, Fullan (2013) talks about the significant amount of work any change process requires and that "leaders know that you can never take the process for granted. It requires constant attention and cultivation" (p. 23). The leader has an "obligation to build the capacity in an individual to meet the expectation" (Fullan, 2013, p. 23) of the change. This is like the Aro Academy promise to its teachers; to provide ongoing, high quality, professional development, support and resources to incorporate STEAM successfully into their practice.

Since the mid 1980s, there has been a large volume of educational leadership research, creating what Stewart (2006) says is a field that is "unfocused and without a guiding purpose [leaving] scholars and practitioners searching to make sense of the field within a rapidly changing and diverse world" (p. 3). For the purpose of this OIP, there is an acknowledgement that the concept of leadership itself is "multidimensional and

complex” (Stewart, 2006, p. 4). Part of sorting through the types of leadership required for this large instructional and organizational change, will be understanding that there should be a focus on lateral leadership and meaningful change moves to encourage progress. Despite this, the mid 1980s were coined “the excellence movement” (Stewart, 2006, p. 7) because accountability for student outcomes became more school-focused and by extension, leadership focused. Instructional leadership and transformational leadership competed for relevance in the educational sphere, with transformational leadership representing shared leadership, teacher leadership, distributed leadership and having an overall goal of improving student achievement (Stewart, 2006).

Fullan’s ‘push, pull, nudge’ strategy for change moves, echoes incremental change theory, also at the heart of this OIP (Fullan, 2013). Fullan (2013) explains that ‘push’ is an action wherein a leader sets high expectation and articulates a refusal to compromise on those high standards. In the case of Aro Academy, this will be a discussion around the importance of STEAM learning to address 21st Century skills and solve real-life problems using an integrated model. Communication must focus on the need to evolve as educators to better serve our students into the future. Wright (2004, cited in Stewart, 2006) asserts that “we have progressed so rapidly as a society that the skills and customs we learned as children are outdated by the time we are thirty. In a sense, we struggle to keep up with our own culture” (p. 2).

“Pull” is the action that involves using leadership strategies to bring people along. Building relationships and ensuring that educators get access to significant support to be able to take on a change of practice. At Aro Academy an example of ‘pull’ could be the

purposeful hiring of new leaders that can take on the curricular and instructional leadership required to model STEAM learning.

“Nudge” is the action to use in order to avoid resistance (Fullan, 2013). An example would be modelling instructional strategies that are high yield and engaging that results in a teacher deciding to change his or her practice to emulate those actions. It can also be the presentation of data that illustrates a failed or a winning strategy. In our STEAM goal, it would be the careful modelling of small steps a teacher can take to move towards some aspect of STEAM integration that is difficult for them.

Fullan (2013) suggests that motion leaders understand that the ‘push, pull, nudge’ strategy is a pathway to success but that the amount of each action will be specific to the context. Fullan (2013) adds, “the point is not to choose among the three forces, but to value their synergy. The savvy is to learn what combinations are best used in different situations” (p. 15). Boyle and Humphreys (2012, cited in Fullan, 2013) identify this as

“the symbiotic relationship between challenge and support which, in turn, drives systemic improvement” (p. 18).

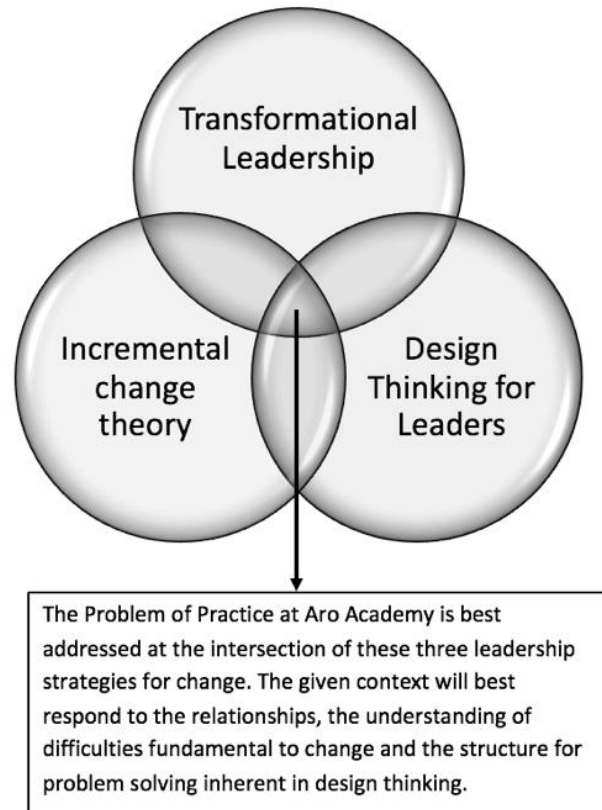


Figure 5. Leadership strategies, theories and pathways to address the problem of practice at Aro Academy. Intersection of selected leadership theories. Shulman Kaye (2019).

By exploring transformational leadership, incremental change theory and Design Thinking for leaders, we can see an intersection of qualities that speak to the specific context at Aro Academy (See Figure 5).

Transformational Leadership. True to its name, Transformational Leadership has undergone many evolutions in its definition and role as an educational leadership paradigm. Stewart (2006) outlines the myriad perspectives concerning this type of leadership, noting Wright’s work (2004, cited in Stewart, 2006) that argues the “roles of

both leaders and followers have become more complex and elaborate and multiple perspectives exist on how leadership is conceptualized” (p. 2).

Later in the 1990s, Hallinger (2003, cited in Stewart, 2006) noted that the concept of transformational leadership became more “consistent with evolving trends in educational reform such as empowerment, shared leadership, and organizational learning” (p. 8). Transformational Leadership as outlined by Leithwood, encourages lateral leadership and focuses on the team of change agents that will move a problem forward. Figure 5 illustrates the intersection of transformational leadership, incremental change theory and design thinking for leaders. It is that core middle intersection where the three concepts merge, that real change at Aro Academy is facilitated.

Incremental Change theory. Gallagher and Thordarson (2018) discuss leaders that try and use change methods from one context and apply it to the next, and the failure of results to scale in other contexts and locations. They worry that if change is too incremental, it will not mean very much as it will become obsolete and irrelevant over time. Indeed, “for years we have been improving and changing educational systems and yet, in many ways, they remain largely the same” (Gallagher & Thordarson, 2018, p. 89).

Design Thinking for Leaders. Design thinking is a strategy for leadership that depends heavily upon relationships, mindsets and the principles of design. Gallagher and Thordarson (2018) identify the leader-educators who are “opportunity seekers, experience architects, rule breakers, producers and storytellers” (p. 19). They believe that opportunity seekers are those leaders that look for problems to solve. Seth Godin (cited in Gallagher and Thordarson, 2018) said that being innovative requires you to be “wrong until you are right.” This is the grit and the mindset that makes a leader focused.

An Experience Architect is a leader that thinks about creating experiences that the end user will enjoy so much that they want to have more experiences like the one provided (Gallagher & Thordarson, 2018). In the case of STEAM learning, a truly integrated inquiry unit can spark imaginations and engage students so deeply in their project- and passion-based learning that students will seek out other opportunities like it. From the standpoint of the teacher, the deep student engagement and new role as facilitator rather than lecturer, can be so meaningful and create positive relationships in the class, making teachers want to replace their old instructional practice with new.

A rule breaker challenges the way things are. They look at systemic structures and work to dismantle them for the greater good. In a smaller focus, the rule breaker works hard to change habits that don't align with the desired change. Gallagher and Thordarson (2018) state that "breaking rules with intention is really a mindset of thoughtfully challenging the way we always do things" (p. 91).

The producer gets things done by finding gaps and filling them, creating the conditions for change (Gallagher & Thordarson, 2013) and Storytellers redesign the narrative around the organization to support the desired change. Authenticity is key in design thinking for leadership.

Through design thinking, incremental leadership and transformational leadership, there is space to set goals, create a meaningful pathway to change, iterate, build relationships, and use push, pull, nudge to encourage incremental moves. Having schools that engage positive, working teams, a positive school culture, context-driven professional development and the creation of a risk-taking structure that 'breaks rules' in the best interest of students, mobilize these three theories of change.

Framework for Leading the Change Process

Since Aro Academy has no native policy in place for implementing STEAM education, it is possible to seek guidance from John Kotter's Eight Stage Process to provide a framework for implementing change (Cawsey et. al., 2016). Pollack and Pollack (2014) note some academic criticism of Kotter's process. There have been only a handful of research studies outlining his process in practice, and his eight stages are descriptive of what must be done, but lacking detail about how it must be done (Pollack & Pollack, 2016; Hughes, 2016). Criticisms also include the suggestion that Kotter's steps are too linear, focused mainly on the leader, and top-down in their implementation (Pollack & Pollack, 2014). Hughes (2016) notes that Kotter's publications are inexplicably cited and circulated in academic circles despite being "a-theoretical" (p. 450). He goes on to wonder if it is the "halo effect of Kotter's employment at Harvard Business school" (Hughes, 2016, p. 450) that lends legitimacy to a book not based on research of others. While Hughes (2016) is critical of the Eight Stage Process, he does acknowledge that the recent update of the process by Kotter, the newly coined "eight accelerators" (Hughes, 2016, p. 453) could be independent strands in a process, operating at different speeds for different groups. It is important to note that there are a handful of studies that utilize Kotter's Eight Stage Step to manage their organizational change (Pollack & Pollack, 2014). Appelbaum, Habashy, Malo and Hisham (2012) applied a literature review for each of Kotter's Eight Stages, finding academic support for his steps and stated that the popularity of the process may, in part, be in its usability. They argue that further research studies may assist in the future with determining greater connections between research and practice.

Kotter's change process is one of the most "widely recognised models for change management" (Potter & Potter, 2014, p. 51). In selecting this model, it is noted that implementation is contextual and does not follow directly from one step to the next but more of a flowing process that sometimes returns to a prior step and that groups may work at entirely different paces. Appelbaum et al., (2012) agree that in addition to the traditional eight stages "complementary tools should also be used during implementation process to adapt to contextual factors or obstacles" (p. 764). For this OIP, incremental change and design thinking models will temper any rigidity in the Kotter model. As well, Appelbaum et al., (2012) state that Kotter's model is "most useful as an implementation planning tool" (p. 764). Potter and Potter's (2014) research found that some criticism of Kotter centred on his silence about the complexities of a real-world change process. However, the process itself was "found to be an effective way of managing the change, although some adaptation was required to suit the process to the needs of the organization" (Potter & Potter, 2014, p. 63). Perhaps the simplicity of the steps articulates a framework that will be open to that kind of contextual flexibility especially with the addition of the Organizational Design Change Strategy questions frame to make explicit all aspects of the change process and the needs of the organization to accomplish it.

Kotter's eight stages and contextual notes follow:

Establish a sense of urgency. For the past few years, many positive changes have occurred to suggest a sense of urgency around STEAM. Communicating to all stakeholders, particularly teachers, parents, and the Board, the need for greater STEAM integration in the school has been pivotal. Utilizing data to indicate an urgent need is compelling and somewhat impersonal, thus less threatening. For example, in our STEAM

example, using the data of Aro Academy's recent decline in enrollment and subsequent closure of one campus to illustrate the urgency for change is quite compelling. Cawsey et al. (2016) state that to understand organizational change impact "depends on our ability to measure change and this sets the stage for future change initiatives" (p. 55). In the past year or two, communication of these details has not been a part of a larger discussion with all staff at Aro Academy, however, transparency and honesty are key to developing trust and engagement. Cawsey et al. (2016) note that leaders create a "compelling vision of the change and what it will look like after it is implemented" (p. 98) and this creates a momentum to the plan of action.

Fullan (2013) argues that leaders have responsibility even beyond the moral imperative of educators; a responsibility that is pressed for time. He states that with leaders at the centre of improvement, those "who develop themselves as they develop others...have a special, timely responsibility...with increased boredom of students and alienation of teachers" (Fullan, 2013, p. 109) impacting education. It is important that there be a transformation in the traditional setting of school.

Create a Guiding Coalition. A team of teacher-leaders who have the enthusiasm, knowledge, and motivation to drive STEAM education in their classes will be provided the time and development to implement STEAM alongside their more reluctant counterparts. STEAM Teams of parents, staff, Board members, and students, respectively, will be formed to plan and develop, provide feedback and impressions of Aro Academy's STEAM integration efforts. Further to the sense of urgency above, the coalition will have a specific set of understandings about the importance of STEAM learning, not just in school, but beyond as global citizens.

Reinking and Martin (2018) state that since the 1990s, females have “lost interest [in STEM related careers] at a higher rate [than their male counterparts] and do not pursue advanced courses, majors and careers in STEM” (p. 148). In higher education, 41% of college male freshman indicated they would major in one of the STEM fields, where only 30% of women felt the same. And while this statistic is imbalanced, the resulting career outcomes are even more so with “the society of women engineers stating that “approximately 20% of new engineers were women compared with about 80% of men” (p. 148). These kinds of statistics will be important as they set the tone for the moral imperative of improving instructional strategies to benefit students.

Develop a Vision and Strategy. The vision would be the seamless integration of STEAM by all teachers in all classrooms in the school. Embedding this learning across grades and traditional timetabling will require a curriculum support document cocreated by all stakeholders. The strategy for achieving this vision, is embedded in the merging of principles of transformative leadership, design thinking and incremental leadership. Strategies will continue to be refined to ensure optimal results.

Communicate the change vision. The school community will come together with a panel discussion about the “why” of STEAM, and to use this event as an opportunity to share the “how” of the plan and vision for STEAM integration with the wider community. Marketing and information sharing through social media, Board Meetings and parent communications will be areas of focus.

Empower employees for broad-based action. The team of teacher-leaders will work on capacity-building among the staff. This can include teacher-leaders team-teaching STEAM lessons which will then be re-taught by a teacher with less STEAM

expertise, as well as providing professional development for all staff, both in-house and at external workshops. By capitalizing on teacher enthusiasm, regardless of skill level, it will be possible to provide the necessary supports for teachers excited about STEAM to implement their activities and to share their enthusiasm with their colleagues.

Generate short-term wins. In keeping with the model of incremental change, STEAM education has been a slower implementation than hoped. Initially in small stages, STEAM was a variety of pilot projects. These pilot projects will be discussed at monthly staff meetings and will serve as proof of concept on a larger scale to motivate and encourage staff regarding the doability of STEAM integration. The linking of STEAM to the larger School Improvement Plan will reassure teachers that they are meeting expectations in this area as well and that STEAM is not a fad but rather embedded into the fabric of the school and essential for improvement.

Consolidate gains and produce more change. By discussing the successes and difficulties of our pilot projects at our monthly staff meetings, we open dialogue about the challenges and benefits of the change process. We can troubleshoot and pivot as needed, and then take those pilot projects as templates for implementing the relevant programming on a larger scale throughout the school. The development of an explicit curriculum showing connections, timelines, grade-level expectations and assessments will be a policy to implement and illustrate the importance of STEAM education in this school's context.

Anchor New Approaches in the Culture. As a result of capacity-building efforts, teacher culture will shift to see STEAM as a relevant and necessary part of teachers' classroom life. By providing teachers with the resources, confidence, and

encouraging environment to devise and execute their own STEAM initiatives, school-based transformation and ultimately student achievement and engagement will improve. Gallagher and Thordarson (2018) argue that in order to translate change movement into the culture of the school, there must be an assembly of the story. By this, they mean a story of need that is statistical and needs-driven, easy to understand, and mobilizes commitment to the desired change. Todd Rose (cited in Gallagher & Thordarson, 2018) argues that an “important leverage point for transforming our education system is changing the mindset that gave rise to it in the first place” (p. 154). A big part of this is doing things differently in the way we communicate with all stakeholders about why we need to change, how we will change and establishing a new perspective on old problems.

Critical Organizational Analysis

In Chapter 1, through an exploration of the problem of practice through the mission, values, and purpose of Aro Academy, there emerged additional goal statements that circle around the central problem of practice and incorporate many of the principles of leadership discussed above. Beyond the fact that there is too little evidence of the integration of STEAM into classroom instructional practice, there are these emergent statements that identify gaps in the organizational readiness and link these key observations to the problem of practice. These are listed below to analyze needed changes and to capture the specific context for leading the process of organizational change in relation to the PoP. Ultimately, a change path model emerges.

Statement 1. STEAM is the vehicle through which Aro Academy might bridge the gap between the two teachers’ groups and move instruction forward for students in both halves of the day. The religious studies teachers and the general studies teachers are

governed under two separate collective agreements and the programs currently run parallel to each other with very little or no connection between the two. Students at Aro Academy have general studies in one half of their day with a given teacher and another teacher will have them in the other half of the day for their Language, culture and religious instruction. The general studies teachers are expected to teach the Ministry Expectations in half a day of learning, so this leaves them quite motivated to explore the idea of integrated curriculum, especially as it relates to curriculum coverage given their short timelines and hundreds of expectations in each school subject. The religious studies teachers are less impacted as their curriculum is based on their half day program and involves a lot of flexibility in terms of coverage and topic. They demonstrate limited interest in instructional improvement and do not often reach out for joint professional development, even though it is offered. This is not to say they are poor teachers. On the contrary, they care about students and provide what they believe to be a program that is deeply rooted in faith. However, there needs to be some leadership work that allows them to see that there is some room for change. Cawsey et al. (2016) talk about creating a heightened awareness of the need for change, which is an important step, particularly for the religious studies teachers who are not as far along that continuum of realization as the general studies teachers are. One positive outcome of this problem of practice could be a merger between the two classroom teachers to engage in a larger STEAM investigation that incorporates expectations from both religious and general studies.

Statement 2. STEAM will be a driver for design thinking and 21st Century skills across both campuses and both teaching streams. Further to the goal above, this instructional goal will act as a driver for change. It is not hard to see how useful

transformational change moves will be in this endeavor. Galli and Suteu (2013) discuss the use of design thinking as a disruptive discourse to create change through conflict. That conflict will be used to understand the root of the divisions between the teaching streams and the resistance of staff to this important evolutionary instructional change. Galli and Suteu (2013) propose that “rather than levelling the differences, through mitigation, the conflictual moment has to be exploited as an important step in the working process” (p. 142). Often people avoid conflict but Galli and Suteu (2013) feel that in this context, conflict is a difficult but necessary step in true change. It is likened to an artist’s relationship to his or her craft where there is a moment of conflict before it becomes a masterpiece (Galli & Suteu, 2013). They argue embracing change conflict is an integral part of design thinking and change management.

Statement 3. The mission of Aro Academy is to provide students what they require to be successful global citizens and if we consider preparing students to develop these qualities, they will have opportunities to thrive in secondary schools that embrace a similar philosophy.

The data here will be clear and particularly helpful in identifying the need for change. Reinking and Martin (2018) argue that the way gender stereotypes are changed over time, is through experiences. Teachers can provide experiences that offset the traditional experience of STEM subjects in schools. Indeed, teachers “of young students can also encourage, incorporate, and expose girls to STEM topics. Teachers can provide experiences, expose children to female STEM role models and create hands-on, safe environments for exploration and combat societal gendered stereotypes” (Reinking & Martin, 2018, p. 151). Beginning to gather, as an organization, data around student

success in secondary school in the STEM subjects will be a good indicator of the success of our elementary STEAM programs. Other essential data will be parent and student feedback, teacher satisfaction and engagement, and report card data in these subjects, particularly with girls.

Statement 4. The SIP goals include fostering a culture of care and well-being, promoting excellence in all subjects so students can achieve their personal best, and developing a maker mindset in students through cultivating 21st Century skills. Gallagher and Thordarson (2018) quote Tony Wagner, a Harvard professor as saying that “the culture of school is radically at odds with the culture of learning necessary for innovation” (p. 66). The school culture must adjust to truly engage all stakeholders and there needs to be a new sense on what that looks like, and leaders need to have a creative rather than compliant standpoint. Gallagher and Thordarson (2018) encourage leaders to reflect on the type of culture they are cultivating, suggesting they, “encourage and reward creative thinking and collaboration while also recognizing both formal and subtle ways those things are discouraged” (p. 66).

As a major goal of our SIP and STEAM integration plan, mindset is said to begin in leadership and then “permeate every level of the organization” (Gallagher & Thordarson, 2016, p. 66). Beyond moral imperatives for educators, creating a safe, listening, informed school culture through incremental moves that involve listening, risk taking, informing and being informed, and ongoing support of lateral leadership and new ideas, is essential in change path development and implementation.

Statement 5. The thematic focus this year is Innovating Tradition through a deep love and respect for the cultural learning the students benefit from and an understanding

that to have deep learning that responds to the needs of students today and the future, instructional excellence must be at the forefront of the curricula. Armenakis (cited in Cawsey et. al., 2016) identified several factors for readying an organization for change. This includes “the need for change is identified in terms of the gap between the current state and the desired state” (p. 107). It is evident to our stakeholders that our school has been successful in the community for so long because of its commitment to tradition, a caring and engaged staff, and school leaders that care. However, with a closed school site amid declining enrollment, change must be embraced in order to stay relevant into the future. Here in the mobilization of a change pathway, communication of the need for change is essential. Cawsey et al. (2016) suggest that managing the stakeholders, change participants and recipients, and helping to move the change forward through appropriate reaction to their feedback, is essential. They add that it is important to “leverage change agent personality, knowledge, skills and abilities and related assets for the benefit of the change vision and its implementation” (Cawsey et al, 2016, p. 98).

Statement 6. The OIP seeks to further improve teacher efficacy by engaging teachers directly in the change process, building positive professional relationships and following through with a sense of urgency around improving practice.

Statement 7. Find ways to engage students and ensure parents and potential parents know that Aro Academy is at the forefront of instructional excellence.

Statement 8. How do we make an organizational shift to manage and produce STEAM learning as a key instructional strategy in every classroom?

Statement 9. STEAM is an organizing principle for teaching integrated subjects for the larger purpose of collaboration, teamwork and problem solving. It provides a conceptual framework for our problem of practice.

Statement 10. When we consider the workplace into which the students will be graduating it becomes clear that the costs involved in increasing STEAM integration are necessary in order to provide our graduates with the skills to be competitive in the 21st Century workplace. Shifting hiring practices to reflect a preference for candidates proficient in STEAM, will support this goal and build staff capacity overall.

Statement 11. Transformational Leadership that embeds design thinking and incremental change model, is appropriate because Aro Academy is looking to improve student outcomes at school and beyond. In a change path model this falls under the institutionalization of a change to help “assess what is needed, gauge progress toward the goal and to make modifications as needed and mitigate risk” (Cawsey et al., 2016, p. 98). Tracking success data, both climate-based and academic will help to stabilize the change and incorporate it into the fabric of the school through both the creation of a curriculum document and a mobilized staff.

A review of these emergent statements demonstrates a pathway that can be linked to the change path model (Cawsey et al., 2016), with each statement linking to one of the four pathways of Awakening, Mobilization, Acceleration and Institutionalization. The statements are organized below in Table 3. While some statements can exist across the continuum, the emphasis is on awakening and using a variety of angles from which to develop a sense of urgency around the need for change.

Change will be both structured and messy. Using push, pull, nudge as part of a transformational leadership move with incremental change theory tempering larger more alienating moves, these guiding statements will work to inform staff of the urgency of change and set the stage for mobilizing and iterating until this integrated instruction is truly part of our school culture.

Table 3

Change Path Model and Guiding Statements

Awakening	Mobilization	Acceleration	Institutionalization
Statement 1	Statement 2	Statement 8	Statement 3
Statement 5	Statement 9	Statement 11	Statement 4
Statement 6			Statement 8
Statement 7			
Statement 10			

Note. This figure organizes the guiding statements generated in Chapter 1 of the OIP Adapted from Cawsey et al. (2016) Change Path Model.

Possible solutions to address the problem of practice.

Schein (1985) suggested that “culture constrains strategy” (p. 33). This is echoed by Fullan (2013) when he states that a strategy is only as good as the person using it. Indeed, any kind of organizational change with carefully planned leadership and conceptual frameworks, is impacted by the culture of an organization. This is why understanding an organizations’ readiness for change is so essential. Schein (1985) suggests that an organization must, “analyze its culture and learn to manage within its boundaries or, if necessary, change it” (p. 34).

This chapter explores some of the many elements of the change requirements for this problem of practice, and considers resource needs, possible solutions and leadership styles. Through a comparison of options for theoretical frameworks and solution models, it is important to determine the framework that is most responsive to the specific context of this school. An exploration of several frameworks and strategies has provided several possible ways forward at Aro Academy.

McLaughlin and Jordan (1999) bring to light the Logic Model, a tool designed for managers to “tell their performance story” (p. 65). It is a way to illuminate the many ways a suggested change or program can be executed, the people affected, the resources needed and the desired outcomes. Before selecting leadership styles and change plans, the Logic Model can articulate the appropriate styles and plans for the situational context. By utilizing a Logic Model Framework, it is possible to answer the questions: What needs to change? How might the stakeholders, goals, priorities and practices be impacted by the desired change and outcome? It also helps to outline resource needs, including fiscal, human, resources, and time. Indeed, at Aro Academy, one thing we are grappling with as a new element of practice is managing improvement through data collection, analysis and ultimately leverage.

The Logic Model will illuminate what kind of data will demonstrate improvements and areas for growth. It is important to also answer the question: what do we measure to best understand the impact of STEAM learning on student achievement and school culture? One of the most important parts of the Logic Model is that it is a way for administration to make “implicit understandings explicit...(that) address...both outcome measurement and improvement measurement” (McLaughlin & Jordan, 1999, p.

65). Selecting hybrid solutions for different phases of change management allows for a contextual solution for our unique school issues.

First, Organizational Design Change Strategy is an excellent way to determine change readiness, the resources required and change points along the way. More succinct, however, and exploring many of the same questions, the Logic Model (McLaughlin & Jordan, 1999) provides an updated framework that covers many of the same questions. Moving forward, the Logic Model shown in Appendix A, provides a visual starting point and flexible roadmap forward while incorporating questions from the Organizational Design Change Strategy.

Secondly, looking at flexible and adaptive leadership compared to a transformational leadership lens. The transformational lens incorporates many of the aspects of the other two combined. Ultimately, change in the context of Aro Academy settles on transformational leadership with incremental change management model.

The Kotter Eight Stage Model assists in understanding the elements of change, but his freeze-unfreeze-refreeze model feels limited and requires a lot of filling in contextual details. However, the Design Thinking for Leaders PDSA cycle provides a detailed look at the complexities of change and reflects directly the desired outcome of flexibility, the ability to be resilient and iterative, and to focus on lateral leadership.

Looking at the logic model (see Appendix A) it is evident that action items involve both specific in-school activities like creating STEAM teams, but also important consultation with, and support from, stakeholders. For example, the Board of Directors is the important contact stakeholder for resource acquisition. Across the bottom, it is easy to see the many potentially competing interests with the variety of stakeholders. The next

section explores data collection that is going to inform the action items moving forward. These data include anecdotal information, survey data, report card data, standardized testing data and data collected from students.

What to change is the focus of a Logic Model analysis and it is a useful way to look explicitly at how the organization functions and the related parts that affect it. In this case, changing the policy through creation of a curriculum document, and embedding STEAM into practice will involve a concerted team effort. The result will be a formal policy and curricular pathway from grades 1-5 at Aro Academy, thus embedding practice into the fabric of the school. Many stakeholders will have to engage with this process for it to be successful.

Cawsey et al. (2016) suggest that there are many paradoxes involved in institutional change and further discuss organizational inertia that acts as a barrier to the buy-in required of change. Resistance is seen as both “a problem and an opportunity” (Cawsey et al., 2016, p. 30) and they note that change resisters often have unique or different perspectives about the proposed change that need to be acknowledged and resolved. More than that, their ideas or notions may help to refine a previously unexplored aspect of the proposed change. Further advice suggests that there is an important balance between the process of change and the focus on results, and one between tweaking small goals and staying the course for the long-term goal (Cawsey et al., 2016). These important reminders about balance are illustrated in Figure 3 in Chapter 1.

The framework of transformational leadership resonates with Aro Academy and makes positive and effective theoretical links to design thinking for leaders and

incremental change management. Hauserman and Stick (2013) define transformational leadership as an “effort to satisfy followers’ needs and to move them to a higher level of work performance and organizational involvement by displaying respect and encouraging participation” (p. 187). Of course, transformational leadership is also about the charismatic characteristics of the change leader, to inspire trust and participation. This leadership model is aligned with the continuous incremental change context of building relationships, engaging lateral leadership, encouragement and trust building. Truly working for change involves building trusting and positive relationships. Carter, Achilles, Feild and Mossholder (2013) remind us that, “continuous incremental change context comprises frequent, purposeful adjustments that are small but ongoing and cumulative in effect” (p. 942).

Another leadership model that was considered was the flexible/adaptive model. Yukl and Masud (2010) explore the concepts of flexible and adaptive leadership. While quite compelling in their description of a flexible leader as one who can pivot contextually and anticipate actions and reactions to a change, thereby adapting, it becomes evident that these leadership styles have a significant overlap in descriptors to transformational leadership.

In Appendix B, it is possible to see a brief comparison between the two leadership styles outlined in Yukl and Masud (2010) and the chosen leadership model: transformational leadership with incremental change theory. Here it is easy to see the similarities, rendering the flexible and adaptive methods redundant to the transformational leadership method.

Yukl and Masud (2010) argue that historically, researchers have done a poor job exploring the components of a flexible and adaptive leadership model, and instead the last quarter century has embraced “prescriptive universal theories” such as transformational leadership (p. 82). They argue there is room for research to reconsider these models as effective ones. Exploring Appendix B, it is easy to see that many of the behavioural components outlined by Yukl and Masud (2010) as encompassing flexible and adaptive leadership are closely aligned with those associated with transformational leadership as well. The main difference is the capacity for the transformational leader to articulate a common vision and rationale for change.

Beyond change frameworks and leadership models, there were other possible solutions considered before settling on a multi-grade curriculum document in STEAM learning. These included: developing mentoring relationships to encourage STEAM instruction in the classroom using an expert teacher and a reluctant teacher, providing family nights and other exciting and fun activities to promote the value of STEAM learning, and the use of a strong specialty teacher to run STEAM in the school. These potential solutions all fell short of the final curriculum decision.

Developing mentoring relationships to encourage STEAM instruction in the classroom using an expert teacher and a reluctant teacher, co-teaching and exploring the topic is a wonderful way to develop individual expertise in the classroom and this is a part of the ultimate process of implementation but the time involved in this one-by-one change would be time consuming and in the end there would be no specific implementation guide to assist moving forward.

Family nights and exciting activities to promote STEAM are good for increasing understanding and interest in the topic. However, it does not meaningfully embed STEAM into the learning and assessment process, making it a one-off, additional workload activity for teachers. The key to the process is to make STEAM replace old practice, not add to what is already happening in the classroom of silo subjects. STEAM Nights and fun events will still happen, but the integration of the elements of STEAM and design thinking cannot be taught in an evening or a day.

There was some consideration of having a STEAM teacher who is comfortable with technology and integrating the science and math curriculum with engineering and offer it as a ‘subject’. However, like the family nights, this makes STEAM a separate subject when it can truly be integrated into the day of students in a seamless, project- and problem-based way. Two years ago, Aro Academy hired a robotics teacher and this person will be instrumental in creating the skill base needed with both staff and students to incorporate technologies into STEAM learning. Ultimately, to truly transform Aro Academy instruction to reflect STEAM as a core component of learning at the school, all staff will be required to participate in this growth.

Choosing Design Thinking as a PDSA Model

The PDSA (Plan, Do, Study, Act) Cycle for change will undergird the design cycle used for organizational improvement at Aro Academy. Looking back at Figure 4, it is possible to see how the Design Thinking cycle (Gallagher & Thordarson, 2018) echoes the PDSA cycle in its commitment to scientific method via constant iteration and embracing of mistakes. Used extensively in educational change management, the PDSA and its similar cycles, RDI (Review, Develop, Implement) for example, have provided a

framework to look at problems, consider stakeholder input, find meaningful data, and revisit in order to shift when outcomes are not as hoped. The cycle itself allows for smaller, incremental change. This is a leadership move preferred in this OIP as these smaller steps allow for reluctant or resistant staff to see the benefits of the change and that the implementation can be smaller moves for those who require it in the beginning.

Reed and Card (2016) discuss the use of PDSA and caution that the simplicity of the model should not be confused for simplicity of the process. Proper preparation of data and identification of a problem prior to its use is essential (Reed & Card, 2016). Using the Design Thinking Cycle allows the school to model the change they wish to see in the instructional staff and directly addresses the iteration mentioned above.

It is important to identify some of the components of Design-inspired leadership compared to Traditional leadership, as noted by Gallagher and Thordarson (2018) to make further connections to the scientific method in STEAM. These include the following:

- User centered (student centered)
- Recognizes intelligence in the room regardless of status within the organization
- Not afraid to go beyond best practices to experiment with new solutions
- Begins with possibilities. Leads with ‘what if...’
- Bias towards action
- Starts with questions
- Embraces ambiguity
- Comfortable with the messiness of learning
- Values great questions and experimentation

- Growth mindset (Gallagher & Thordarson, 2018, p. 8)

Since design thinking in a STEAM integrated curriculum model is the desired outcome of the organizational change, it makes sense to use the iterative design thinking model of leadership instead of a more traditional one. Appendix B illustrates the iterative and sometimes messy steps involved in Design Thinking for leaders.

Leadership ethics and organizational change.

Complex problems in education require solutions that are multi-faceted and cooperative in nature. With so many educational stakeholders, even in a relatively small, three-school setting like Aro Academy, it is important that change management addresses the implications of change at all levels. There are the drivers of change, the problem of practice and the framework for change management and theory, but ultimately, there are ethical and social justice issues that permeate all problems inherent in school organizational change. In thinking about ethics as they relate to organizational change, this section will explore the Giving Voice to Values Curriculum (Gentile, 2010 cited in Cawsey et al., 2016), important religious considerations related to social justice and inclusion (Slattery & Rapp, 2006), inequity in STEM/STEAM.

In the Giving Voice to Values Curriculum, outlined by Gentile (2010, cited in Cawsey et al., 2016) change leaders and participants must be continually questioning their values and ensuring that those values are upheld at each stage of the change process. It provides ways to effectively speak up when there are questions about the ethics of a change. This is a way to ensure that change goals do not overcome or deny the grounded ethics of the organization and society writ large. In the case of Aro Academy, the organization itself is well situated to have checks and balances embedded in change

through its shared faith and its structure for approvals to the Head of School and Board of Directors. On the Board of Directors and present at school regularly, there is a faith leader whose role is to inculcate ethical teaching and practice. There is a strong commitment to the widely shared values articulated by Gentile's Giving Voice to Values curriculum, "honesty, respect, responsibility, fairness and compassion" (Cawsey et al., 2016, p. 49).

The important factor here must be to ensure that the change is truly thought out and aligns to the best interest of students, staff, and other stakeholders. The amount of instructional change and re-learning required of teachers and the benefits to students must be considered to have a high yield that is equal to or greater than, the learning curve involved.

Religion in the curriculum. Slattery and Rapp (2006) talk about the importance of acknowledging and identifying the ways religion is infused in school curricula and goes on to discuss the dangers of theological bias further marginalizing students in any setting, but particularly a secular setting. In one example, they talk about a Jewish boy having to clean classrooms while his classmates and teachers prepare for a Christmas concert. They argue that, "the intersection of religion and schooling extends beyond prayer at football games or the display of religious holiday symbols. Theological questions are at the very heart of every aspect of life in schools" (Slattery & Rapp, 2006, p. 131). Further, they feel that the topics of, "theology and religious pluralism may have replaced race and ethnicity as the most critical social issues" (Slattery & Rapp, 2006, p. 131) facing education today. It is important to note that Aro Academy is not, and does not present as, secular in nature.

It would be remiss not to state an obvious bias here. The community of Aro Academy is faith-based and community oriented. Curriculum, Language, and all aspects of the school are purposely permeated with a singular faith-based education. Parents elect to send their children so that they will be imbued with a sense of their faith, traditions and culture. In one sense, that ostensibly creates the singular focus Slattery and Rapp (2006) argue is counter to problem solving global problems. On the other hand, being faith-based presents an opportunity to teach, rather than erase diversity from the standpoint of this faith in the context of a wide variety of faiths, beliefs, and political viewpoints. The faith at Aro Academy does not attempt to convert others to their faith. Administration and teachers are acutely aware that teaching acceptance and having a wide lens from which to view other belief systems is important to instill a global problem-solving, maker mindset and generosity and kindness in our students. As a leader, the action here is to continue to illuminate the many connections between our faith and the values we wish to engender towards all living things and the environment.

Stone (2012) reminds us that neoliberalism and paternalism are replete with examples of one group determining what is right over another from the standpoint of religion, racism and prejudice. Keeping our people's history of oppression at the core of our equity work will be a way to frame the rights and differences of others. By the same reasoning, students at this school come from a variety of backgrounds, dominantly financially privileged. Those on scholarship may feel that their voice is more difficult to have heard. It will be essential to reach out to these groups and ensure their participation on STEAM Teams. Teachers will explore ways to incorporate notions of social justice

and oppression into STEAM curriculum with a focus on what voices are at the table and what voices are silenced.

Social justice, particularly as it relates to ecological issues, are at the heart of STEAM learning. Real-life problem solving engages far more than one subject or strand of curricula. It involves acknowledging other perspectives, resilience, repetition, scientific process, iteration, pivoting, skill in engineering and math, a wide perspective on science and creative problem solving. Interestingly, Slattery and Rapp (2006) describe many of the wonderful ways the arts are used as leverage to bring a voice to “urgent political, social, ecological and spiritual concerns” (p. 146) making the implementation of STEAM even more important.

Gender gap in STEAM and STEM careers. Another moral imperative is to address the inequities of gender in STEAM and STEM careers. While girls start out participating in sciences and maths, they often drop out before pursuing these subjects as the basis of future careers. Reinking and Martin (2018) note that while the number of women going into these fields in post-secondary education has increased, it has not translated into careers. They note that research has shown that in higher education, only “one in five faculty members employed in computer science, mathematics, engineering and the physical sciences” (Reinking & Martin, 2018, p. 148) are women. This aligns with Reinking and Martin’s (2018) statistics on engineers, where only 20% are women. This prompted them to explore why there was a gender gap. There are several reasons stated including gender socialization, peer groups, and stereotypes of STEM professionals.

In terms of Aro Academy and the ages of the girls that attend here from Junior Kindergarten to Grade 5, one area that is a particularly important ethical imperative for consideration is exposing girls to, and engaging them in, STEAM activities. Reinking and Martin (2018) argue that by exposing girls to STEM topics and experiences and “hands-on, safe environments for exploration and combat(ing) societal gendered stereotypes” (p. 151) it is possible to change the things that go wrong, right from the beginning of schooling. There are many ways to implement the creation of a positive, curious learning environment, such as STEAM camps and clubs, but there is a larger ethical imperative to respond to the STEM gender gap to improve outcomes for women in STEM careers. This gender marginalization is just one of the things that make STEAM implementation through organizational change management an essential consideration. Within the context of STEAM implementation, the actionable items will be creating additional opportunities for girls to engage in and take leadership in STEAM curriculum and for female mentors to be visible to girls as a core part of programming.

Inherent bias. Difficult problems are difficult, in part, because of the number of stakeholders with differing perspectives and needs who will approach the problems with different outcomes in mind. They are complex and have no easy answer, with many challenges and resistors (Hobson & Cram, 2018). Further, change is attempted it is faced with this “complex ecology of players/stakeholders, politics, funders and (all going well) evaluators—from those who yearn for change that will improve their lives to those whose interests are well served by the status quo” (Hobson & Cram, 2018, p. 238).

The key to ethical considerations is to remember that the work is “inherently values driven and political” (Hobson & Cram, 2018, p. 254). A good leader understands

that all our opinions and decisions are viewed through our personal context lens and coloured by our own inherent, sometimes unconscious, biases. To articulate these and have them out in the open, allows for the exchange of open discussion about the impact these biases may have on decision making.

Beyond this, Buchanan (1992) argues that it is ethically essential that relationships and responsibility be at the forefront of change management. To ensure that any change is more than just, for example, fiscally beneficial, it is important to ensure that the work is truly meeting “the diverse and dynamic needs of stakeholders and other interested groups, and that a more grounded, functional, and integrated understanding of the relevance” (p. 16) of the work is evident to all. Only then, should the work articulated in the change “inform policy, strategy, programs and projects” (Buchanan, 1992, p. 17).

Cawsey et al. (2016) agree that relationships built on ethical decisions and honest communication are key to engaging trust during the change process. As part of ‘working the plan’ they argue that facing failure and revisiting goals are part of the process but if trust is lost at any point during the change, it is very hard to bounce back. In fact, “recovery is less likely if people feel they have been lied to or otherwise ethically abused. A permanent sense of betrayal tends to ensue when you have been dealt with unethically” (Cawsey et al., 2016, p. 319). Leadership needs to be transparent, honest, and aware of implicit bias that can shade the interpretation of various issues in the change process.

Ultimately, as the school leader, it will be important to acknowledge and identify areas of implicit bias and temper the influence of that bias. Stone (2012) states that “equality of voice is the most important equality issue at all” (p. 62). The voices at the decision-making table influence all level of power and outcomes at the school; In policy

creation that impacts student learning, teacher instructional focus, distribution of funding, building and classroom discourse, facility management and more. The impact of voice is a blanket equity issue across the other issues outlined above. Using STEAM Teams in a lateral leadership model, Administration seeks to mitigate traditional hierarchical power structures and ensure voices are heard at all levels of the organization.

Conclusion

Determining frameworks, theories, interventions and structures to address the problem of practice and change readiness at Aro Academy, must be considered through the lens of equity. Privilege, inherent bias, gender inequity and how solutions tend to favour those in positions of power, must provide foundational understandings upon which the change is ultimately built. Communication, transparency of action, lateral leadership teams and strategies for conflict management will guide Design Thinking moving into the implementation plan in Chapter 3.

Chapter 3: Change Implementation, Evaluation and Communication

In this chapter, strategies for change, implementation considerations and a strategy for monitoring and evaluating the process of change at Aro Academy, will be clearly outlined. The chapter will look at the goals of this project through an organizational framework that uses the spiral to illustrate the interconnectedness of the PDSA cycle to the design thinking model, and the steps involved in this project are directly linked to the cycle. Change management strategies and stakeholder interests will also be discussed.

Introduction: Strategy for Change

Appendix C illustrates the various cycles at play through the change model. Below in Figures 9, 10, 11 and 12 the cycles are separated from the whole. It is important to view these cycles not as independent, but rather part of a spiral and cyclical whole, with each stage of the change process moving fluidly through the 3 circles to finally reach the goal at the centre of the circle. To keep this cycle current at the school level the central goal is a 'moving target' because what STEAM integration looks like in the next two years, will be different from what good STEAM integration looks like in 5 years.

New Strategic Organizational Chart

Currently all curriculum delivery is filtered through the head of school down to the teachers, who implement it with the students in a variety of ways, mostly traditional in nature. In recent years, Professional Learning Communities at times have provided some collaborative and team planning that has proved beneficial for teachers in their practice. As well, there have been specific teachers who worked to develop interesting and engaging activities for their colleagues to participate in as well. However, to fully

implement this project, it is evident that there must be some agency over the STEAM programming in order to make enduring change. The current organizational chart can be seen in Figure 6. It is linear in nature and the proposed change is to challenge this traditional, linear model. In the new model, STEAM teams are given leadership over their curricular and resource needs as they implement change. In the second model, all stakeholders will have an opportunity to exercise real change in a lateral leadership model.

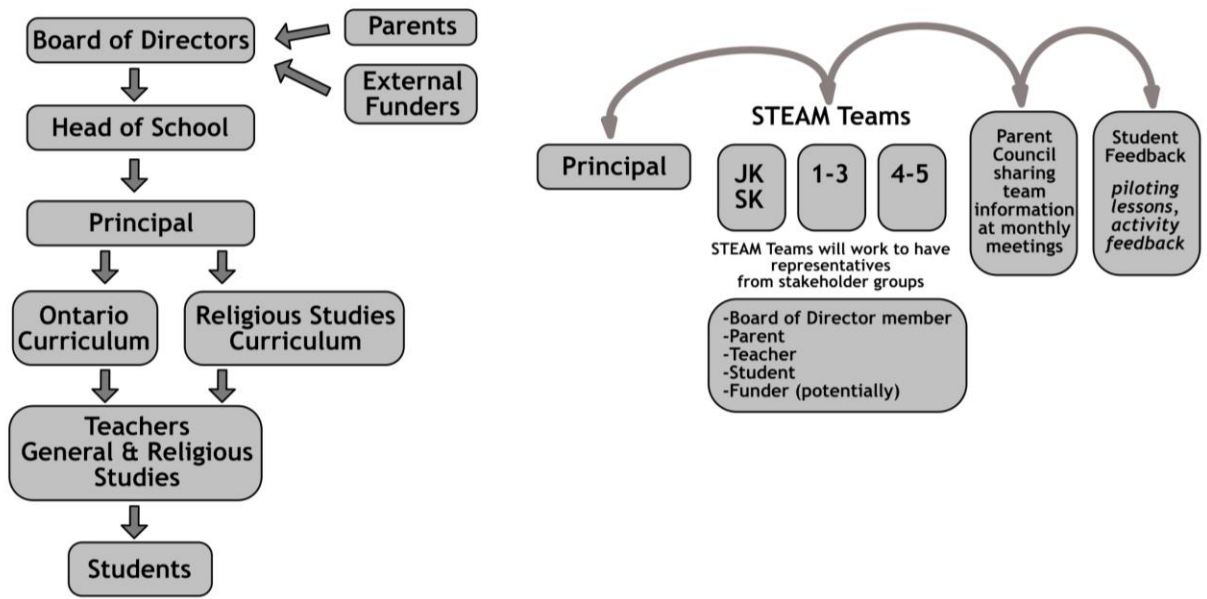


Figure 6. Current organizational model at Aro Academy and proposed lateral organizational model for STEAM policy implementation at Aro Academy. Shulman Kaye, 2020.

Imperative here is having teachers involved in the change and choosing STEAM team leaders carefully. Dudar, Scott and Scott (2017) remind us that teachers become change weary and at times, resistant. They argue that teachers are the most important change participants because of their general influence over the implementation of a change. Indeed, they can “choose to implement or sabotage the change agenda” (p. 29).

In a study by Gaubatz and Ensminger (2017) that looked at successful change through smaller team leaders within a larger secondary school, it was noted that leadership behaviours, to be successful, must be both contextual and must resonate with even the most contentious resistor in the group. However, in the many change stories they explored, none were successful without creating a sense of urgency for change among those that were to implement it. Disrupting the status quo to motivate a group to action is the first task in our STEAM teams. Anticipating some of the resistance and developing a team that is open to communication is key. Managing the change will require a look at the importance of teams in the plan overall.

Managing the Transition: A focus on teams

The creation of STEAM Teams that include multiple stakeholder groups has been an important part of this change process in providing lateral and enhanced leadership opportunities from all levels at the school. The STEAM Team strategy reflects a core conceptual framework that draws on research about the positive effects of team structure on a teacher's commitment to the change process (Dee, Henkin & Singleton, 2006; Gaubatz & Ensminger, 2017). Through the improvement of individual teachers' commitment to the school overall and developing a sense of significant agency in the change, teachers will be more invested in the project. Dee, Henkin and Singleton (2006) outline the use of a conceptual framework that presupposes the importance of team structures in change management to improve individual connection and loyalty to an organization. They argue that the team structure creates a collaborative environment that can "increase feelings of attachment to the goals and values of the school, change perceptions of the individual's role in relation to these feelings and strengthen linkages to

the organization (Dee et al., 2006, p. 607) beyond the classroom. The use of teacher teams in the STEAM integration project is meant to provide a vehicle to improve autonomy through lateral leadership, improved communication and a sense of individual power to institute positive change.

Potential problems with the team model include communication issues, team competition and trust (Dee et al., 2006). In this project these potential problems will be managed through the creation of team norms, group autonomy, fiscal responsibility and clear agenda setting. These are explored first through addressing communication issues that may arise.

Creating a space for communication that is open is essential as STEAM Teams are created. Staff must feel valued, listened to and allowed to express ideas that may not immediately align with the curricular agenda. As articulated by Gaubatz and Ensminger (2017) leaders must engage in contextual conversations that respond to the specifics of the time and place. Through this change journey, it will be important to bridge the divide between the general studies teachers and the religious studies teachers. This type of communication allows the leaders to influence the participation of the various groups, despite some existing divisions. At Aro Academy, there will be work to be done around engagement of the religious studies teachers in this process. Communication that is sensitive to the politics of the organization will be essential. This potential area for conflict is closely tied to the second potential problem of team competitions.

If the divides that exist are not mitigated through careful team creation and ongoing communication, these competitions may arise causing strife within the larger organization because, according to Dee et al. (2006), competing agendas become an area

of focus. This obstacle can be addressed in STEAM Team building because the agendas of the various teams will be common in their goal (see Appendix A) to create a cross-curricular, multi-grade document, integrating subjects, aligning and using resources, and capitalizing on the human resources and expertise of team members to fully integrate best practice into school culture. Team collaboration and belief in its ability to affect change will be key to successfully creating a STEAM integrated document. This aligns with Hattie's (2018) highest-ranked marker for student success and achievement, collective teacher efficacy (CTE). This is the shared belief of a group of staff that they can positively influence outcomes for students and that CTE is reflected in a positive, engaged and empowered school culture.

Trust is the third obstacle to effective team creation and management as outlined by Dee et al. (2006) who go on to say that focusing on trust-building will "strengthen organizational commitment" (p. 609). Part of trust building is empowerment. Tschannen-Moran and Gareis (2015) suggest that trust in a principal is a key element of any change venture in a school. Further, trust is a key element of school climate and ultimately, the STEAM team health and productivity.

In addressing trust, it is important to recognize that as a faith-based school, our beliefs cannot be ignored in the change process. Indeed, engaging our religious studies teachers will require it. Drawing on our faith and stories to drive the building of a trusting environment must be a component of change management. In many faiths and cultures around the world, teamwork is built on the need to place your trust in others. The Lunar New Year in the Chinese faith, for example, tells the story of the Lion Dance; The 'lion' is a puppet that two or more people are inside and to the accompaniment of drums, the

lion spreads prosperity through the room in a celebratory dance. The Lion Dance is incredibly physically demanding. Training takes years and involves the development of a trusting team where a long sash inside the lion is used as a non-verbal communication signal. In building this team, there is a recognition that one part does not work without the others, that perseverance, discipline, and a belief in the process are key to bringing the prosperity of the Lion Dance (Wushu Project, 2019).

In the Jewish faith, school leaders are encouraged to bring faith teachings to both staff and students. Rabbi Garfield (2019) stresses the importance of stories to “even G-d himself” who “chose them as a means to communicate his eternal message” (p. 27). He encourages leaders to go beyond the teachings of the Torah while building school cultures. He asks how sharing your story can help build understanding, compassion and most importantly, trust. So, as a faith-based leader, engaging in school change, it is important to be able to share stories, personal and professional, prudently, to be open to the change, in the way staff is asked to be.

The use of storytelling is not unique to religious faith in change management. Mento, Jones and Dirndorfer (2010) talk about using metaphorical storytelling to delineate each step in the change process and to further engage stakeholders in the process. In their discussion of General Electric change management, they use the story of a ship going on a long voyage and the things needed to be successful along the way. In this storytelling, they “constantly and strategically communicate the change” (p. 55). Indeed, Dudar et al. (2017) argue that successful change strategies and successes are only possible within environments that “foster high morale, trust, instructional capacity, and open, honest, and credible communication” (p. 43).

Change Process: Monitoring and Evaluation

The Plan, Do, Study, Act Model has been reflected in a Design Thinking Model that more aligns with school goals to demonstrate learning through this process. By looking at Appendix A throughout this section, it is possible to see the cyclical PDSA cycle in greater detail reflecting the learning environment at the school. By using Design Thinking as a change strategy, the goals are reviewed, developed and implemented with

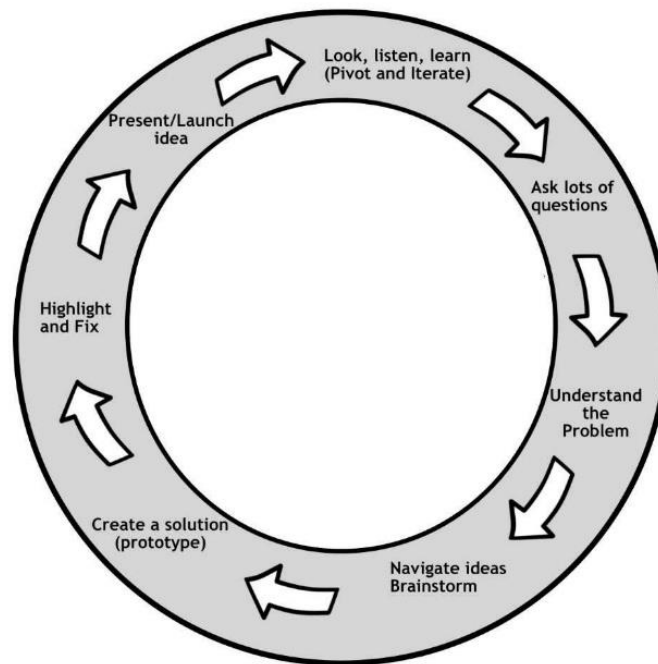


Figure 7. Cyclical process for Design Thinking and Change Management at Aro Academy. Shulman Kaye (2020). Adapted from A. Gallagher & K. Thordarson (2018).

strategies for challenges and setback management.

As we explore the change process, we can separate Appendix C into its three circles to delve into the process and the way it links to research and specific plans at Aro Academy. Figure 7 outlines the overall Design Thinking process that is guiding the plan. Figure 8 outlines specific focal areas at each stage of the change process, specific to Aro Academy. Figure 9 is even more task specific for Aro Academy and spirals into Figure 10

which is the goal of the project. However, it is important to note that the process, while pictured as 3 distinct circles travelling to a middle, it would be best thought of as a spiral as each section bleeds into the next to create the steps and stakeholders' action plan.

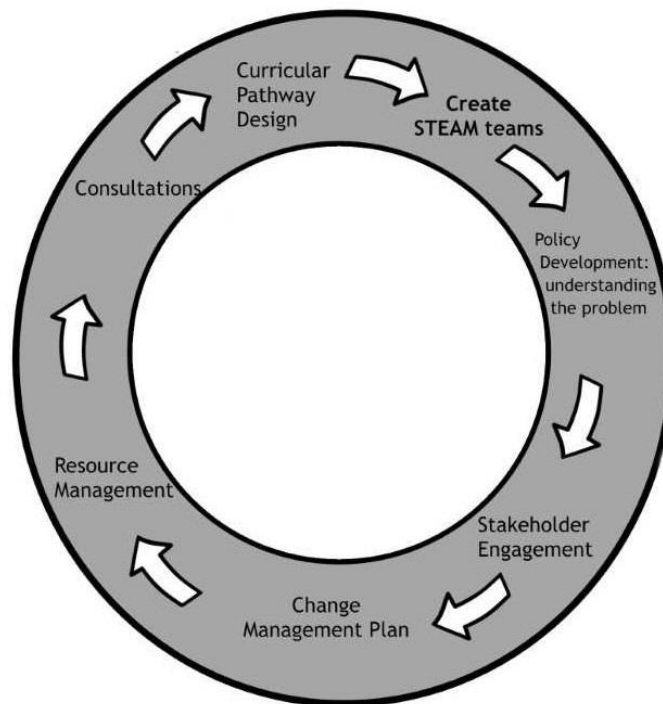


Figure 8. Focal Areas for Development during Change Process. Shulman Kaye, 2020.

The *look, listen, learn, pivot/iterate, ask lots of questions, and understand the problem* sections, all involve the 'Plan' aspect of the project. Here is where STEAM teams will be created based on grade level taught, interests and skills, and ensuring a balance of stakeholders are involved and have agency throughout the project.

Stakeholders in the unique private school environment include members of the Board of Directors, the Head of School, principal, teachers, support staff, parents, students and some external funding agency representatives. The policy development required in this stage is ensuring a multifaceted understanding of the problem through learning. Here is where professional development is accessed based on identified needs of stakeholders.

For example, it would be easy to anticipate that a board member on a STEAM team may need some professional development about high-yield strategies and the Ontario Curriculum, whereas a teacher might require professional development around learning how to plan in a cross-curricular way. This professional development phase is evident in Figure 9. Dudar et al. (2017) remind us that it is professional development that often lets teachers down and fails to produce the desired results, largely because of the way it is structured. Guskey (as cited in Dudar et al., 2017) argued that professional development is typically designed to alter the beliefs and actions of teachers to produce a change in their teaching practice. However, he proposed that changing beliefs was not the right first



Figure 9. Specific tasks across the change process. Shulman Kaye (2020)

step. Teachers, Guskey (cited in Dudar et al, 2017) said, should engage in a new practice first, because of their professional development, and that ultimately, instructional beliefs will change through successful implementation. This is because, “teachers are totally focussed on their students’ learning and well-being and so will only adopt new ways of

teaching or assessing once they see the advantages to their students” (Dudar et al., 2017, p. 50).

There is an added sense of urgency to respond to recommendations of future-looking organizations like OECD to ensure that students are receiving instructionally the best practice and overall, the skills needed for a future job market. The Horizon Report (Freeman, et al., 2017) is a good measure of skills and educational needs over the next decade. The report articulates educational trends as they align to the global job market, advancing technology and required skills for success. Right now, schools should be implementing makerspaces and robotics programs as these have been evolving for years, however, according to the Horizon Report (2017), over the next two years the STEAM curriculum will need to respond to analytics technologies and virtual reality. Artificial intelligence will be a key learning need over the next 3-4 years (Freeman et al., 2017). For these reasons, the curriculum needs to be relevant and open to constant revision to be appropriately responsive to the labour market and globalization. This is a cyclical process because it must remain current in the best interest of student skill building.

The *navigate ideas, brainstorm, create a solution (prototype)* sections align with the “do” portion of the PDSA cycle, and part of the ‘study’ portion, because here is where the work gets done. Starting with stakeholder interest and agency, the Ontario Curriculum, resources available, and in collaboration with the other STEAM teams, a sample integrated curriculum for each grade level is created. This allows for a curriculum that is truly embedded and moves away from past practice of STEAM as a ‘one-off’ or fun activity that happens occasionally. In this way we link major hands-on projects to

science and math, while using the arts and literature to spark interest and provide story

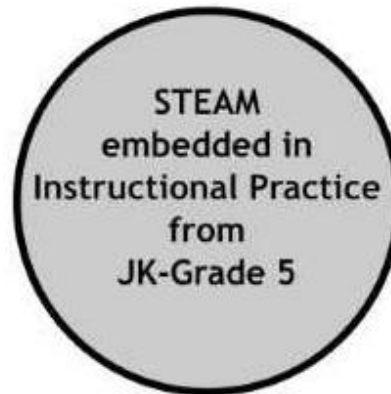


Figure 10. Goal of the Change Process. Shulman Kaye (2020).

around the projects themselves. By looking at Figure 8, it is possible to see that stakeholder engagement, change plan and resource management are all considerations in this phase of the cycle. In Figure 9, this portion includes Job-embedded learning opportunities (JELO) where ideas and activities can be formally ‘tested’ in the classroom. In this phase teachers have an opportunity to co-teach and work with their STEAM team colleagues and learn collectively, which activities and topics will resonate best with students. In order to facilitate these job-embedded opportunities, the school budget will provide occasional teacher coverage for each teacher in the project who wishes to co-teach and ‘test drive’ with their colleagues. These are the days where there will be reflection on the engagement, appropriateness and success of the new curriculum which will provide valuable data for the next stage.

Highlight and fix is the formal ‘study’ portion of the PDSA cycle, however, it is important to note that study also appeared at the ‘plan’ phase where there was an influx of professional development, data gathering and analysis that allowed for the creation of a draft curriculum. Prior to presenting the final draft curriculum it will be important for

STEAM teams to come together and highlight potential areas of difficulty, curriculum overlap, ensuring each grade level enjoys unique programming while also ensuring that there is a progression of skill building that is revisited each year. The curriculum itself will continue throughout the change cycle in order to ensure that students continue to receive exceptional instruction and that teachers continue to evolve as practitioners (see Figure 9). As well, the curriculum will have to be relevant to the Board of Directors and other funders, so a strong data and information collection process is key. This portion will be effectively monitored through the implementation strategy and accountability portion of the change cycle. This is the ‘Act’ portion of the PDSA cycle and includes *presentation and implementation* of the draft curriculum. All of this will be reviewed yearly using data collected through the implementation of the draft curriculum. Data that would be useful for this reflection includes task assessment data, literacy, science and math report card data, student and parent surveys, teacher perception of student engagement, pedagogical documentation and standardized test results. As well, continued reflection on the relevance of the skills and activities taught will create an environment where the curriculum evolves using real data and research, while maintaining connections to the Ontario Curriculum documents.

Ultimately, the spiral of change management ends with a goal of STEAM embedded in instructional practice from JK-Grade 5 (see Figure 10). This policy document will ensure that STEAM moves beyond low-level event type practice to a truly embedded expectation. The system change allows, also, for lateral leadership through STEAM teams to revise and revisit this curriculum through ongoing professional learning community work within the specific and meaningful context of Aro Academy.

Change Process: Communication Plan

Communication and relationships building are key to the success of this OIP. Poor communication of a change can become an insurmountable barrier to the change process as people become discouraged and, at times, resistant (Tyler, Lepore, Shield, Looze & Miller, 2014; Fiss & Zajac, 2006; van Vuuren & Elving, 2008). Fiss and Zajac (2006) state that the success of change in an organization “will depend not only on an organization’s ability to implement new structures and processes, but also on the organization’s ability to convey the new mission and priorities to its many stakeholders” (p. 1173). A key part of communicating the change in an organization is the ability to ensure that stakeholders clearly understand the change being proposed. More than this, the success of an organizational change such as this one will “depend largely on the quality of the interaction processes and the extent to which mutual understanding is achieved” (van Vuuren & Elving, 2008, p. 351).

Culture building through relationships, story, education, and design thinking have been discussed in Chapter 2 and will frame the communication plan for this OIP. The communication plan itself will consider communication an essential tool in the change process. It will be utilized to highlight and acknowledge three key areas. Firstly, member participation and leadership in the change process. Stakeholders need to feel that they have agency in the process and are a valued member of the change team. Secondly, the communication of key information required by stakeholders and the importance of the timely provision of that information. Creating readiness for change through communication by reassuring people of their position and their future role at the organization is essential. If people hear change information through other channels before

the leader articulates it, resistance and distrust can emerge. Timeliness is important and will be carefully planned. Lastly, the ongoing articulation of the need for change and the goals and purpose of that change tie into timeliness above. Ensuring that people are clear about why the change is important, it is possible to reduce the number of saboteurs and



Figure 11. A second order change at Aro Academy. Shulman Kaye, (2020). Adapted from M. vanVuuren and W. Elving (2006).

ensure employee readiness for change (Johansson & Heide, 2008).

Van Vuuren and Elving (2008) make an important distinction between information and communication that will be a key focus for this communication plan. Information is the provision of information about a change that is happening in a top-down, hierarchical way with little room for change revision or control. Communication, however, is the development of relationships in an environment such that stakeholders feel involved in the change and have some agency over it. The creation of a STEAM curriculum/policy document for the school using STEAM teams and teacher voice and choice, provides a venue for true communication through a significant change process. Elements of the change process will be informational but the change itself will have significant room for input, challenge, change, creation and revisioning.

This type of organizational change would be classified as a second order change and van Vuuren and Elving (2008) warn that communication in this kind of change is

more difficult and if not handled appropriately then “cynicism (becomes) a more likely result of the initiative than enhanced productivity and engaging culture” (p. 351). At Aro Academy this OIP is a systemic shift in changing instruction and curricula, requiring change on the part of every educator in the building and thus, a transformed organization in the end. The reason communication in this kind of change is harder is that there are unknown outcomes and processes while curriculum is being re-thought and instruction is being replaced. Figure 11 demonstrates this second order change.

At the *indicators that Aro must change stage*, there is essential evidence that decreasing enrollment and a closure of one campus suggests significant change has to re-make Aro Academy relevant and important in the eyes of fee-paying parents. As well, through parent conversation and Board of Directors input, there is an impetus for improved instructional practice that speaks to research about 21C learning. These are two drivers that will create the ‘unfreeze’ for the organization (Lewin, 1951 cited in Cawsey et al., 2016). Communicating these two indicators effectively will be important; teachers will need to recognize their essential role in creating and executing this change.

The *change* process itself has been extensively discussed in Chapters 1 and 2 and can be seen visually in Appendix C. However, key to communication at this phase will be that this process is the area of true agency for stakeholders. The creation of STEAM teams who will use the design process to create a living policy/curriculum document for embedding STEAM at every grade level, provides this opportunity for ownership, leadership, engagement and collaboration. In this space, what van Vuuren and Elving (2006) consider the human need for autonomy, connectedness and competence will be celebrated and engaged. Each team member will hold a significant role in the creation of

the curriculum document that they will then implement and continuously revise.

Important and meaningful conversations at all levels, across stakeholders, will engage and connect participants so that ownership of the endeavour can be embraced.

The final *unknown end state* section is the final rollout of the newly created document. In some sense the document's arrival has been expected, but the areas where stakeholders will engage, and exercise discretion and professional judgement leave the final document as an unknown. STEAM teams will determine contents, activities, assessments and all aspects of the teacher role. It's important that this part is not yet known to truly make it a living document created using lateral leadership and stakeholder agency and power.

In Figure 12, a communication plan is embedded in the spiral of change articulated in Appendix A and earlier in this chapter. Key to this plan is a focus on clarity of communication and influence of leader personality (Tanner & Otto, 2016) who cite these two concepts as 'interveners' in organizational change. Throughout the cyclical process for change, communication planning will be embedded at each step with careful planning for messaging across all stakeholders.

Additional Challenges in Communication

In addition to challenges faced by all organizational change of this magnitude, it is anticipated that there will be three additional areas where challenges will emerge. Communication strategies must be anticipatory, responsive, contextual and flexible in order to address these challenges. These areas are: STEAM Team conflict, the implementation of professional development and responding to persistent resisters.

STEAM Team Conflict. Inevitably in any group setting, conflict arises. In the STEAM Teams, communication and group norms will be essential to plan and build an integrated curriculum. Part of the STEAM Team communication plan involves creation of group norms; co-created learning goals for each meeting, and an established strategy for communication break-down. Hage and Finsterbush (1989) talk about three sub-groups that can be valuable in larger change groups: decision-making groups, T-groups, and problem-solving groups. The decision-making group can be the entire STEAM Team as each person on the team brings specific expertise to the group. T-groups are designed to increase sensitivity and empathy among group members through purposeful group cohesion activities. In a STEAM Team this can be envisioned as ice breakers and other cooperative games built into the planning, play and work time. The role of the T-group is to ultimately articulate the importance of belonging in the group and wider organization. Cross group activities will build further community. Lastly, the problem-solving groups will act as mini arbitrators when conflict arises. The first step would be open communication between the parties in conflict and an internal group restorative activity.

As a second step, if the conflict is not resolved, there would be an external problem-solving group to determine a resolution that re-creates a STEAM Team that can continue to be functional despite the conflict. Communication here will be flexible and yet structured enough to elicit a sense of fairness and due process. It will be key to mending relationships that have become fractured. According to Hage and Finsterbusch (1989) using internal group structures to initially establish norms and strategies for potential communication break-down often results in positive interventions and leaves participants feeling heard and committed to the change.

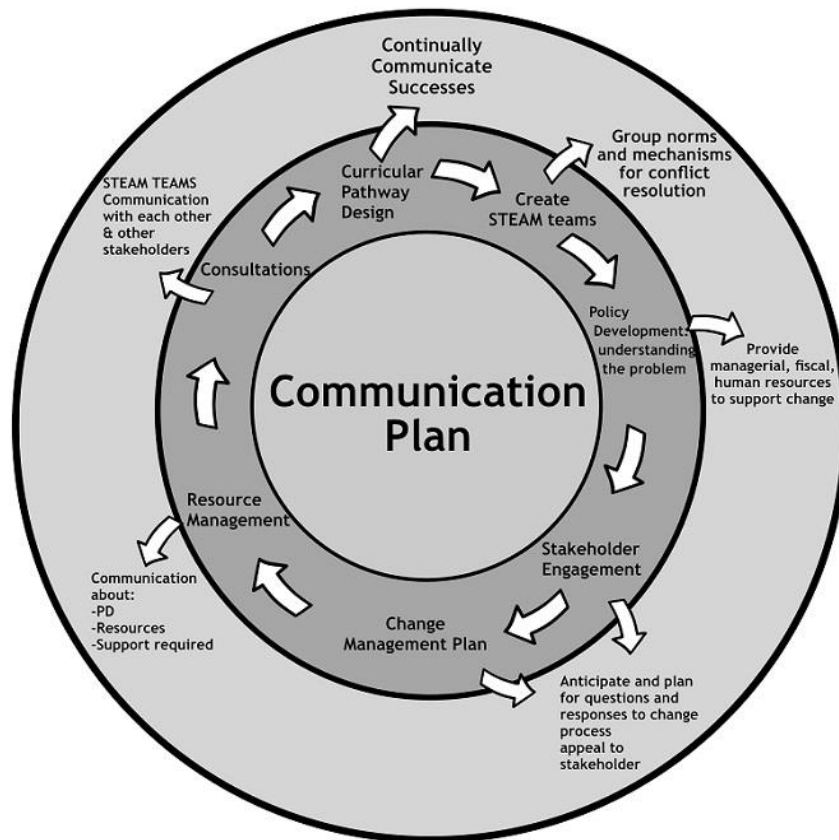


Figure 12. Communication plan across the change process. Shulman Kaye (2020).

Implementation of professional development. Professional development is historically poor at changing teacher practice enough to impact student outcomes (Gusky & Yoon, 2009; Guskey, 2002). In a scoping review by Gusky and Yoon (2009) only 9 of 1343 studies of professional development “met the standard of credible evidence” (p. 496) and only a few of those 9 could identify improvements in student outcomes. Findings indicated that: when teachers are involved in identifying their areas of need, the outcomes are better; meaningful workshops, with accountability and specifically used time for deeper learning can produce successful outcomes; and a focus on both content and pedagogy at the right time will assist in making meaningful professional development

(Guskey & Yoon, 2009, p. 497). Key to all of these elements is convincing teachers to buy-in to the process, and this is where communication becomes the lynchpin for success or failure.

In the STEAM Team design process, there are budgetary allocations for job-embedded learning opportunities that teachers determine that they require. By engaging staff in co-planning and co-teaching activities as ‘trial runs’ for the STEAM curriculum, teachers can practice teach a concept or topic and evaluate its effectiveness that is unique to their grade and classroom make up. Contextual learning is essential and Guskey and Yoon (2009) assert that it is sometimes appropriate to also bring in an expert in a particular area to assist with implementation and increased content knowledge. In fact, in every one of the successful studies explored by Guskey and Yoon (2009) the professional development “centered directly on enhancing teachers’ content knowledge and their pedagogic content knowledge (and was) designed to help teachers better understand both what they teach and how students acquire specific content knowledge and skill” (p. 497).

Ultimately, communicating the value of what constitutes meaningful professional development must be considered while also thinking about how to get teachers actionable on changed practice. Guskey (2002) supports a model of teacher change that sees action items before change in teacher attitude and beliefs. According to Guskey (2002) this model suggests that teacher beliefs and attitudes about a new practice are not consolidated until they see actual improvement in student outcomes. Communication around “just try it” must be considered during the STEAM team professional development planning process.

Responding to persistent resisters. Campbell, Carmichael and Naidoo (2015) agree that effective communication “lessens uncertainty among stakeholders about the planned change by creating shared meaning” (p. 197). However, resistance and hostility can look differently depending on the context. Much hostility will be non-verbal (Campbell et al, 2015) and may be difficult to address directly. Tanner and Otto (2016) looked at individuals and the concept of dispositional resistance to change which was mitigated by quality ongoing and meaningful communication between leaders and employees, suggesting that careful communication and relationship building will greatly reduce the potential damage of a persistent resistor.

Important to note here is Tanner and Otto’s (2016) finding that change can be a significant stressor for an employee and can impact his/her well-being in a variety of ways. This is partly mitigated by good communication, relationship building and reassurance by superiors but is also exacerbated by factors beyond the control of a manager such as “ambiguity tolerance or resistance to change” (Tanner & Otto, 2016, p. 2185). Compassion around these external factors may make planning for extensive and ongoing conversations about the change easier. Employees are also reassured when they feel top management supports the employee during the proposed organizational change (Tanner & Otto, 2016). By extension, building awareness to reduce anxiety around change benefits all parties.

Building awareness. van Vuuren and Elving (2006) talk about communication and coordinating efforts to affect change as having positive or low energy, depending on whether the communication increases or decreases their human needs. For example, “when people interpret an interaction as meeting basic human needs like autonomy,

competence or relatedness, their energy increases” (p. 353). This becomes a particularly important consideration when planning the specifics of a communication response plan that seeks to build relationships and positive culture. When faced with stakeholder questions, van Vuuren and Elving (2006) suggest that it is essential to ask the following questions:

- What will this message mean for people’s autonomy?
- How can the increase of people’s autonomy and responsibility help to reach our goals?
- What competencies are available and may be insufficiently used that can be helpful to keep things going?
- How can we improve lasting positive and significant interpersonal relationships at work?
- How can we help organization members to identify where they belong to by being member here? (Baumeister & Leary, 1995, as cited in van Vuuren & Elving, 2006, p. 353).

These questions should be considered while creating measured responses that are both strategic and contextual, so they respond to all stakeholders meaningfully.

Anticipating questions and responses

There are several anticipated questions that will require a specific communication plan for each of several stakeholders and which will first go through the above questions as a filter for consideration. For example, one question that has arisen already is concern that adding STEAM to the curriculum is going to be unmanageable since each teacher

group (e.g., general studies and religious studies) has only a half a day of instruction time. How do we fit it all in?

The messaging must be tailored for each stakeholder group in carefully designing responses that truly secure support at all levels. Indeed, “by framing strategic change and thereby articulating a specific version of reality, organizations may secure both the understanding and support of key stakeholders for their new strategic orientation” (Fiss & Zajac, 2006, p. 1174). Framing of information that is shared and by tethering it to the interests of the specific stakeholder can assist in creating buy-in and a clearer sense of the purpose of the proposed change. In Appendix D one question is addressed in several different ways depending on the stakeholder perspective in question. (See Appendix D.)

Other anticipated questions that will undergo this process to articulate specifically to different stakeholders within a particular context are:

- What kind of professional learning will be needed to make this successful?
- What kind of human, fiscal, and time resources will be allocated to this process?
- What kind of supports will be provided to teachers who are struggling with implementation?
- Why is this good for children? Why is this best practice for teachers?
- Why should the Board and external funders fund this change process?

Unexpected questions will undoubtedly arise and considering the underlying questions outlined earlier, creating a response that speaks to the interests of those who are asking, staying on message and being authentic about the need for change will be key to engaging all stakeholders.

Next Steps and Future Considerations

In exploring change research for this OIP, a key area of communication strategies to support change has emerged, highlighting the essential, indeed, foundational importance of communication to support any successful organizational change. Johansson and Heide (2008) suggest that all organizational change should be reframed to be, by definition, a “communication-related phenomenon” (p. 289). Communication should be ongoing, open, honest and acknowledge that there are areas of the unknown through the change process.

An area that will require support through several incantations of this document is the relationship and partnering between general studies teachers and religious studies teachers. There has historically been a significant divide between the two programs with each side protective of their time for their curriculum. This is a major change and incremental partnering will be expected and celebrated along the way.

It is exciting to create through this OIP something collectively to improve professional learning, instructional practice and truly embed STEAM into the everyday at Aro Academy. The finished document will act as an imperfect starting point and each year professional learning communities will work on improvements and revisions as student interest and external forces demand them. The future of this process aligns with design thinking and the resulting document and STEAM Teams should be well positioned to reflect and respond to shifting global job markets and trends in education. The Horizon Report (Freeman et al., 2017) stresses the urgency of student technological literacy which should currently focus on coding, innovation in STEAM and robotics. However, creating tech literate students is a moving target with analytics technology and virtual reality

arriving at education's doorstep immediately. Over the next couple of years, the technology focus is predicted to shift to artificial intelligence and the internet of things (Freeman et al., 2017). As each new technology emerges onto the global landscape and job market, the school must pivot and redesign the nature of the STEAM curriculum to reflect real-life shifts in the global market.

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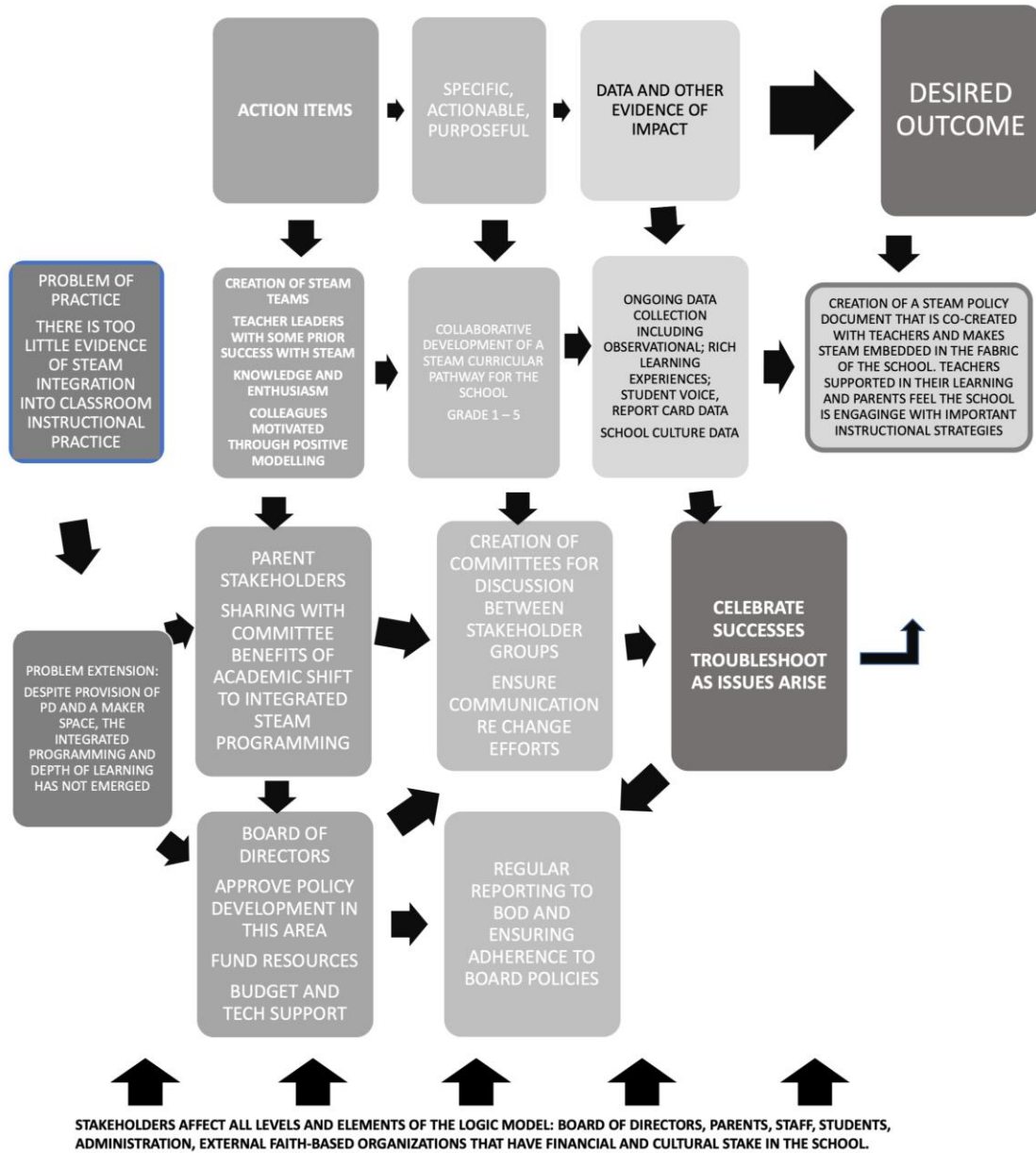
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Appendix A

Steam Integration Logic Model for Aro Academy



Appendix B

Behavioural qualities of Flexible and Adaptive Leadership, and those of Transformational Leadership.

Flexible and Adaptive Leadership (Yukl & Masud, 2010)	Transformational Leadership with incremental change theory
<p>When changing leadership positions or changing organizations to a new environment, new behaviours are required. Success in these changes indicate flexible and adaptive leadership. (Yukl & Masud, 2010)</p>	<p>Transformational leaders make strong positive and personal connection to others and are able to articulate a vision of the organization and a sense of team that goes beyond the individual (Cawsey et al., 2016).</p>
<p>How does a leader change behaviour to suit the situation and context? Flexibility is “the extent to which a leader’s behaviour changes for different tasks and different people and personalities. (p. 82)</p>	<p>Transformational leadership involves the, “behaviors to develop, share and sustain a vision [. . .] with the intention [. . .] to encourage employees to transcend their own self-interest and achieve organizational goals” (Anderson et. al., 2018, p. 55).</p>
<p>In crisis a leader demonstrates flexibility in how well they handle “immediate crises”.</p>	<p>Transformational leaders can build cohesive partnerships and relationships during moments of chaos and urgency (Cawsey et. al., 2016).</p>

<p>As a leader, dealing with competing value systems is difficult. Leadership that is flexible must demonstrate a balance or “trade off” of certain behaviours like “reliability and efficiency versus the need for innovative adaptation to emerging threats and opportunities” (p. 82)</p>	<p>Continuous incremental change context and transformational leadership aligns to concepts of building relationships, engaging lateral leadership, encouragement and trust building (Cawsey et al., 2016).</p>
<p>For each context a leader finds him/herself in, there should be an understanding of how to determine the parameters of the situation and exhibit behaviours that are appropriate for it.</p>	<p>“Transformational leaders aim to raise employees’ awareness of the importance of organizational outcomes” (Anderson et. al., 2018, p. 55). Indicating an ability of transformational leaders to behave in ways that speak to a variety of people with different agendas.</p>
<p>Flexible and adaptive leadership is difficult and “leaders need to have a high level of commitment to do what is necessary and ethical” (p. 84).</p>	<p>Anderson et. al. (2018) argue that transformational leaders engage employees by establishing a vision of the organization and creates a moral imperative or a narrative around the contributions the organization makes to society.</p>

Appendix C

Spiral and cyclical process for change at Aro Academy. Explicit outline of each process in the table following the cyclical graphic.

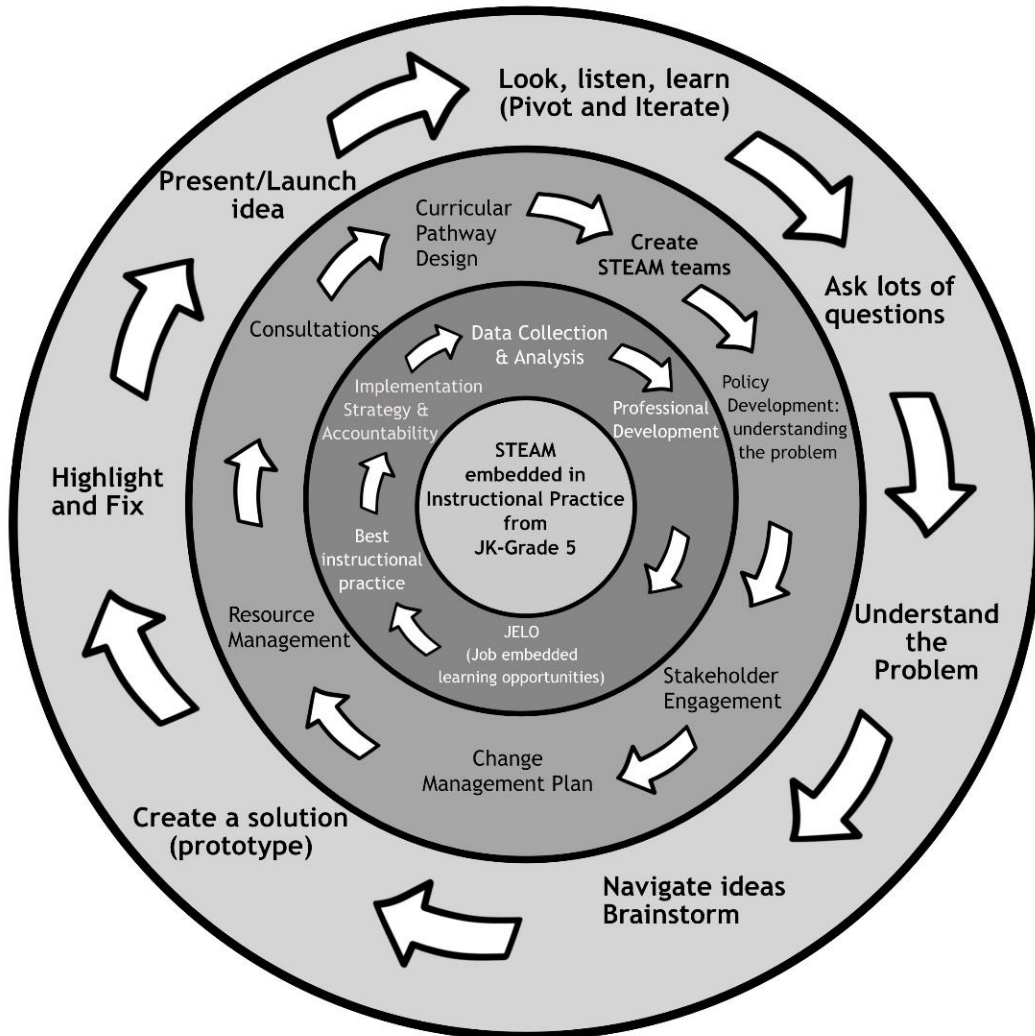


Figure 15. Cyclical process for change in instructional practice at Aro Academy. Using Design Thinking as a change strategy goals can be reviewed developed and implemented with strategies for challenges and setback management. By L.R. Kaye, 2020. In part modified from A. Gallagher and K. Thordarson, 2017.

Appendix C

Continued: Table companion to graphic

Design Cycle Stages of Change Process	Action Items related to STEAM integration at Aro Academy	Principal Management Items and resource support	Indicators and Look fors	Who is responsible for monitoring? Timelines	Outcome
Look Listen Learn (Pivot and Iterate)	Create STEAM Teams	Data Collection & Analysis	<ul style="list-style-type: none"> -STEAM teams reflect all stakeholders -data collected is anecdotal, school-culture based, report card data, learning skills data, standardized tests, and other Board approved data (i.e. DRA, CASI, OWA) -collaborative meeting structure for STEAM Teams, meet bi-monthly -STEAM Teams set goals for each meeting and assign who will monitor and report on goals -active use of pedagogical documentation -jigsaw method used amongst STEAM Teams to ensure sharing of outcomes, common trouble shooting -student voice present on STEAM Teams and as part of data collection -self-assessments for teachers to improve professional development targets 	<p>Principal and Coordinator of Teaching and Learning</p> <p>Teachers (gathering data directly)</p> <p>Tech team (data collating)</p>	<p>STEAM Policy development to fully embed high yield practice into instructional</p>

Design Cycle Stages of Change Process	Action Items related to STEAM integration at Aro Academy	Principal Management Items and resource support	Indicators and Look fors	Who is responsible for monitoring? Timelines	Outcome
			-self-assessments for students to understand areas of interest -consider third teacher/environment needs Pivot and Iterate -this is the second pass after implementation (see bottom cell for look fors related to adjusting for error, improving outcomes, analysing outcomes and assessing programming against established look fors, goals, instructional targets and teacher/stakeholder feedback.		core at Aro Academy. By proxy: Improved student achievement and engagement.
Ask lots of Questions	Policy Development & Problem Exploration		-improved instruction is outcome goal of STEAM integration. Ongoing achievement data collection to monitor policy development and effectiveness -continual professional reading assigned to STEAM groups to keep abreast of STEAM policy in different districts -thinking about STEAM on a continuum that moves away from single event activities and towards embedded practice across subjects -understanding that STEAM must replace old practice and policy creation creates the impetus for change	STEAM PLC groups led by team leads Principal: explain and discuss programming to stakeholders	

Design Cycle Stages of Change Process	Action Items related to STEAM integration at Aro Academy	Principal Management Items and resource support	Indicators and Look fors	Who is responsible for monitoring? Timelines	Outcome
			<ul style="list-style-type: none"> -understanding the “necessity of coherence among policy, programs, implementation and professional learning” (SEF, 2013, p. 6) -draft document outlines STEAM curriculum where students “engage in authentic and relevant performance tasks that are connected to learning goals” (SEF, 2013, p. 10) -uses a common language across all grades, with increasing complexity of understanding -common assessment structures across grade teams; variety of assessments -learning goals in STEAM include goals beyond the curriculum: global problem solving, learning skill developments. -technology, inquiry learning and activities engaging real-world school, community and global problems develop critical thinking and problem-solving skills 	<p>Teacher accountability</p> <p>Engage Director of Innovation in creation of draft document alongside TEAMS</p>	<p>STEAM Policy development to fully embed high yield practice into instructional core at Aro Academy.</p> <p>By proxy:</p>
Understand the Problem		Professional Development; Job embedded	<ul style="list-style-type: none"> -engage in STEAM tasks with students; developing assessment and feedback strategies -engaging a failure is positive approach to learning 	Lead Teachers and mentoring administrators	Improved student achievement

Design Cycle Stages of Change Process	Action Items related to STEAM integration at Aro Academy	Principal Management Items and resource support	Indicators and Look fors	Who is responsible for monitoring? Timelines	Outcome
			<ul style="list-style-type: none"> -set meaningful, smaller goals for each meeting; track implementation and progress -celebrate small successes -have a living document that tracks the STEAM journey -engage curricular experts in each subject to determine pathway for each grade -ensure there is not overlap in topics and activities at each grade -principal works through implementation dips with staff directly -ensure curricular pathways are clearly outlined and that all stakeholders have time to have input before implementation -maintain the integrity of instruction – educational and STEAM experts should participate in this piece -identify curricular and learning skill expectations that should be highlighted in the policy document -celebrate student progress at several steps in the process; not just end points 		<p>yield practice into instructional core at Aro Academy.</p> <p>By proxy: Improved student achievement and engagement.</p>

Design Cycle Stages of Change Process	Action Items related to STEAM integration at Aro Academy	Principal Management Items and resource support	Indicators and Look fors	Who is responsible for monitoring? Timelines	Outcome
Create Prototype Solution	Resource Management		-continuous improvement is a focal goal -engaging the Board of Directors in the STEAM journey, including membership on STEAM Teams- *iidentify human, physical and time resources for the project -ensure funding for technological aspect of this programming -resources are chosen to assist interventions -resources are chosen to allow for a variety of demonstrations of learning -is the environment aligned to ease of implementation -brainstorm strategies for classroom implementation and those items required for success -budget process reflects STEAM implementation needs	Principal STEAM Team Leads Head of School and Board of Directors	STEAM Policy development to fully embed high yield practice into instructional core at Aro Academy.
Highlight and Fix	Curricular Pathway Design Creation	Best instructional Practice exploration	-ask: where are we? Where do we need to go? -utilizing Ministry Curriculum outcomes to create new policy document	STEAM Teams Principal	

Design Cycle Stages of Change Process	Action Items related to STEAM integration at Aro Academy	Principal Management Items and resource support	Indicators and Look fors	Who is responsible for monitoring? Timelines	Outcome
			<ul style="list-style-type: none"> -build on best practice literature to ensure students are receiving up-to-date, high yield instruction -students will be explicitly taught and have opportunity to practice skills beyond the classroom such as global citizenship, stewardship of the earth, self- and other-advocacy, cooperation and teamwork. -build on staff knowledge and knowledge mobilization among staff (using Job embedded learning opportunities, co-teaching) -ensuring resources for implementation -qualitative and quantitative data is used to meaningfully inform planning, goal setting, activities, instructional improvement -rich tasks engage many students. -in what ways can the religious curriculum, holidays, celebrations and traditions be built into the STEAM curriculum? -ensure an intervention plan in place for students who are struggling -determine a variety of entry points and varied assessment 	<p>Instructional leaders and innovation leader</p> <p>CDL Leaders</p>	<p>By proxy:</p> <p>Improved student achievement and engagement.</p>

Design Cycle Stages of Change Process	Action Items related to STEAM integration at Aro Academy	Principal Management Items and resource support	Indicators and Look fors	Who is responsible for monitoring? Timelines	Outcome
			<ul style="list-style-type: none"> - “focus and energy on the instructional core (STEAM) are key to teaching, learning and leading” (SEF, 2013 p. 6) -set measurable and aggressive targets for student achievement and culture data; revisit regularly -engage a transparent learning process including assessment practice, implementation of programming practice, successes and failures -using descriptive feedback as a high yield strategy for both staff and students 		<p>STEAM Policy development to fully embed high yield practice into instructional core at Aro Academy.</p>
<p>Launch</p>	<p>Action! Classroom implementation of Pathway Design</p>	<p>Accountability</p>	<ul style="list-style-type: none"> -continually navigate student learning needs and ensure the curriculum meets those needs -continually adapt and reflect evidence-based practice -continually collect and reflect on data collection; staff input on the STEAM continuum students positively engaging in the program; using learning skills: cooperation, perseverance, positivity to pivoting during failed trials -communication with Middle School after first term to determine student success in STEAM subjects 	<p>Discuss progress and implementation at staff meetings, board meetings, in written documents, parents, and STEAM Team</p>	<p>By proxy: Improved student achievement and engagement.</p>

Design Cycle Stages of Change Process	Action Items related to STEAM integration at Aro Academy	Principal Management Items and resource support	Indicators and Look fors	Who is responsible for monitoring? Timelines	Outcome
			<ul style="list-style-type: none"> -participants accept accountability for student successes, difficulties and learning overall -participants think systemically to ensure they see the benefits of replacing old behaviours and methods with new -utilizing social media to celebrate success -utilize other media to advertise the instructional practice at Aro Academy -teachers expected to participate in this new curriculum; assistance for those that are struggling -share results (data, anecdotal, video, pedagogical) with Board of Directors, other funding sources -implement and adjust based on feedback -revisit the policy document after each unit is completed to make adjustments that are evidence based -determine how this curriculum supports transitions between classes, grades, and schools 	<p>Principal</p> <p>Staff</p>	

Appendix D

Framing responses to anticipated change resistance concerns and questions

Question: <i>How do we fit STEAM into our already crowded half day with our classes?</i>			
Stakeholder(s)	Concerns: What are the underlying concerns?	Responding to those concerns	Communication by what method(s)?
Teachers - General Studies	Concern about time for instruction and assessment in all the English-language curriculum: math, language, social studies, science, the arts, phys ed.	<p>STEAM should replace old practice, not be an add-on. This should reduce your time limitations as all subjects are being addressed through one larger unit of study.</p> <p>Through exploratory STEAM days, staff can see how this type of pedagogy works with students</p> <p>We will create integrated units of study together, which will include assessment strategies for all your subjects.</p> <p>Each person brings something special to the STEAM team and we want to build on that and give a voice to each of your areas of expertise.</p>	<p>In person</p> <p>Weekly staff newsletter (more informational items like research links, fun STEAM activities they can try with their classes as they learn).</p> <p>Through other teacher leaders already engaged in the practice.</p> <p>Social Media - celebration of teachers at Aro Academy.</p>

Question: <i>How do we fit STEAM into our already crowded half day with our classes?</i>			
Stakeholder(s)	Concerns: What are the underlying concerns?	Responding to those concerns	Communication by what method(s)?
Teachers - Religious Studies	Concern about time for the faith-based curriculum, the many holidays and observances, presentation, language acquisition	<p>Stories and literature are a great starting place for STEAM, including Bible stories. For example: Noah’s Ark Unit on simple machines and stability of structures.</p> <p>If we can collaborate more with the general studies teachers, we extend the time on academic pursuits while continuing to infuse religious and language studies. We can redesign the way we do celebrations here! This is a project to have religious and general studies voices heard.</p> <p>Each person brings something special to the STEAM team and we want to build on that and give a voice to each of your areas of expertise.</p>	<p>In person</p> <p>Weekly staff newsletters (more informational items like research links, fun STEAM activities they can try with their classes as they learn).</p> <p>Also, ideas that draw on religious story integration into STEAM learning.</p> <p>Social Media - celebration of religious studies at Aro Academy.</p>
Parents	Concern that their child is getting a great education in both religious and general studies	<p>Students who love school, learn more. Engagement in inquiry learning is evidence-based best practice and supports 21C learning. Our key focus here is ensuring students are ready for the job market that lies ahead which has moved beyond memorization and rote learning.</p>	<p>In person</p> <p>Newsletters (ongoing celebration of learning through STEAM)</p>

Question: <i>How do we fit STEAM into our already crowded half day with our classes?</i>			
Stakeholder(s)	Concerns: What are the underlying concerns?	Responding to those concerns	Communication by what method(s)?
			<p>Social Media - Students having fun and learning!</p> <p>Parent and student surveys share outcomes.</p>
Board of Directors	Concern that children are receiving the best possible education; concerns about enrollment	<p>Students who love school, learn more. Engagement in inquiry learning is evidence-based best practice and supports 21C learning. Our key focus here is ensuring students are ready for the job market that lies ahead which has moved beyond memorization and rote learning.</p> <p>Discussions about what works in professional learning and high yield strategies like the importance of Hattie’s collective teacher efficacy.</p>	<p>In person Board Meetings (monthly updates)</p> <p>Social Media - celebrating teachers and students engaging in STEAM.</p> <p>Professional learning video documentation.</p> <p>Parent, students, staff surveys throughout implementation to track engagement</p>
Funders	Concern that students/parents and community will utilize funding in a way that meets the criteria of that funding. For example: funding from one	<p>Our religious studies teachers are taking on STEAM so that students engaged in their faith-based learning and language learning can engage in deeper inquiry learning. Through STEAM we work towards a more seamless day where there are learning connections between what is done in general studies and what is done in</p>	<p>In person funding discussions</p> <p>Newsletters</p>

Question: <i>How do we fit STEAM into our already crowded half day with our classes?</i>			
Stakeholder(s)	Concerns: What are the underlying concerns?	Responding to those concerns	Communication by what method(s)?
	large organization stipulates that monies must be used to further religious instruction in the second language.	religious studies.	Information (i.e. provision of research like the Horizon Report, 2017) Social Media acknowledgement of funder generosity; demonstrate visual documentation of use of funding.