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The implementation of problem-based learning in mathematics through teacher capacity building

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Abstract

Current instructional approaches to mathematics are not meeting the diverse needs of students in Ontario. In response to steadily declining mathematics performance, the Ontario Ministry of Education released a Renewed Math Strategy geared towards addressing the gap in achievement. The position of mathematics lead teacher was created as part of this strategy. These teacher leaders are expected to devise plans for improvement initiatives relevant to their respective school sites. This Organizational Improvement Plan (OIP) explores the problem of practice where the mathematics lead teacher wishes to facilitate the implementation of problem-based learning in mathematics at an Ontario elementary school. Problem-based learning is a pedagogical approach characterized by student-led learning through teacher facilitation and solving real-world, open-ended and open-entry problems. Perspectives on the problem are gained through analysis of current practices, school board procedures and organizational culture. External and internal forces for change are assessed to establish momentum. Transformational and shared leadership approaches to change leadership, and possible solutions are considered to address this problem. Kotter's 8-Stage Model for change is used to create a change implementation plan, guide communication and to evaluate and monitor the change process. The proposed solution incorporates the Systems Improvement Learning Cycle (SILC), a *Plan, Act, Observe and Reflect* cycle, collaborative inquiry and team teaching guided by the mathematics lead teacher and school administration. Ethical consideration and possible next steps are outlined in this OIP. It is proposed that if implemented, this OIP will successfully support teachers through the implementation of problem-based learning, leading to improved student learning outcomes. Key words: *teacher capacity building, mathematics, school reform, shared leadership, transformational leadership, coaching*

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Executive Summary

This organizational improvement plan represents the work undertaken during a doctor of education program. This work investigates the need for a strategic approach to professional learning during the implementation of problem-based learning in mathematics at an elementary school, Elm Grove Public School (EGPS), located in an urban school board, Blue Heron District School Board (BHDSB).

Chapter 1 provides an introduction of the problem of practice that is the focus of this organizational improvement plan. Organizational structures and current leadership approaches are explored. Ontario's Renewed Math Strategy (RMS) is discussed as part of the organizational history, exploring the Ministry of Education's goals and current achievement data in mathematics. EGPS' cohort mathematics scores on the Education Quality Assessment Office (EQAO) testing across are analyzed and the agency of the mathematics lead teacher (MLT) is discussed. Transformational and shared leadership are presented as underpinning the leadership lens behind this organizational improvement plan. The Ontario Leadership Framework (OLF) and the Five Core Competencies of Leaders are offered as the leadership frameworks guiding the development of this organizational improvement plan. Guiding questions, challenges, a vision for change and a study of the forces that drive change at EGPS are explored. Finally, key stakeholders and organizational change readiness are discussed.

Chapter 2 delves into how change might take place at EGPS. Kotter's 8-Stage Model (1996) is presented as the theory and basis for proposed change at the school. Nadler and Tushman's (1980) Congruence Model for Organizational Analysis is used to perform a gap analysis and further understand the dynamics and performance of the organization. Required changes resulting from the gap analysis are explored, including a system of supports in place for

teachers during the implementation of mathematics related change. Possible solutions are put forth with corresponding benefits, drawbacks, required changes and resources needed. Systems Improvement Learning Cycle (SILC) is chosen as the solution to the problem of practice because it is aligned with current approaches to system improvement in Ontario and fits with the structure at EGPS. Collaborative inquiry and constructivist professional development (Pitsoe & Malia, 2012) are incorporated in the SILC solution. The role that growth mindset plays in the SILC cycle is also explored. Kotter's 8-Step Model (1996) is put forth as a framework for communication throughout implementation.

In Chapter 3, implementation of the chosen solution is laid out. Problem-based learning is compared with traditional approaches to mathematics instruction. Priorities and goals for implementation are shared, including garnering formal leadership support, sharing the rationale behind PBL, eliciting understanding surrounding this learning theory, developing and sustaining a collaborative culture, and providing individualized support for teachers. A detailed implementation plan is outlined along with corresponding timelines and a communication plan informed by Klein's (1996) key principles of organizational communication. Current and proposed organizational strategies are explored and potential implementation challenges stipulated, including the varied needs of teachers and underlying assumptions. Change process monitoring and evaluation outlined, based on the concepts of open communication and ongoing feedback. A detailed monitoring and evaluation plan is outlined and ethical issues considered.

Next steps and future considerations conclude this organizational improvement plan, including the importance of maintaining the culture of collaboration and inquiry that is established as part of implementation and ensuring that it carries forward to other change initiatives and reform in mathematics at EGPS.

Definition of Terms

- *EGPS* - Elm Grove Public School, a pseudonym for an elementary school located in a large urban school board in Ontario.
- *BHDSB* - Blue Heron District School, a pseudonym for a large urban school board in Ontario.
- *MLT* - Mathematics lead teacher
- *PBL* - Problem-based learning.
- *ELL* - English language learners
- *SIP* - School improvement plan
- *POR* - Position of responsibility
- *SILC* – Systems Improvement Learning Cycle

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Chapter 1: Introduction and Problem

Introduction & Organizational Context

Elm Grove Public School (EGPS) is in the Blue Heron District School Board (BHDSB), a large urban school board in Ontario. EGPS caters to kindergarten through grade 5 students following a recent regional reorganization. It is dual track with both French Immersion and regular English track programs available. Enrolment is decreasing on the English side but rapidly increasing on the French side due to rising popularity of the French Immersion program in Ontario, with current student enrolment sitting at 300. There are 40 staff members and an administration team comprised of a principal and two teacher chairpersons. The chairpersons' role is to liaise between teaching staff and the principal.

The surrounding community is mostly upper middle class. There is an involved parent council that advocates and raises funds for various projects in the school and neighbourhood. Parental involvement is generally high, but it varies across the two tracks, with extra involvement in the French immersion track and less on the English side. A contributing factor may be the fact that some French Immersion students are bussed to EGPS from other neighbourhoods. Other contributing factors might include parent availability, differences in socioeconomic status and family situation. Parental involvement and understanding of educational programs is a reliable indicator of whether or not a child will be enrolled in French Immersion programs (Roy, 2008, p.397).

Vision, Mission, Values, Purpose, and Goals. The ideological framework of the school is complex. One formal belief that is evident in the structures and expectations at EGPS is that individuals must work together to deliver the best education to all students in the school. A belief that is connected to this is that students have diverse needs that should be addressed. By

extension, the worldview that has been explicitly communicated in writing on the school website is that all students are able to succeed, given the appropriate support and opportunities.

The mission of EGPS is to provide quality education to all students and enable them to acquire the knowledge, skills and values required to become responsible members of society, a message which is communicated in the student agenda and in the school foyer. The school's vision is to provide a positive and caring environment where staff works together to provide the best education such that children can grow and succeed. The school has the same values as the school board, which include strong public education, partnerships between students, schools, families and the community, diversity, the commitment and skills of school staff, equity, innovation, accountability and accessibility, as showcased on the website and explicitly stated on posters in classrooms and around the school. Other values are fairness, caring, success, respect and student empowerment. These values become apparent through curriculum, school events and community relations. The purpose of EGPS is to provide quality education to students in both French and English such that they are prepared to succeed in a competitive environment. The goals are to make it an effective school and to identify and help those who are disadvantaged, as well as being environmentally sustainable, and to provide quality education to students in both French and English.

Organizational Structure and Current Leadership Approaches. The administration team at EGPS consists of the principal and division chairs. EGPS is divided into two divisions with a primary and junior division chair whose jobs are to liaise between the principal and teachers. Teachers use this structure to make sensitive concerns known to division chairs, who then speak to school administration on their behalf. School administration generally introduces initiatives in a holistic manner, to the school where applicable. There are teachers who are

willing and open to collaboration and new initiatives and others who are hesitant due to past experiences with change.

Current leadership approaches in the school are transformational and shared in nature. Transformational leadership necessitates guiding others through vision, inspiration and motivating people to work towards achieving common goals (Bass & Riggio, 2006). It involves encouraging creativity and exploring novel ways of action through individual encouragement and the creation of supportive relationships. Doody and Doody (2012) state that transformational leaders establish open lines of communication and supportive rapport with individuals in an organization. The principal at EGPS sets goals in collaboration with staff and provides guidance throughout the process of reaching them. Some of these goals are guided by the school improvement plan (SIP) and others are based on that which the administration team deems necessary or beneficial in conjunction with conversation and feedback from teachers.

Interaction between leaders and followers is the cornerstone of transformational leadership (English, 2008, p.15). The principal at EGPS communicates goals with teachers and engages them in the process of finding ways to reach them, through emails and in meetings. He also acts as an instructional leader. Hallinger (2005) notes that such leaders are goal-oriented individuals who can pinpoint a precise direction for the school and can motivate his or her followers to work towards achieving that goal. These principals are willing to work with teachers to reach goals for the betterment of the school (Hallinger, 2005, p.224).

Shared leadership is very much in line with the leadership framework that the school board and, by extension, EGPS has adapted. Gibb (1954) postulated that shared or distributed leadership is comprised of groups of leaders who work together to take leadership actions, a concept which has evolved to Pearce and Conger's definition of shared leadership as "...a

dynamic, interactive influence process among individuals for which the objective is to lead one another to the achievement of group or organizational goals or both” (p. 1). Shared leadership theory is important when looking at reform in schools because it provides a framework for harmonizing direction from the top (the school board or school administration) and the contextual nuances and expertise on the front lines (teachers and staff in schools). Shared leadership is a framework that places an emphasis on the relationships and interactions between those in leadership roles by focusing on how leadership practice affects improvement in an organization (Spillane, 2006).

The tenets of shared leadership (Carson, Tesluk, & Marrone, 2007) such as having a shared vision, sharing responsibility and celebrating and using individual expertise to further organizational goals, lend themselves well to issues surrounding the implementation of problem-based learning (PBL) in mathematics. Issues faced by teachers will naturally be made known since they, too, will be involved in leadership. This also impacts decision-making, because teachers will be part of the planning and implementation of the initiative, giving feedback and working with administration and the mathematics lead teacher (MLT) (Lambert, 2002; Barnett, & Weidenfeller, 2016).

Contractual agreements allow for curriculum leads as deemed necessary by individual schools, while others are positions mandated by the Ministry of Education of Ontario. An example of this is the position of MLT, which is integral to this OIP and will be discussed in greater detail throughout this chapter.

Organization History. A recent Ministry Memorandum, sent to board leaders, outlined the need for a renewed focus on mathematics from Early Years to Grade 12 to improve

achievement across the province, and more than \$60 million dollars was to be dedicated to funding the Renewed Math Strategy (RMS).

The RMS provides support to all schools, increases support to schools where students are underperforming in mathematics and gives intensive support to schools with the lowest scores to boost achievement in mathematics. This support primarily emphasizes professional learning, which leads to student learning and well-being through a balanced approach to instruction that aims to develop proficiency and understanding in mathematics. Culturally responsive pedagogy is also important to meet the needs of French-language learners, English Language Learners (ELL) and Indigenous students in Ontario. EGPS has many ELL students and as a dual track school, the issues facing French-language students are also pertinent.

The Ministry's goal for mathematics is that 75% of elementary students achieve a level 3, which means that they are meeting the provincial standard. To identify the needs of mathematics learners, information from the Education Quality and Accountability Office (EQAO) and other assessments were used. Basic skills and conceptual understanding of mathematics are an important goal in Ontario to allow students to apply their skills and critical thinking to real-life tasks. School-level supports involve providing release-time for teams of teachers to work together and collaborate in professional learning and capacity-building activities. Each elementary school must have up to three lead teachers who are responsible for extending and deepening their knowledge in mathematics through collaboration with other MLTs. They must then apply this learning to their practice within the school and share with other teachers, followed by sharing at transition meetings within the LC.

Each school board is given funding to allocate a part-time specialist teacher in mathematics; an English-language and French-language professional learning mathematics

facilitator; funding for school board supports to grade 9 and 10 mathematics teachers; funding for networking; pedagogical leadership for kindergarten to grade 3 and summer learning programs in mathematics. Ministry officials will engage in dialogue with school boards in working towards implementation of the RMS.

Mathematics performance at EGPS reflects a similar decline as seen in the rest of the province. The school has three MLTs who meet regularly with the school principal to discuss goals and ideas. These lead teachers represent both the English and French tracks, as well as the primary and junior divisions. As part of the RMS, EGPS must look for ways to improve student learning outcomes in mathematics. Despite various school and school board PLCs and learning pathways, mathematics scores continue to decline.

Leadership Position Statement

As mentioned, the MLT position is a relatively new one that has been mandated by the Ministry of Education in Ontario. This position was created as part of the RMS to address the need for change in mathematics instruction. Each school has different areas of need, thus the school-based MLT position allows for contextual relevancy and provides agency for teacher leaders to lead change. The position and responsibilities of the MLT at EGPS will be the focal point when addressing the problem of practice throughout this OIP. As the lead MLT at EGPS, I will be leading and facilitating the change process as described in this OIP.

Transformational and shared leadership are the chosen frameworks for the development of this OIP. In this section, literature surrounding both theories and the ways in which these theories connect with the problem of practice are discussed.

Transformational Leadership. Transformative leadership is a framework where those who lead and those who follow work together and support one another towards improvement

(Burns, 1978). It is characterized by individualized consideration, which describes the level of attention the leader gives to the individualized needs of followers; intellectual stimulation, which entails the encouragement of risk-taking and critical thinking, inspirational motivation, the articulation of the vision and challenging of high standards; and idealized influence, which describes the modeling of moral and ethical behaviour by the leader (Bass & Bass, 2008; Northouse, 2013; Lamm, Sapp & Lamm, 2016). Allen, Grigsby and Peters (2015) define transformational leadership as involving a leader who finds a way to unite staff such that they work together to meet a goal as set out by the leader. This leader provides a clear and purposeful goal that he or she and the staff work towards achieving. There is also the element of empowerment wherein the leader seeks to empower teachers to achieve these goals. There is a relationship between transformational leadership and school climate, which in turn affects school culture (Allen et al., 2015, p.3).

Teachers' perceptions of school leaders can play a large role in the implementation of curriculum change in mathematics. Transformational leadership on the part of the principal will help the MLTs set up systems to support the implementation of these changes. It will be useful to see how transformative leadership can work in conjunction with distributed or shared leadership to support teachers throughout implementation. A lack of transformational leadership can result in leaders who mislead themselves, leading to misrecognition, which means that the leader does not criticize his or her own stake or interest in achieving a goal (Bourdieu, 2008 as cited in Bolton, 2011, p.226). This can result in teacher apathy or disinterest because the leader will not have sufficiently analyzed the change initiative in a manner that considers stakeholder professional context.

Shared Leadership. Shared leadership maximizes the human resources in an organization by allowing individuals to take on leadership roles in their areas of expertise. In shared leadership individuals lead each other, which allows for a reciprocal sort of relationship between formal leadership and members of the organization (Cawthorne, 2010; Bezzina, 2007). Shared leadership involves sharing power by giving it to the most qualified individuals, setting limits for decision-making power, creating a climate where people feel comfortable leading initiatives, allowing those who are qualified to have some autonomy over their resources and accepting the decisions that these leaders make (Carson, Tesluk, & Marrone, 2007).

As the lead MLT, I have a passion for and am knowledgeable about mathematics and have expertise in this subject area as well as some decision-making power related to issues pertaining to mathematics instruction at EGPS. Shared leadership provides a useful framework for this OIP because it allows for the sharing of power and the empowerment of individuals that can address issues surrounding the success or failure of mathematics related curriculum change. This leadership framework provides the opportunity for critical discussions and the building of trust in an organization, such that change becomes a part of the culture and a way of doing (De Jong & Dirks, 2012). As Aime, Humphrey, DeRue and Paul (2013) suggest, it is important that those who are leading feel that they are making a difference. The MLT should be involved in decision-making, as should members of the mathematics committee and mathematics teachers in the school.

Leaders need to develop the leadership skills in others with the understanding that developing human potential leads to positive outcomes for the organization. New relationships are also critical, and the leader has to create the circumstances for greater organizational capacity through the fostering of relationships. Collaborative cultures should be purposeful and focus on

the right outcomes to be positive. School culture needs to be developed to create the conditions for these systems and supports. Resistance is often seen by leaders to be a setback, but the idea that resistance can help improve the initiative is critical when looking at curriculum reform (Fullan, 2007).

Leadership Problem of Practice

One of the challenges faced by elementary schools across Ontario is the lack of sustainable implementation of professional learning initiatives pertaining to curriculum in mathematics. Traditional approaches to mathematics instruction are not meeting the diverse needs of students. According to the Education Quality and Accountability Office that puts together EQAO testing in Ontario, the percentage of students in grade 3 who are meeting the Provincial Standard in mathematics has been steadily declining from 71% in 2009 to 67% in 2014 (Education Quality Assessment Office, 2016c). In response to this, the Ministry of Education has recently allocated \$60 million to be used to improve mathematics scores on EQAO testing through various curricular initiatives. One of the areas in which students' struggle is problem-based questions and mathematical communication.

School culture and relationships between teachers and school leadership play a large role in the implementation phase of curricular changes. There is a lack of time, minimal access to resources and decreased teacher leadership, which results in diminished teacher implementation of professional learning initiatives as they are presented. As a result, the degree of authentic, measurable change focused on addressing and achieving school board math-related initiatives is limited. This problem of practice investigates the need for a strategic approach in professional learning initiatives related to the implementation of problem-based learning in an Ontario elementary school.

Framing the Problem of Practice

Historical Overview of the Problem of Practice. Improving mathematics instruction has been an area of interest in the province of Ontario for many years. EQAO scores have demonstrated a decline in student performance in mathematics. In 2012, 58% of grade 6 students met or surpassed provincial math standards and in 2016, that number fell to 50%. The percentage of grade 3 students who performed at or above grade level fell from 68% to 63%, while the number of grade 9 students who met or exceeded provincial standards decreased by one (1%) percent. During this time, students in both grades 3 and 6 improved in reading and writing (Education Quality and Accountability Office, 2016a). Data from the EQAO scores also shows that there is no difference in performance between males and females (Education Quality and Accountability Office, 2016b).

The EQAO releases achievement data for each grade level. In 2012, 39% of grade 6 students did not meet provincial standards, in 2013 that number increased to 41%, in 2014 and in 2016 it increased further to 47% (Education Quality and Accountability Office, 2016c). This is worrying, in that it not only shows that a very large percentage of students are not succeeding in mathematics, but that more and more students are not meeting provincial standards. This indicates that there is a misalignment between current instructional practices and student learning outcomes.

The Ministry of Education of Ontario published a document entitled “Paying Attention to Mathematics Education: K-12.” In this document, the need for refocusing on mathematics is laid out. This focus on mathematics suggests beginning with curriculum, planning and connecting key concepts across grades, assisting students in making sense of relationships between strands in mathematics, providing opportunities for application of mathematical knowledge, co-learning,

undertaking meaningful, complex tasks, using higher-level thinking, encouraging diverse approaches, differentiating instruction, fostering an environment where questioning is welcomed and developing goals and success criteria based off of student reasoning (Ontario Ministry of Education, 2011).

Problem of Practice Framed Using the Ontario Leadership Framework and the Five Core Competencies of Leaders. The Ontario Leadership Framework (OLF) is a roadmap for leadership that was created based on the thoughts and experiences of effective leaders in Ontario and around the world. It outlines the skills, attitudes and knowledge that strong leaders have and discusses leadership language that allows for quality discussion, collaboration and professional learning (The Institute for Education Leadership, 2013). EGPS is situated in Ontario, thus any leadership framework geared towards finding a solution to the problem of practice at the centre of this OIP must align with this document.

The OLF states that while system leaders play an important role by setting up supportive system practices and procedures to lead school leaders, school leaders themselves are critical to the development of best teaching practices, effective schools and improved student achievement and well-being (The Institute for Education Leadership, 2013). The key concepts of the OLF that will provide the foundation for framing this problem of practice are leadership, management, authority and context.

The OLF cites Leithwood (2012), who states that Ontario's commitment to equity and inclusion in education necessitates the sharing of leadership. This, along with the key concepts of the OLF will provide a framework for understanding the problem of practice and developing this OIP. This OIP focuses on leadership practices that can provide systems and supports at the

school level throughout the implementation of PBL. As such, the guidelines for school-level leadership as outlined in the OLF will be used.

Another framework that is of particular interest with respect to this OIP are the five core leadership capacities, as outlined in the Ministry of Education document entitled *Ideas into Action: For School and System Leaders*. The first capacity put forth in the document is setting goals, which refers to working in conjunction with others to make sure that specific, measurable, attainable, results-oriented, and timely (SMART) goals are created. The second capacity is aligning resources with priorities, meaning that financial, capital, human resources, curriculum, professional learning resources and program allocations are all connected to student achievement and well-being. Promoting collaborative learning cultures is the third capacity, followed by using data to show the need for school improvement and finally, engaging in courageous conversations when challenging current practices in an organization (Ontario Ministry of Education, 2009, p.5).

The OLF and the core capacities are relevant to this OIP since EGPS is located in Ontario and that the OLF is a roadmap used to frame leadership in the province. By extension, the five core capacities of effective leaders are connected to the OLF and used as a guideline for leaders. All five capacities as referenced by the OLF will be analyzed to better understand the goal state of the organization.

Bolman and Deal's Four Frames. Bolman and Deal's (2013) Four Frames Model consists of four frames: structural, human resources, political and symbolic. The structural frame creates policies, procedures and hierarchies comprised of standards and formal roles in an organization (Bolman & Deal, 2013). The structural frame plays a large role at EGPS. The central leadership structure involves a principal and vice-principal who work closely with the office administrator. As mentioned, we also have division chairs who are classified as holding

PORs or positions of responsibility. There are also subject leads who oversee committees that are tasked with guiding subject related initiatives. School administration is open to the creation of groups and committees to help with initiatives, but there is a chain of command that is to be followed. Any created committee often must fall in line with the current structures.

The human resources frame involves looking after the needs of individuals, supporting them so that they succeed and improving interpersonal competence (Bolman & Deal, 2013). The principal at EGPS makes himself available and encourages teachers to approach him with concerns and input. He is highly involved, visiting classrooms and providing feedback as well as ideas for improvement. Some teachers appreciate this, while others have stated that they feel it is intimidating. Some teachers feel that they do not need the improvement, which has a direct impact on the success of an initiative, because there is a connection between the successful implementation of a change initiative and a teacher's willingness or belief that the change is useful or needed (Robinson & Timperley, 2007).

In terms of conflict resolution, interactions and coalition building in the political frame, EGPS has a very involved parent community which is generally positive but has some negative aspects as well. Parents place pressure on teachers but often go so far as to speak to the principal about classroom concerns instead of speaking to the teacher first. As mentioned before, parent council and school council do a lot of fundraising and work closely with school administration when deciding where the funds will go. The elementary teachers' union is an example of an external political factor that has an impact on what happens in the school which can sometimes include change initiatives that affect teachers. There is also BHDSB and the Ministry of Education, both of which play an important role when it comes to change at EGPS.

The symbolic frame provides individuals in an organization with a reason for what they are doing, making the mission of the organization meaningful (Bolman & Deal, 2013). The structure of staff meetings at EGPS indicates the importance that is placed on learning. The second half of each meeting is designed as a professional learning session with opportunities for discussion, collaboration and the sharing of ideas or resources. They are usually delivered by the principal, which symbolizes the fact that he is aware of and involved in pedagogical practices pertaining to the classroom. As mentioned, the principal visits classrooms often, sometimes at random and other times to check in on implementation of an initiative during scheduled visits. The symbolic frame as it applies to EGPS is important when looking at how teachers perceive change.

Further Considerations in the Problem of Practice

Teacher Leadership. Teachers contribute greatly to the reform process by changing and adapting the change to meet the needs of their respective contexts. When teachers engage in instructional discourse within schools pertaining to change, they are more likely to take ownership and to help implement it. Drawing upon teacher expertise would help bridge the gap between the top-down nature of curriculum reform and the bottom-up orientation of effective school reform (Brondyk & Stanulis, 2014).

Teacher leaders can create the conditions and environment required to support other teachers to understand and learn through the creation of relationships and coalitions (Brondyk & Stanulis, 2014). Teacher ownership of curriculum change is possible when teachers have the agency to speak and share opinions about curriculum change, thereby becoming change agents. If teachers are actively engaged in the implementation of curriculum change, then they are able to speak authoritatively and situate themselves in relation to it. Teachers are also aware of their own skills and motivations as well as the realities of their workplaces, thus they are aware of the

environment in which they work and their mindsets. This concept links directly to teacher participation in curriculum change because it involves the contextual relevancy of the initiative in question (Kirk & MacDonald, 2001).

The notion of involving teachers in the change process is integral to the problem of practice involving MLTs, because it supports the need for teachers to be engaged on some level in the implementation of change initiatives pertaining to pedagogy. Teachers who are encouraged to lead and accept change must engage in reflection in order to help develop the beliefs, skills and knowledge that address the needs of schools, ultimately resulting in change in teacher pedagogy. Challenging traditional views through critical discourse plays a critical role in changing teacher beliefs (Carrington, Deppeler & Moss, 2010).

Teacher Change Agents and Growth Mindset. Change in schools requires a lead teacher who has the agency to lead his or her colleagues in a contextually relevant manner, given that they work directly with teachers and students in their respective schools (Fastier, 2016). Teacher agency is ecological in that it is tied to context; it can be temporary and spatial, therefore past experiences need to be accounted for. Teacher agency that develops and challenges the status quo in schools requires a well-developed educational philosophy that includes the broader goals of education. Whether or not a teacher embraces risk taking is impacted by their social and professional contexts as well as their past experiences. Top-down prescribed change is a problem because it does not take into account what they call ecological factors that can influence whether or not the change is successfully implemented. Educational change needs to be flexible and take into account teacher agency and what teachers' projective and proactive contexts and mindsets might be (Priestly, Edwards, Miller & Priestly, 2015).

Bearing this in mind, it is essential to include and incorporate teacher voice when designing and implementing professional development. Teachers differ in the types of mathematical knowledge they use when teaching, thus their needs will be different. Although mathematics professional development is often prescribed and delivered in one way, it is not effective because the needs of teachers are so different. Varied teacher needs towards mathematics are shaped by their diverse experiences and backgrounds in math (Caddle, Bautista, Barabara & Sharpe, 2016). In the context of the current problem of practice, one of the roles of the MLT is to discuss and address teacher needs, which necessitates understanding and expertise on the part of the MLT.

Learning and growth is critical when dealing with this problem of practice. Dweck (2006) describes the growth mindset as the belief that human qualities can be developed and formed through practice and cultivation. In the chapter involving the changing of mindsets, she explores the nature of change and the idea that intrinsically, it is a tenet of the growth mindset. Dweck defines a person with a fixed mindset as one who measures self-worth by his or her successes and failures. An individual with a growth mindset sees success and failure as opportunities for growth. Dweck stipulates that asking people to change from a fixed to growth mindset may be difficult because it pulls people away from the reinforcing behaviour and beliefs they have been engaged in since childhood and has become an integral part of the self.

The fixed mindset can lead to people feeling like they do not need to change, rather the world and the circumstances around them need to change. In a school, this can result in stakeholders feeling that pedagogical change is not necessary and that it is not worth trying, given that trying a new strategy means he or she has failed and the individual will avoid problems because it attacks the perception of self that he or she holds to be true.

Dweck's work surrounding mindsets and change is integral to the problem of practice because it applies directly to the issue of whether or not an individual is receptive to change. Looking at growth versus fixed mindsets can help leaders understand why a teacher may be unwilling to consider or take on new change initiatives. Feelings pertaining to success, failure and even comfort with mathematics may also be a contributing factor; an individual with a fixed mindset who did not do well in mathematics throughout his or her schooling may be made uncomfortable for various reasons if he or she is asked to explore the teaching of mathematics in a different way. Exploring these mindsets and the way in which leaders can help teachers move from fixed to growth mindsets is an important subject when looking at the structures required to support the implementation of mathematics related curriculum change.

Problem-based learning. PBL is an approach that is characterized by an environment of stimulation and engagement in problem solving behaviours (Savery & Duffy, 1995). Students learn through completing complex projects based on challenging problems and are actively involved in the design, problem solving, decision-making, and investigation (Thomas, Mergandoller, & Michaelson, 1999). The content of these problems and assessment is authentic, the teacher facilitates learning and learning goals are shared. Reflection and collaborative learning are critical and instruction involves communal inquiry (Moursund, 1999).

PBL is an instructional strategy used in mathematics in order to improve learners' higher order thinking skills through the use of questions that are open to interpretation and assumption by the learner, who then has to justify his or her answer by communicating strategies and reasoning (Tarmizi & Bayat, 2012). Due to this engagement in critical thinking, PBL has a positive effect on student motivation and learning of concepts (Schwartz, Mennin, & Webb, 2001).

Internal Data Analysis

The school improvement plan (SIP) for EGPS resembles the plans for many schools in the province of Ontario. The overarching goal is to prepare students to be problem solvers, to work cooperatively and to think creatively. The goals of equity, well-being and achievement are the cornerstones of the SIP. The goal related to equity is to re-engage underperforming students and maintain a positive environment through a constant and purposeful sharing, discussion and application of strategies and ideas found in professional articles on pedagogy, classroom environment and management. This involves inquiry-based learning and differentiation in the classroom. Well-being involves ensuring that we have healthy bodies and minds by incorporating mindfulness, daily physical activity and environmental literacy in curriculum delivery.

The section of the SIP that is directly connected to the problem of practice that is the focus of this OIP is student achievement, which entails meeting the academic needs of all students. The first component of this section is numeracy and the focus on improving student achievement as outlined in the RMS. This entails increasing the capacity, confidence and enthusiasm in mathematics instruction through professional development. EGPS will undertake a review of materials and resources to ensure all classes have equitable access to manipulative and 21st century appropriate materials. Teachers will share best practices, authentic and rich tasks, new and challenging pedagogical documentation to further professional competence in mathematics education. Students will be taught to apply learning and apply problem-solving skills in meaningful and authentic contexts so that they see mathematics as a relevant part of their current and future lives.

The goals for numeracy are based on student achievement in mathematics in the school. Internal data shows that 37% students are not showing improvement in mathematics achievement between grades 3 and 6. There is also a large difference in student achievement between the English and French tracks, with French immersion students consistently outperforming their English counterparts.

External Data Analysis

External data for this OIP comes from EQAO standardized testing. As previously discussed, EQAO is an arms length organization that creates standardized testing in reading, writing and mathematics in grades 3 and 6 and mathematics in grade 9. The purpose of EQAO testing is to measure how well the education system is nurturing student's reading, writing and math skills (EQAO, 2017). The trends and performance for each school are available through the EQAO's website. For the purposes of this OIP, the data pertaining to student performance in mathematics in grade 3 and 6 will be analyzed.

In 2013, 85% of grade 3 students in Ontario were at or above grade level, 88% in 2014 and 86% in 2016. Although these numbers are relatively high, they are falling, a trend that is more obvious when looking at grade 6 students' performance. In 2013, 79% of grade 6 students were performing at or above grade level in mathematics. In 2014 and 2016, that number fell to 73%. To further illustrate the way in which the numbers are declining, it is important to compare how the grade 3 cohort from 2013 performed on EQAO when they were in grade 6. The number of students who performed at or above grade level in this cohort went from 85% in grade 3 to 73% in grade 6. This demonstrates a 10% decline in student performance in the same group of students, which indicates an issue with mathematics instruction on some level.

The declining trends in mathematics performance at EGPS are similar to the trends in the school board as a whole. In 2013 and 2014, 70% of grade 3 students were at or above grade level and in 2016 that number fell to 69%. In 2013, 61% of grade 6 students were meeting or exceeding grade level expectations, a number which fell to 60% of students in 2014 and 57% in 2016. When comparing the same grade 3 cohort from 2013 through to 2016, there is a decrease from 70% of students meeting grade level expectations in mathematics to only 57% in 2016 when those same students are in grade 6. This is an alarming drop of 13% which demonstrates a downward trend in achievement in mathematics in the school board (see Figure 1.1).

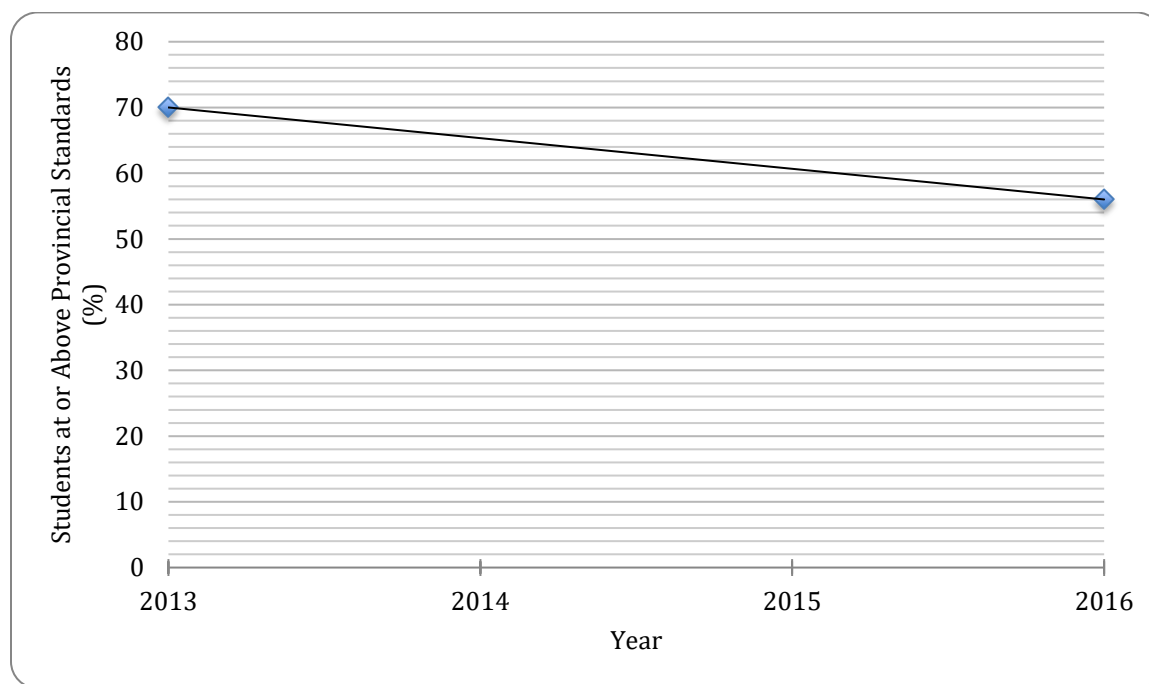


Figure 1.1: Trend line analysis of cohort scores on EQAO from 2013 to 2016.

Leadership Perspective

The problem of practice regarding the procedures required in order to support the implementation of PBL at EGPS is complex. The Ministry of Education in Ontario has outlined

the need for improving mathematics performance in the province, referencing the decline in the number of students who are meeting and passing grade level expectations.

The position of MLT provides a useful method to improve mathematics in a way that is contextually relevant, while working towards board and Ministry goals. As the lead MLT at EGPS, I have the agency to lead change in my organization by working with other teachers and school administration in order to improve student learning outcomes in mathematics. The MLT is someone who teaches mathematics at the school, is passionate about pedagogy pertaining to the instruction of mathematics and is willing to lead through collaboration with others (Ontario Ministry of Education, 2016a). This means that the individual is someone who is willing to learn, share and help develop teachers' capabilities as mathematics instructors. The role of MLT is relatively new and differs depending on other leadership structures in each school. At EGPS, three MLTs work together collaboratively to improve mathematics instruction and student learning outcomes. These teachers also attend board and Ministry conferences and professional learning sessions for guidance and collaborative learning with Ministry and board officials, as well as lead teachers from other schools.

The agency and expertise connected to the MLT position is critical to this OIP and the problem of practice because it provides the opportunity for teacher leadership of change.

Guiding Questions Emerging from the Problem of Practice

One of the lines of inquiry that emerges from this problem of practice is what structures are required in order to support the implementation of curriculum change. How is curriculum change different than other forms of change at the school level? How does this curriculum change translate to teacher practice? How can this change become sustainable? Given that the MLT position is still relatively new, how does teacher mentorship become teacher leadership?

How does this position fit in with the leadership structure at the school? How can the systems and structures for the implementation of PBL be institutionalized such that they become the way of doing at the school? Further, how does this leadership affect the relationship between the MLT and his or her colleagues, as well as the relationship between the lead teacher and school administration?

Challenges

Change Fatigue. Change fatigue, describes what happens when teachers become overwhelmed, passive and even resistant to change initiatives. This is often a result of the repeated top-down initiatives that were being implemented in schools and leads to a negative impact on the implementation of change initiatives as well as teachers' receptiveness to this change. When this happens, real change cannot take place because the change does not translate into an actual change in teacher practice (Dilkes, Cunningham & Gray, 2014). Persistent school reform and the pressures it places on teachers can create cynicism and resistance (Lingard, Mills & Hayes, 2000). It is a psychological response to the belief that too much change is taking place and can have a negative effect on stakeholders in an organization (Berneth, Walker, & Harris, 2011).

There have been various initiatives over the years pertaining to mathematics instruction in Ontario and change fatigue may cause teachers to be unwilling to participate in new initiatives. Burnout and change fatigue have been linked to change cynicism, change resistance, and uncertainty (McMillan & Perron, 2013). This is one of the challenges that may be faced when implementing this OIP and will be discussed further in Chapter 2.

Motivation. If leaders wish to have teachers engaged in reform, their needs, beliefs, commitments and professional contexts must be considered (Day & Leitch, 2007). One

perspective that should be considered is that of usefulness for teachers, which is when the initiative in question relates to teacher and student needs as well as practitioner inquiry. In order to be effective, the change in question should also inspire motivation, commitment and be related to the teacher in terms of his or her professional identity (Day & Leitch, 2007). If these criteria are met, then teachers may feel more motivated to engage and participate in change.

It is important for the leader to realize that simply forcing change on teachers cannot result in motivation. He or she needs to look at the issue on a deeper level rather than simply looking to create teacher buy-in to change initiatives, because this assumes that teachers can be roadblocks (Day & Leitch, 2007). The tenets of transformational leadership can help remedy this challenge and will be discussed further in Chapter 2.

Leadership-Focused Vision for Change

Gap Analysis. Nadler and Tushman's (1980) congruence model deals with the ways in which the performance of an organization is influenced by tasks, people, structures and culture. The higher the congruence between these four components, the better the performance of the organization. The main task of the school is to educate students and with respect to this problem of practice, it is to educate students in mathematics. Teaching students mathematics is interdependent, because the teacher works with other teachers, needs resources and works with outside supports, depending on school administration and the MLT.

When looking at the people involved, the principal, the MLT, classroom teachers and outside board supports work together in the delivering of mathematics curriculum. This collaboration between teachers, school administration and school board staff has to be perceived as useful, be focused and sustained in order for implementation of change to be successful in improving student learning outcomes (Ronfeldt, Farmer, McQueen & Grissom, 2015). When the

focus of the change is a change in pedagogy, teacher and student need should inform the collaboration and implementation processes (Ronfeldt et al., 2015). The MLT must be able to help and lead in the area of mathematics and teachers must be able to teach mathematics and willing to learn. Some are and others are not due to various factors including but not limited to previous experience with change or change fatigue, as discussed earlier. The principal needs to be open to sharing leadership and be capable to lead in times of change.

Organizational structure involves the formal systems, structures, and processes in an organization (Nadler & Tushman, 1980). The rules and procedures surrounding the role of the MLT are not clearly defined given that it is a new position. There is informal teacher recognition at staff meetings and school recognition by superintendents, but nothing formal within the school itself in terms of incentives. Culture looks at the unwritten rules that outline the way that work happens in the organization. Information at EGPS is shared through email and hardcopy notices. Monthly staff meetings and smaller more focused meetings are also used for complex issues. Leadership is mostly shared, transformative and inclusive. The principal encourages people to use their individual expertise and lead, but he oversees what happens and keeps in constant contact with these individuals. There are organizational goals set out by the principal, and he works with staff to find ways to support them to get to where those goals are achieved.

The *Congruence Model* (1980) is useful as a gap analysis tool to gauge where the organization is in terms of systems and supports being in place to help create and sustain change in mathematics instruction at the school. It is evident that although there is some compatibility between the components in the model, there is a need for greater congruency, thus the need for change at EGPS. The organizational structure generally provides a framework for change but

some of the historical and environmental factors that influence school culture are at odds with stakeholder needs.

Future State

The future state of the organization will include systems that support teachers throughout the implementation of mathematics-related curriculum change. The MLT will be integral to the development and maintenance of these systems and structures, liaising between administration and teachers. These systems would include professional development, coaching, mentorship and advocacy for resources. This would be geared towards not only meeting the goals of the RMS, but ultimately to support teachers working towards improving student learning outcomes and will be discussed throughout this OIP.

Forces that Drive Change

The most significant external force that influences the success of this OIP is the Ministry of Education's RMS. The Ministry has mandated that each school have at least one MLT, allocated funds and communicated goals for student performance in mathematics (Ontario Ministry of Education, 2016a). Parents in the community are another factor, because they are heavily involved in what happens in the school. Parent council allocates funds for mathematics and often asks the MLTs at EGPS for input on how to use these funds. The teachers' union is another factor; the MLT is a member of the union, therefore he or she must abide by union rules and regulations.

Internal forces include the principal; the principal's leadership style has a drastic effect on whether or not an initiative in a school is successful, particularly when it is inclusive and learning-oriented (Soini, Petarinen and Pyhältö, 2016). Teacher individual experiences, both past and present, with change also have an impact on whether or not this OIP is successful.

Key Stakeholders

The readiness of a school community for the implementation of a change initiative depends on the readiness levels of key stakeholders, including principals and teachers. The information gathered from these stakeholders can be used to guide implementation of an initiative (Ehlers, Huberty & Beseler, 2013). The readiness of school staff when implementing reform along with the staff's perception of leadership plays a critical role in the progress of an initiative (Huberty, Dinkel & Coleman, 2012).

Principal. The support of the principal is critical in the implementation of this OIP, because he holds the formal position of leadership. The MLT will have to work closely with the principal in order to set up the systems and structures required to support the implementation of mathematics related curriculum change. This may involve in-school supports as well as outside supports (e.g., school board supports, Ministry funding, etc.).

Teachers. Teachers must support this OIP in order for it to be successful, because they are on the front lines. It is teachers who have a direct impact on student learning outcomes. They must be open and willing to work with the MLT in order to establish the procedures and supports that they need to successfully implement mathematics related curriculum change.

Organizational Change Readiness

The change readiness of an organization is characterized by the members' experiences with change in the past, how flexible and adaptable the culture of an organization is, how involved leadership is in the change process and the confidence that members have in leadership. Previous experiences with change affects individual readiness for change, which in turn affects organizational change readiness (Cawsey, Deszca & Ingols, 2016). The development and sustenance of top management support for change is critical to the success of a change initiative

There are various factors affecting an organization's readiness for change, including: making the need for change apparent by referencing the gap between the current and goal state of the organization; individuals believe that the change is right for the organization; members of the organization believe that they can affect change; key individuals in the organization support the change and the benefits of the change have been communicated (Armenakis, Harris & Field, 1999). Judge and Douglas (2009) list eight dimensions related to readiness for change: trustworthy leadership; trusting followers, capable champions; involved middle management; innovative culture; accountable culture; effective communications and systems thinking.

Cawsey et al. created a tool for assessing an organization's readiness for change which was referenced in this OIP in order to understand the readiness for change at EGPS (Cawsey et al., 2016, Table 4.1, p. 108). The previous change experiences of the organization have been generally positive, however with teachers coming from different schools, individual experiences with change vary. Executive support is strong because the principal and vice-principal are supportive of change, endorsing it and being actively involved in its implementation. Leadership is credible and generally trusted and middle managers, the MLTs for the purposes of this OIP, are able to liaise between school administration and school staff. There is an openness to change because there are open lines of communication for teachers to voice their concerns, conflict is dealt with openly and teachers and administration will be willing to look into implementing change related to improving student learning outcomes in mathematics. Future EQAO testing provides a formal measure of change that will allow members of the organization to see the success or failure of the initiative. Rewards for change need to be developed, because at present there is a lack of formal rewards to celebrate success.

Conclusion

In Chapter 1, the organization that is at the centre of this OIP was described, providing historical information and current contexts. The role of the MLT was explained and the need for structures and supports throughout the implementation of mathematics-related curriculum change at EGPS was explored through the analysis of internal and external data. In Chapter 2, a detailed plan for establishing these systems and structures will be described through frameworks for leading change and the provision of possible solutions to the problem of practice as discussed in Chapter 1.

Chapter 2: Framework for Leading Change

This chapter will include an analysis of EGPS as well as a discussion of applicable organizational frameworks that can help implement change. Potential solutions to the problem of practice will be put forth, highlighting considerations for each and proposing a solution that fits best for the organization. To close the chapter, relevant leadership approaches to change will be discussed.

A personal leadership framework of shared leadership and a constructivist orientation towards learning underpin this Organizational Improvement Plan. Shared leadership is "...a dynamic, interactive influence process among individuals for which the objective is to lead one another to the achievement of group or organizational goals or both" (Pearce & Conger, 2003, p. 1). The constructivist paradigm posits that reality and learning are constructed in the minds of individuals and therefore it is not objective, instead there are multiple constructions of reality that are tied to each individual and context (Lincoln & Guba, 1985, p.167). The ontology associated with the constructivist paradigm is relativist, in that reality is relative and subjective (Schwandt, 1998). Constructivism is based on the belief that in order to understand the world, an individual must interpret it in his or her own way by constructing meaning and clarifying how meaning is portrayed through the language and behaviours of those who use it (Schwandt, 1998). Shared leadership connects with the constructivist paradigm because constructivism allows for teachers to build their own meaning and teacher leaders, such as the MLT, to navigate their roles as teacher leaders.

Shared Leadership

Shared leadership involves developing leadership in others so that school improvement can be carried forward and become part of the organization (Fullan, 2006). Although Dollarhide,

Smith and Lemberger (2007) suggest that principals are school leaders who have the agency to initiate change, they must use this power to develop leadership in others. According to Carson, Tesluk, and Marrone (2007) shared leadership requires a team environment that has shared purpose, social support and voice (p.1222). This form of leadership also involves the joint completion of tasks, mutual skill development, decentralized interaction and emotional support (Wood, 2005, p.76).

The problem of practice addressed in this OIP involves establishing supports and systems to help teachers throughout the implementation of PBL. There are likely differing views on which appropriate pedagogical approaches are best and the actual level of student achievement at the school, among other areas. It is essential to reach an agreement in order to move forward with implementation and in order to achieve sustainable change. The distribution of work in accordance with the expertise that different individuals have is also important, because the MLT will likely have a high level of interest and knowledge in the area of mathematics instruction. Plans should be shared throughout the change process because it allows for transparency and the inclusion of stakeholder voice. Teamwork and collaboration are important in order for the change process to move smoothly.

Shared leadership is the chosen leadership framework for this OIP because it lends itself well to involving teachers in the change process while still allowing for school leadership to guide and set parameters for the change. Details pertaining to the method in which this framework will be operationalized will be discussed throughout this chapter.

Relevant Frames for Leading Organizational Change

Kotter's 8-Stage Model. Kotter's 8-Stage Model (1996) will be used in this OIP as the theory and basis for proposed change in the organization. The stages and purposes at each stage are outlined in Table 2.1 below.

Stage	Purpose
1) Establish a sense of urgency	Help stakeholders see the need for change.
2) Create a guiding team	Create a collaborative group with the agency to guide the change process.
3) Create a change vision	Develop a vision to help direct the change vision; develop strategies.
4) Communicate the vision	Ensure that stakeholders understand and accept the change vision.
5) Empower others to act	Remove obstacles, procedures, routines that undermine the change vision and encourage risk-taking.
6) Generate quick wins	Plan achievements as checkpoints and celebrate/reward successes.
7) Consolidate improvements and drive continuous change	Encourage determination and persistence; ongoing change takes place and encourage ongoing progress while highlighting milestones.
8) Make the change stick	Pinpoint connections between new behaviours and organizational successes; incorporate change into organizational culture.

Table 2.1. Kotter's 8-Stage Model. Adapted from *Organizational change – An action-oriented toolkit* (3rd ed.) by Cawsey, T. F., Deszca, G., & Ingols, C. (2016).

Kotter's model is designed to follow a step-by-step format, with each preceding step informing and supporting the next. This OIP adapts Kotter's model for change but treats it as a cycle wherein after the *making it stick* stage, reflective activities will inform whether further changes are required and will help MLTs decide in conjunction with the principal, which supports are needed moving forward.

Schein (1996) discusses cognitive re-definition that occurs when the individual learner becomes motivated to change and opens him or herself up for the reception of new information

(p.4). The inclusion of Schein's perspective on the individual learner will be of great importance moving forward when looking at how teachers are affected by and participate in the change process. Schein also delves into areas such as survival anxiety, overcoming learning anxiety, imitation and identification with role models and trial and error learning to shed light on the personal aspect of change in an organization. Schein's expansions and theories connected to Kotter's 8-Stage Model will be instrumental in Chapter 3 when considering teacher resistance to change.

Critical Organizational Analysis

Gap Analysis. Nadler and Tushman's (1980) Congruence Model for Organizational Analysis is used to perform a gap analysis (p.44). As mentioned in Chapter 1, this model is geared towards understanding the dynamics and performance in an organization. When used, the Congruence Model provides a diagnosis of the issues within an organization. Each component of the model will be used to analyze EGPS.

In the Congruence Model, input consists of the environment, resources and history of the organization (Nadler & Tushman, 1980, p.39). Environmental input involves the institutions, groups, events and individuals external to the organization that can have an impact on it. Environmental factors affecting EGPS include parents, the teachers' union, community groups and the Ministry of Education. When looking at the environmental factors affecting the organization, Nadler and Tushman suggest that it is necessary to look at the demands that are made on the organization from its environment. The parent community at EGPS is highly involved and follow teacher and school performance closely. This places pressure on the organization when it comes to student performance in mathematics and literacy.

Resources are the assets that the organization may have access to, such as human, capital, technological, financial and informational resources (Nadler & Tushman, 1980, p.39). There are also intangible resources that are at the organization's disposal, such as community recognition. EGPS has access to technology within the school, school board technology and technology provided by the ministry in the form of technological devices and programming. All personnel working in the school are managed and allocated centrally by the school board. The ministry provides funding to the school board, who then allocates funds to schools based on various factors, such as student enrolment and perceived student socio-economic need. EGPS is privy to the same basic resources as other schools at the BHDSB. It is not an inner city school and does not score high enough on the learning index to necessitate additional funding for special programming. Financial resources are allocated based on the special programs and the number of students in the school. EGPS is located in an upper middle-class neighbourhood with a very active parent council that engages in many fundraising activities for the school, which allows for extra funds in order to support the use of technology in the classroom.

Historical resources consist of the trends in past activity, behaviour and overall effectiveness of the organization being analyzed which might have an effect on it (Nadler & Tushman, 1980, p.39). This includes any landmark events that have occurred in the past. EGPS is an inclusive school that is well-known in the community for its outreach and support to students and their families. In terms of the historical resources, EGPS has a history of providing both curricular and extracurricular activities for students.

Some resources in the organization are fixed by the school board or ministry. These include areas such as financial and human resources allocated for specific purposes. Other

resources, such as fundraising money or volunteers can be spread or used as administration sees fit.

The historical input of an organization involves the major stages or phases of development in the organization's past as well as the influence that past strategic decisions have on the organization's present-day operations (Nadler & Tushman, 1980, p.39). Many of the staff members at EGPS have been at the school for many years, through changes in administrators and other staff members. Part of this may be due to the fact that teaching jobs in Ontario are difficult to attain. These teachers who have been at the school for more than a decade communicate the way they believe things should be done by stating that it has always been that way and often revert to old habits and beliefs depending on the expectations of new administrators. The current principal at EGPS has been there for only 5 years while the majority of the teachers have been working there for more than 10 years. These individuals in the organization have been carrying the implicit core values pertaining to pedagogy over the years and continue to communicate and make use of these beliefs in their teaching. There is an imbalance in the French and English tracks, with the French track including many more teachers who have been at EGPS for a long time.

The historical input of the organization seems to be where the issue lies. Traditional pedagogy of instruction, particularly in mathematics instruction is present in most classrooms. Traditional teaching practices for mathematics include the belief that students must learn math facts as the basis of all other mathematical understanding. It involves the belief that there is one best way to find the right answer (Chapko & Buchko, 2004). New research suggests that not all students learn this way and that a PBL approach grounded in inquiry and authentic tasks targets a

wider range of mathematics learners (Bonner, 2006). Unfortunately, not all teachers at EGPS share this view of mathematics instruction.

The current administration is supportive of this new way of thinking about mathematics as evidenced in the school's current plan for improvement:

- Inquiry-based learning: Through keeping the curriculum in mind, allow for student-led learning to create engaging, authentic, and differentiated learning experiences.
 - The provision of release for training to select staff at the *Dr. Eric Jackman Institute of Child Study*, and time to work with previously trained Kindergarten staff, to implement deeper inquiry-based learning.
- Differentiation: Analyze currently available classroom resources in both English and French through an equity lens and compile a list of resources to promote equity and differentiation in the classroom.
 - Allocate budget to allow removal of outdated resources and purchase any needed materials.
 - Ensure these materials are applied within the programs on a regular basis.
 - Work with our learning coach, publishers (if available) and internal PD to have a consistent understanding amongst our staff of differentiated learning and assessment.

This emphasis on differentiation to meet the needs of all learners and inquiry-based learning is in line with new pedagogy pertaining to mathematics instruction and is at a disconnect with current approaches at the school. This section of the school improvement plan is designed such that the MLT is designated as a leader who will work with administration to create a pathway for the implementation of these new approaches to teaching in mathematics.

A Vision for Learning

Section 1 of the *A Vision for Learning* published by the BHDSB outlines goals for school improvement and school effectiveness. This document discusses a new strategy to increase effectiveness in schools and addresses the needs of students, communities and improving student learning outcomes. This document further expands upon how Learning Centres (LCs) will work towards improving schools through improved instructional practice. All schools within the BHDSB will feed into a LC, which are hubs where teachers can work collaboratively, learning from each other and sharing resources. LCs are geared towards making schools more effective, building adaptive, open and resilient cultures where leadership can thrive, form healthy relationships, build sustainable schools that engage teachers and learners and identify disadvantages and work towards intervention.

The strategy put forth in this OIP is that of shared leadership such that each school and department is involved in leadership. Shared leadership in this context is described as valuing the expertise and experiences of individuals and putting processes in place that allows for this expertise to have influence on decision making within the school board. Professional capital and the subcategories of social, human and decisional capital are seen to be very important. Social capital involves wisdom that comes forth from a group, human capital is the individual expertise of individuals in the group and decisional capital is the positive effect each member has on decisions that are made (Hargreaves & Fullan, 2012, p.515).

This strategy seeks to bridge the gap between top-down and bottom-up initiatives, stating that direction from the top (school board) is important as is the context and expertise available in the field (schools). Formal leadership in the school and school board are seen to be important in providing the conditions for learning and school effectiveness but informal leaders are also

integral to the success of initiatives in the school system. The document outlines an enhanced learning culture which stipulates that learning in teams can solve issues that arise, trust exists throughout the BHDSB on and between all levels, positive relationships result in more engagement and empowers all stakeholders, and that a strong partnership exists between system leadership, LCs and schools.

All schools were asked to create a learning focus involving achievement, well-being and equity. These focuses were to be guided by Ministry goals and informed by the needs of the school. These learning focuses are then to be shared with the school's LC and learning coaches will then help provide in-school support for teachers and principals to guide them through the focus towards the school's goals. The focus on leadership, developing a positive culture of collaboration and learning and emphasizing student achievement is geared towards teacher capacity building and improved student learning outcomes in mathematics. The goal is to encourage and enhance teacher leadership to help implement changes to foster student achievement, well-being and equity such that the needs of all students are met.

As the lead MLT at EGPS, *A Vision for Learning* will help guide us when considering the implementation of PBL. It expands upon the document pertaining only to LCs and provides starting points for school level focuses in three areas to help schools begin to synthesize Ministry and school board initiatives. The move towards school input in areas of need, which will then inform more specialized change areas, is one that might influence the success or failure of PBL implementation at the school level.

Required Changes

Based on the preceding gap analysis, there are several issues pertaining to the implementation of PBL where EGPS falls short. Given that it is a dual track school, there are

different needs for the English and French tracks respectively. Many of the supports in mathematics instruction are geared towards the English track, such as home school program support, instructional resources and central coaches. Mathematics instruction throughout EGPS is varied, with some teachers adopting practices that reflect current pedagogy and ministry initiatives while others do not. Teachers have stated that the supports required to implement mathematics change are not there, and school administration is willing to be supportive of teachers during implementation but does not know which specific supports teachers need. The Ministry of Education in Ontario has put forth the RMS with the goal of addressing the diverse needs of mathematics learners and teachers to improve student learning outcomes. The MLT position was created to help bridge the gap in schools between administrator's expectations and teacher needs.

At EGPS, the MLT needs to work with school administrators and teachers of mathematics, using Kotter's (1996) 8-Stage Model, to pinpoint issues in the instruction of mathematics, develop a course of action and methods for addressing areas of need, formulate a system for providing support to teachers throughout implementation and to work towards institutionalizing the resulting change.

Possible Solutions

Maintain the Status Quo. At present, mathematics performance at EGPS is higher than some other schools, therefore maintaining the status quo is an option that has both benefits and drawbacks. The benefit of this option is that additional resources are not required and that disruptions will not be necessary. The financial and human resources can be allocated elsewhere. The drawback to maintaining the status quo is that students whose needs are not being met by current instructional practices will not receive the help they need. Any further attempts at

implementing change handed down by the Ministry may not result in authentic, sustainable change, given that teachers will continue to lack individualized support.

Data-Driven Decision Making. Datnow and Park (2009) discuss reform that stems from data-driven decision making or DDDM. They put forth a co-construction framework to provide context for DDDM. When implementation is enacted with the co-constructed framework in conjunction with data, it can help simplify large-scale change in education. The co-construction framework focuses on the relationships between actors and the social and political environments that affect and bring about change. By drawing on the data surrounding student achievement, MLTs can help teachers and administrators see the need for change as well as the need for appropriate supports throughout implementation.

What needs to change? Teacher perspectives pertaining to mathematics performance need to change and improved student performance in mathematics needs to be put at the forefront. Throughout implementation, data needs to be tracked, analyzed, shared and discussed amongst teachers, the MLTs, PORs and school administration.

Resources required. Time is required to meet and conduct frequent check-ins throughout implementation. This release time will also necessitate financial resources to be able to pay for substitute teachers. Access to student performance data is critical, as well as data analysis tools and personnel who are trained or skilled in using those tools. Personnel who have used DDDM in the past would also be necessary to help implement this solution.

Benefits and drawbacks. One of the benefits of this solution is that it is transparent in that teachers and administration can see the direct effects of teaching practices on students. The MLT

can see how the implementation of new curriculum is actually leading to an improvement in student performance in mathematics.

A drawback to this solution is that the collection and analysis of data takes a lot of time and expertise. If standardized data were to be used, the amount of time between the various tests is too long and it would be difficult to pinpoint which factors are affecting student performance. This solution seems more suited to board or province-wide problems of practice. Another drawback to this solution is that it emphasizes the measuring of results instead of focusing on the teacher learning and capacity building that has occurred.

The SILC/CASA Cycle. The professional learning cycle created by the Ministry of Education of Ontario is known as the *System Improvement Learning Cycle* (SILC) or *Cycle d'amélioration systémique et d'apprentissage* (CASA). This cycle was introduced during the *Provincial Mathematics Learning Day (2016)* and is geared towards improving student well-being and achievement. It was drafted by the Board Improvement Plan for Student Achievement through feedback from school boards to address the need for reflective dialogue throughout the change process. School boards requested that the opportunity be provided for critical friends to pinpoint challenges of practice, points of focus, and opportunities to engage in collaborative inquiry with the ministry (Ontario Ministry of Education, 2016b).

SILC is a *Plan, Act, Assess, Reflect* cycle defined as a process moving towards a collaborative, reciprocal and intentional approach to providing support for school board needs through the use of reflective dialogue pertaining to leading for learning and collaborative professionalism (Ontario Ministry of Education, 2016b, p.2). It involves four phases, beginning with the *plan* stage where a focused improvement plan is created to address needs. This involves identifying and reflecting on improvement needs and opportunities for the provision of support.

The second stage is the *initiation* or *plan* phase where the improvement plan that was created is implemented and opportunities for support are identified and accessed (Ontario Ministry of Education, 2016b).

The third, *assess*, phase is where the implementation of the plan is monitored using various sources of evidence to record, assess and adjust the actions that are being taken. The fourth phase is the *reflective* stage where multiple pieces of evidence are reflected upon to measure the impact of the implementation plan by engaging with stakeholders (Ontario Ministry of Education, 2016a).

What needs to change? A team needs to be created for leading mathematics related curriculum change implementation. This team would be comprised of the MLTs and other teachers who are interested in pedagogy surrounding its instruction, as well as the principal. This team would have to meet throughout the SILC cycle and support other teachers in the school. As the name suggests, SILC is an adaptation of a *Plan, Act, Assess, Reflect* cycle to be used at the systems level by system leaders in the Ministry when working with school boards and school board staff. A different adaptation of this cycle is included on the Ministry of Education's EduGains website, which is a resource bank for teachers and leaders. The adapted version is geared towards the implementation of change on the school level.

- **Plan.** During this phase, data and evidence are analyzed to find areas of need related to student achievement and engagement. Based on this, a focus for learning that addresses the specific area of student need is selected and the needed learning for educators is determined. Planning is done while keeping in mind the evidence that will serve as an indicator that the need has been met.

- **Act.** At this stage, the implementation of strategies and action takes place. This includes implementing adjustments based on ongoing assessment and feedback. Teachers will participate in professional learning to develop a common understanding and belief about the instructional approach. It is critical that throughout this phase teachers have access to professional learning resources, including time, human resource and financial resources.
- **Observe.** Monitoring student and educator learning takes place by sharing and analyzing evidence. At this stage, sharing of pedagogical practices, discussions about instructional issues, solutions for issues and formulating next steps for professional learning take place.
- **Reflect.** During the fourth stage, the results are examined, analyzed and evaluated. Through collaboration, decisions are made about evidence and whether the area of student need had been met. Reflection on professional learning is critical before thinking about next steps, at which point moving to the plan stage of the cycle once again (Ontario Ministry of Education, 2016c).

Resources. Human resources would be required to build a team, but these individuals would be teachers who already teach at EGPS along with the MLT and the principal. Learning coaches would also be included in this committee; thus, some meeting dates would have to align with the coaches' availabilities. Financial resources would include providing substitute teacher coverage for the MLT who would support teachers during the Act phase. Members would also have to be available to participate in the Plan, Act, Assess and Reflect phases.

Benefits and drawbacks. One of the benefits of the SILC solution is that there is a high level of support for teachers throughout the change process. All phases of this solution allow for teacher involvement and the sharing of teacher voice. This structure is very much in line with the

role of MLT because I can guide the process with the agency that I have and really support teachers. With this model, all levels of leadership can be involved to some degree, but teachers have the central voice. A drawback to models such as the SILC cycle is that often, the plan phase is overlooked and given the fast-paced nature of most organizations, planning teams often jump to the Act phase (Reed & Card, 2016).

Collaborative Inquiry. Another possible solution is that the MLT can coordinate with learning coaches from the school board to gain support and resources for teachers in the school. Bringing the learning coach in to support the MLT can help with respect to bringing school administration on board and advocating for financial and school-level supports.

Using a collaborative inquiry approach allows teachers to collaborate or work together with the goal of identifying common issues, analyzing data and test instructional practices which, ultimately lead to improved learning outcomes (David, 2009). This solution involves teachers engaging in collaborative inquiry to pin-point shortcomings in mathematical instruction and learning, analyze student performance data from EQAO and provincial report cards and discuss pedagogical practices that might help improve student learning outcomes in mathematics. The MLT would propose solutions to the teachers and school administration.

Collaborative inquiry is a structure for professional learning that gives celebrates the positive effect that teachers have on student learning. Collaborative inquiry teams:

- Identify areas of student need and obstacles to student learning;
- Investigate and select effective practices to meet student needs;
- Learn about these practices by using them in their classrooms;

- and assess the effect that these actions have in order to formulate next steps

(Doonhoo, 2016, p.9)

Collaborative inquiry lends itself well to building teacher capacity in a shared leadership framework because it establishes the structure required for teachers to become active decision-makers (Doonhoo, 2016). Furthermore, teachers are actively involved and learn by doing, thus they are more likely to be meaningfully involved in school reform efforts (Doonhoo, 2016).

Hansen et al. (2016) suggest that developing teachers' skills should meet the following three conditions:

1. Teacher skill development must include professional development and teacher supports that are part of their regular work days.
2. Teachers must be given the opportunity to reflect on one's own mindset and how these epistemologies have an impact on their choice of pedagogy and student expectations.
3. School leaders should develop structures to support teacher collaborative inquiry and interactions between leadership and teachers.

It should be noted that the solution of collaborative inquiry differs from the SILC cycle in that this solution provides the framework for working in collaboration with others while the SILC cycle can be done individually.

What needs to change? Instead of leadership dictating what the problem is, teachers work together, with guidance from the MLT and direction from the principal, to pinpoint problems and gaps in mathematics instruction and student performance in mathematics. Based on this type of collaboration, a plan of action is created and implementation would follow.

Resources. Financial resources would be required for release time so teachers can engage in collaborative inquiry. Data pertaining to student achievement would be required, along with data analysis tools. Personnel skilled and trained in these data analysis tools would also have to be involved.

Benefits and drawbacks. The benefit of this solution is that it is contextually relevant and authentic to teacher practice because of the high level of teacher involvement. A drawback may be that it can be difficult to direct teachers in the desired direction. Much of the change pertaining to mathematics curriculum is mandated on some level, thus it will be difficult for the MLT to balance collaboration while also guiding the discussion towards PBL. This is where the principal will be instrumental, because for change sustainability, formal school leadership must be actively involved to guide the change such that it becomes part of school culture and the way of doing (Marks and Printy, 2003).

Team Teaching. Team teaching or co-teaching involves two or more teachers teaching together (Johnson, Bird, Fyfe & Yench, 2012, p.3). This approach to teaching allows for teachers with specialized skills to work with other teachers in the classroom to support new practices or pedagogical approaches (Murawski & Swanson, 2001).

What needs to change? A team comprised of mathematics teaching staff, the MLTs and the principal needs to be created. Each of the MLTs will work with teachers depending on language of instruction and grade level to find areas of individual need. These pairings and groups will then work to develop a plan tailored to the needs of the teachers and his or her students. The MLTs would then team-teach with one or two other teachers at a time, implementing the plan of action. This team-teaching will be followed by small and then full group reflection and discussion. Throughout the process, there will be frequent check-ins with

the principal to ensure that plans are geared towards meeting school and RMS goals for improving student learning outcomes.

Resources. Human resources will be necessary because team-teaching involves more than one teacher engaging with a single group of students during a lesson, thus substitute teachers would be required. With this comes the need for financial resources because the substitute teachers need to be compensated for their time. Financial resources may also be required if the print and technological resources needed to support teacher needs must be purchased. Furthermore, financial resources may be required if the planning teams wish to participate in off-site professional development or workshops that would support their needs.

Benefits and drawbacks. One of the benefits of team teaching as a solution is that it allows for the MLT to support teachers in the implementation of mathematics-related curriculum change in the classroom. It has the collaborative component throughout because the planning, teaching and reflection will all be done with two or more teachers involved. A drawback to this team-teaching model as a solution is that the principal's involvement is open to interpretation and, as mentioned previously, it is paramount for the principal to be involved in reform for it to become permanent and a sustainable component of school culture. Principals play several roles in impacting school culture:

- Symbol: affirmation of school values through behaviour, policies and routines.
- Potter: the shaping of and being shaped by rituals, ceremonies, symbols and stakeholders.
- Poet: use of language to reinforce values and maintain the school's best image.
- Actor: improvise in the solving of issues that arise.

- Healer: ease transitions and implement change in the school (Deal & Peterson, 1990, p.31).

Chosen Solution

For the problem of practice pertaining to the implementation of PBL, the SILC solution is chosen. The problem of practice involves the systems and supports required to help teachers throughout the implementation of PBL. Given that the focus is on teachers' needs and how school leadership, the MLT in particular, can address them, it is beneficial to include a solution that provides the circumstances for teacher voice to become a part of the change process. The involvement of teachers is paramount in bringing about change in teacher practice (Kirk & MacDonald, 2001).

It is critical that the principal be actively involved during the process of collaborative inquiry through a delicate balance where the principal provides direction to teachers and teacher leaders (Wilhelm, 2013). A facilitator external to teacher inquiry groups can provide supports for the inquiry process through the provision of tools and alternative perspectives that can stimulate purposeful conversation between teachers (Nelson & Slavit, 2008, p.107). Although the MLT is there as a teacher leader, it is important that the principal provide guidance because it is the principal who has the agency to do so. When principals completely hand over important aspects of leadership to teacher leaders, teacher leaders may be unprepared for that amount of responsibility due to contractual commitments. This results in key decisions and responsibilities being neglected because teacher leaders may not have the time, agency nor symbolic authority required to address them (Wilhelm, 2013). Although teacher collaborative inquiry is possible without principal guidance, it is difficult because of teacher accountability in other areas (Giles & Hargreaves, 2006). Investing time and resources in teacher capacity-building to establish

strong pedagogical practices can result in improved student achievement and coherence in schools (Robinson, Hohepa, & Lloyd, 2009, p.2). Fullan and Langworthy (2014) suggest that when principals take on the role of co-learners during collaborative inquiry, it serves to “merge top-down, bottom-up and sideways energies to generate change” (p.12). This role also allows for the reciprocal sharing of skill and experiences between teachers, teacher leaders and principals.

To balance the needs of teachers, the expectations of the RMS, the agency of the MLT and the importance of direction and inclusion of the principal, SILC has been chosen as the main solution but elements of collaborative inquiry will be included as well.

Leadership Approaches to Change

Constructivist Professional Development. Teacher professional development is a social construct that changes over time. Effective professional development allows for teacher critical reflection on practice, which helps them construct their own beliefs with regards to pedagogy (Pitsoe & Malia, 2012). Pitsoe and Malia make the case for constructivist professional development by citing Darling-Hammond and McLaughlin’s (1995) assertions that throughout a teacher’s career, professional development should place an emphasis on deepening their understanding of the processes involved in teaching and learning. This is the basis of constructivist professional development.

The tenets of the constructivist approach to professional development suggest that it must engage teachers in tasks pertaining to teaching and it must include observation and reflection that shed light on learning and development processes (Pitsoe & Malia, 2012). The professional development must also be grounded in inquiry, reflection and experimentation guided by the teacher. It should be collaborative, connected to what teachers do and be connected to other components of school reform. Finally, it is necessary for the professional development to be

sustainable, ongoing and supported through various methods such as coaching and collective problem solving of issues pertaining to pedagogy (Pitsoe & Malia, 2012).

The instructional coaching model is geared toward building teacher capacity to implement instructional practices designed to improve student learning outcomes (Casey, 2006). As the professional capital increases, the social capital of the school surges through the use of effective instructional practices. For this to occur, interaction, collaboration and trust are necessary in coaching relationships (Leana, 2011). Coaching enables teachers to make instructional decisions that lead to increased professional capacity through ongoing and supported learning, targeted school-based learning, reflective practice and a culture of collective responsibility for student achievement (Neufeld & Roper, 2003). Coaches should emphasize that they, too, are teachers (Casey, 2006). As the lead MLT at EGPS, I have contextually-relevant experience, subject knowledge and established professional relationships with teachers and the principal at the school in order to successfully take on coaching role throughout the implementation of PBL in mathematics.

A model of constructivist professional development will be adapted in this OIP in part because it matches the agency connected to the role of MLT. Since the MLT is a teacher leader, the agency held by such a teacher would not merit the authority required to tell other teachers what to do. Agency is the capacity to make things happen or to influence what happens in an organization (Durrant & Holden, 2006, p.169). Furthermore, enforcing change on individuals in an organization and forcing members to do something is not effective in the long run. To change teacher practice, teacher mindset needs to change first (Lorenzi & Riley, 2000). Teacher beliefs influence teacher practice, thereby having an influence on student academic performance (Blackwell, Trzesniewski, & Dweck, 2007; Farrington et al, 2012).

School Growth Mindset. Growth mindset as described by Carol Dweck (2006) connects with the tenets of constructivism. Dweck describes the growth mindset as the belief that human qualities can be developed and formed through practice and cultivation. She explores the nature of change and the idea that intrinsically, it is a tenet of the growth mindset. Dweck stipulates that the human brain is constantly interpreting what happens and making assumptions and drawing conclusions based on them. A mindset is the ongoing process of what is going on in a person's mind, thereby providing meaning to the interpretation (Dweck, 2006, p.17).

Hanson, Bangert and Ruff (2016) propose that the one-dimensional construct of school growth mindset is comprised of collaborative planning, shared leadership and open support and communication. Given that there are varied experiences and capacities when it comes to mathematics instruction and change in general, school growth mindset and individual growth mindset are critical. The MLT is obligated to help teachers develop their instruction in mathematics to meet the needs of students and as such, support them throughout the implementation of mathematics related curriculum change. This position is also designed such that the individual works closely with school administration to ensure that the SIP considers the needs of teachers when planning change implementation.

The solution as outlined in the previous section lends itself well to the concept of shared leadership. The solution of collaborative inquiry allows for the sharing of responsibility between various staff members who feel strongly about mathematics, the MLT and school administration as well as other supports (David, 2009).

Towards Shared Transformational Leadership

The preferred organizational state is one where teachers feel supported by school administration and school leadership and that there is an improvement in student performance in

mathematics. For this to happen, leadership practices need to change because it requires a shift in thinking about the need for change and the type of change required (Firestone, 1996). Transformational leadership is a framework that seeks to develop capacity and increased commitment to organizational goals (Burns, 1978; Bass & Avolio, 1994). According to Leithwood and Jingping (2012), transformational leadership is characterized by nine practices divided into three stages. The first stage involves setting directions and includes developing a shared vision and building communal goals as well as holding high expectations for performance. The second stage is the development of individuals in the organization, comprised of providing individualized support, providing intellectual stimulation and modeling valued behaviours. The third phase is the redesigning of the organization and entails strengthening school culture, building structures for collaboration, engaging stakeholders in the community and focusing on the development and improvement of instructional strategies (p.401).

Poutiantine (2009) discusses the foundations of transformational leadership as follows:

1. Transformation is not the same as change
2. Transformation requires assent to change
3. Second-order change is always needed
4. Transformation always involves all components of organizational or individual life
5. Transformational change cannot be reversed
6. Transformational change necessitates letting go of the myth of control
7. Transformational change includes risk, fear and loss
8. Transformational change always involves broadening worldview

9. Transformation always involves moving towards greater integrity of identity and wholeness (p.193).

To illustrate the complexities of transformational change, Poutiantine cites Korthagen's (2004) onion model that represents the multilevel nature of human identity. The centre of the onion represents the core or essence of the individual; the next layer is the mission or purpose of the individual's existence. The third layer is the identity, which represents the individual's understanding or sense of self. This followed by the fourth layer, which encompasses the beliefs that the individual holds about himself or herself and the world in general. Competencies is the fifth layer, which is the abilities of the individual, followed by behaviour as the sixth layer and the external environment lying outside of the onion.

This model can be applied to organizations as well and for transformational change to take place, all layers of the onion must be involved (Poutiantine, 2009, p.198). An individual or an organization can choose whether to engage in transformational change, but given the permeable nature of each layer, once the transformation process begins, all layers are affected (Korthagen, 2004). The onion model provides a dynamic way of understanding how transformational change affects individuals and organizations, a concept, which is critical when looking at change sustainability in a school such as EGPS when dealing with pedagogical approaches to the instruction of mathematics and improvement in student learning outcomes. Furthermore, shared leadership lends another dimension to transformational leadership and the proposed solution for the problem of practice because it provides a format of leadership, which involves collaboration (Hauge, Nrenes & Vedøy, 2014).

The ideal method of encouraging improvement in schools is to redesign leadership responsibilities, form new leadership teams and share or distribute leadership widely (Harris,

2010). In moving from traditional forms of leadership to shared leadership, there are three shifts in leadership thinking that must take place. The first shift is that leadership must not only become distributed but also interdependent between leaders and members in an organization. Instead of embedding leadership as behaviours and attributes of hierarchical structures of power, it becomes behaviours and tasks that are performed by individuals at all levels in the organization (Firestone, 1996; Kouzes & Posner, 2002).

The second shift in thinking that is required to move towards shared leadership is that it should be rooted in social interaction in the organization - it is a construct created by leaders and followers. Leadership is a multi-directional and collective process that occurs through interactions and relationships between individuals who have common goals (Wenger, 1998).

Finally, the third shift that is necessary to move from hierarchical structures of leadership to a shared model is that there must be an emphasis on leadership as a process of learning that is undertaken by individuals or groups which provides shared comprehension and action in the organization (Argyris & Schon, 1996). Principals should give up some authority to have an influence on school improvement and must stimulate bottom-up change, and the building of a common vision and instructional leadership at different levels in the school in order to achieve their goals of school reform (Louis & Miles, 1990, p.236).

Instead of the change being dictated or handed down as law, teachers need to be given the opportunity to conclude what is needed based on collaborative questioning. Traditionally, mathematics change has been mandated or prescribed by the Ministry of Education in Ontario and teachers are expected to comply for the purposes of meeting board expectations and achievement goals. This change is often short lived, either because new research results in new changes from the Ministry, or because teachers feel that the change is unnecessary, which may

stem from the fact that teachers do not feel that their voices are heard when initiating the change to begin with. Research related to school improvement has shown that intra-organizational relationships and networking between teaching staff are critical (Hubbard, Mehan & Stein, 2006; Louis & Miles, 1990). This fosters a sense of “mutual dependency” between teachers and leaders in the school and places an emphasis on concerted efforts towards leading reform (Woods, Bennett, Harvey & Wise, 2004).

Shared leadership lends itself well to allowing for teacher voice because it involves working together to meet a common goal. The use of a shared leadership model in schools results in responsibility and accountability becoming shared beliefs, which becomes a catalyst for school reform (Ankrum, 2016, p. 151). The problem with previous initiatives is that the core reasons and concepts behind these prescriptions are often discussed at higher levels in the educational system that most teachers may not be privy to (Ankrum, 2016), which highlights the issue surrounding teacher voice and teacher mindset. This OIP suggests that the common goal be to engage leadership to improve student learning outcomes in mathematics through the implementation of PBL. In doing so, the research and rationale behind PBL will be shared and discussed with all staff.

As a teacher at EGPS and the lead MLT, I can guide teachers towards a plan of action. To do this and still make it be authentic and ensure that there is a provision of support throughout implementation, I will use a modified version of the SILC cycle.

The first part, *plan*, will involve all teachers who teach mathematics and are interested in being part of a committee to improve student learning outcomes in this subject area. The idea would be presented at a staff meeting and through email, and teachers would be able to sign up to participate. In this way, teachers who are passionate about mathematics will be involved in

finding ways in which PBL can be implemented to tackle the problem of how the needs of students are not being met. The MLT will lead the committee and consult with the principal to discuss appropriate plans and options for action, based off the perceived need. Following these consultations, the MLTs will discuss the plan of action with school administration, communicating the change that is needed and the resources that would be required.

The *act* stage of the SILC model will be very much the same as it was described previously. One difference is that instead of blind implementation, the MLT will work with teachers to implement the plan of action and support them throughout. This may involve team teaching, co-planning, support, modeling and catering to other teacher needs.

The MLTs will be heavily involved in the *observe* phase, meeting with the principal to analyse teacher and student feedback as well as samples of implementation from teacher lessons. This information includes questionnaires, conferences, meetings, videos and samples of student work, among other things. After the analysis, the performance data and analysis will be shared with the math committee for discussions surrounding successes and challenges that occurred during the *act* phase. Based on these discussions, a revised plan will be brought to school staff for the *act* phase.

Plan to Communicate the Need for Change

Elving (2005) provides a conceptual framework for studying communication in organizations during times of change. The propositions put forth are:

1. Low resistance to change or a high level of readiness for change is an indicator of effective organizational change.

2. The individuals of the organization need to be informed about the change and how it will change each individual's work.
3. Communication should be used to form a community that will increase trust and communication.
4. High levels of uncertainty have a negative effect on the readiness for change.
5. Downsizing and the loss of jobs causes insecurity, which in turn affects the organization's readiness for change.
6. Communication substantially improves an organization's readiness for change (p.134).

To communicate the need for change at EGPS, Klein's six principles of communication as presented in Cawsey et al. (2016) will be used: message and media redundancy, face-to-face communication, immediate supervision, opinion leaders and personally relevant information (p.323).

Through continuous repetition of the initial necessity for change as well as the successes and challenges of the change throughout implementation, there is a higher chance that individuals will remember the information being communicated (Cawsey et al., 2016). It is critical that the message be communicated through various avenues, such as during staff and individual meetings, email, announcements, handouts, etc.

As much as communication is critical, it is also important to include face-to-face dialogue or large group discussions because it allows for raising awareness of the advancement of the change. Furthermore, it allows for a platform to celebrate successes and by doing so, increase motivation for others. Supervisory staff must place an emphasis on the change through their behaviours and words. In the case of EGPS and this problem of practice, the supervisory staff

would be both the administrator and the MLTs, given that they would be leading the change. MLTs also fall under the category of influential staff members who hold some sway over others in the organization, as would teachers who have been at EGPS for many years and those who are popular amongst staff for their expertise.

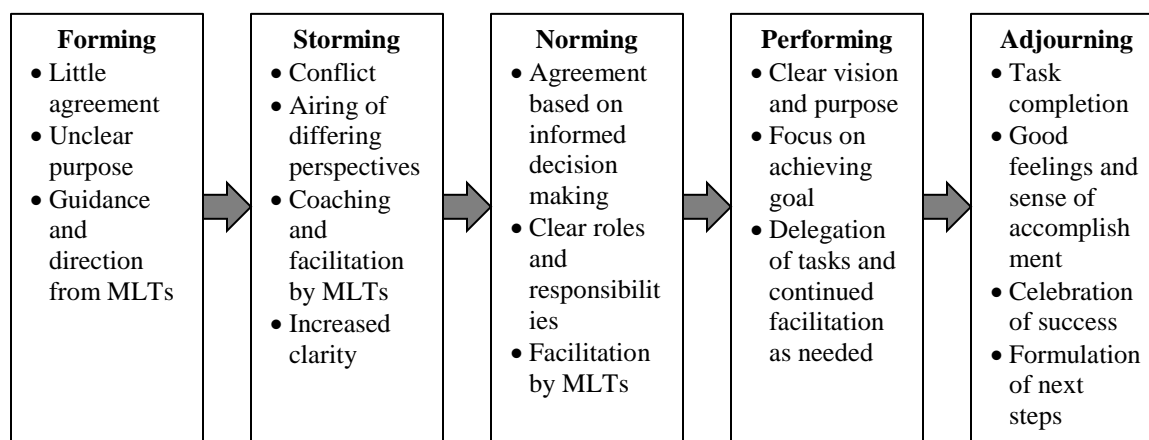
Lastly, information that is communicated must be contextually relevant to those who receive it for the individual to retain and make use of the information. For the purposes of this OIP, communication would be worded and made differently depending on the audience. For example, when communicating with the principal, the MLT would include different information than when communicating with the centrally assigned learning coach or the teachers in the school.

Communicating the need for change will be an ongoing process whereby staff members are made aware of the reasons, issues, successes and failures at each stage of the process. The math committee, learning coach and principal will also receive different communication but it will ultimately lead to the communication that will be shared with the entire staff. Those members engaging in collaborative inquiry would be engaging in more frequent communication.

Kotter's 8-Step Model. Kotter's (1996) recommendations for change and leadership will be used to guide the ongoing communication of change throughout implementation because there is a strong connection with shared and transformational leadership. The first step is to establish a sense of urgency; the goal is to show why the change initiative is required by connecting it to the needs and contexts of EGPS teachers, students and community. The MLT would find this information and discuss it with the principal, figuring out the best way to communicate and share the information with the rest of the staff. The staff would co-create a vision for change based on the discussion surrounding PBL.

The second step is to create what Kotter calls a “guiding coalition” or group that is given the power to lead the change initiative (p.3). The MLT would form a committee and act as chair. For sustainable change to take place, leadership for change needs to be shared and the creation of such a group is critical (Scully-Stewart, 2015). This would be the stage where strategies for reaching that vision would be hashed out. Tuckman and Jensen’s (1977) Stages of Small Group Development will be adapted in developing a high performing and effective mathematics committee (Figure 2.1). In order for the mathematics committee to act as a guiding coalition, the members need to be able to work in a cohesive, synchronized but reflective manner. These stages will help the committee develop as a team working towards a common goal.

Figure 2.1: Adaptation of Tuckman and Jensen’s (1977) Stages of Small Group Development.



Communicating the vision in different ways is paramount at this point. Kotter states that the new strategies and expectations should be demonstrated and supported by the guiding coalition or group. The fifth stage involves empowering others to implement the change. This stage is very much in line with servant leadership’s stipulation that to serve is to empower others and help them grow. During this stage the MLT would look for obstacles that may be hindering implementation for some or all teachers in conjunction with the principal to reorganize structures

that were undermining the shared vision. Individuals would need to be encouraged to take risks and be supported throughout. During modelling, co-planning and co-teaching, lines of communication will be open and feedback will be encouraged.

Kotter recommends that the sixth step involve looking for and celebrating short-term successes and improvements to boost morale and keep everyone focused. This can also help avoid burnout and provide opportunities for teachers to voice their concerns and needs. The next step would involve using these check-ins to inform how the change initiative will continue and whether there might be other changes as a result. The final step is where the new approaches are institutionalized and made part of regular practice at the school, which connects with SILC as discussed earlier. Feedback would be taken from staff members and connections would need to be made between the new practices and successes in the school. Those teachers who require further support with PBL will need to be further supported. When the change becomes part of the institution, there is a better guarantee that it will survive changes in leadership and staff. It is possible that some tweaking and revisiting of strategies will be necessary during the final step, and it may take some time, but it is a crucial step to ensure that change is sustainable and authentic.

Conclusion

The framework for leading change was described in Chapter 2 provides theoretical underpinnings and orientations for leadership practices that will be utilized to lead change. Through an organizational gap analysis, areas of need were outlined followed by possible solutions to meet this need. Constructivist professional development, growth mindset and shared and transformational leadership were discussed as leadership approaches to change. In Chapter 3,

a change implementation plan will be put forth along with ideas for change process monitoring, a discussion surrounding ethics and a change process communication plan.

Chapter 3: Change Implementation Plan

Introduction

In this chapter, a change implementation plan will be put forth in conjunction with a plan for parameters surrounding monitoring and evaluation of the change process. Future considerations and next steps are stipulated and the organizational improvement plan is concluded.

The proposed shift in pedagogical approach to mathematics instruction involves moving from traditional lessons to problem-based learning (PBL). PBL engages learners in authentic and relevant inquiry which allows them to learn from real-life situations (Fogarty, 1997; Silver, 2004). This shift in pedagogy is summarized in Figure 3.1:

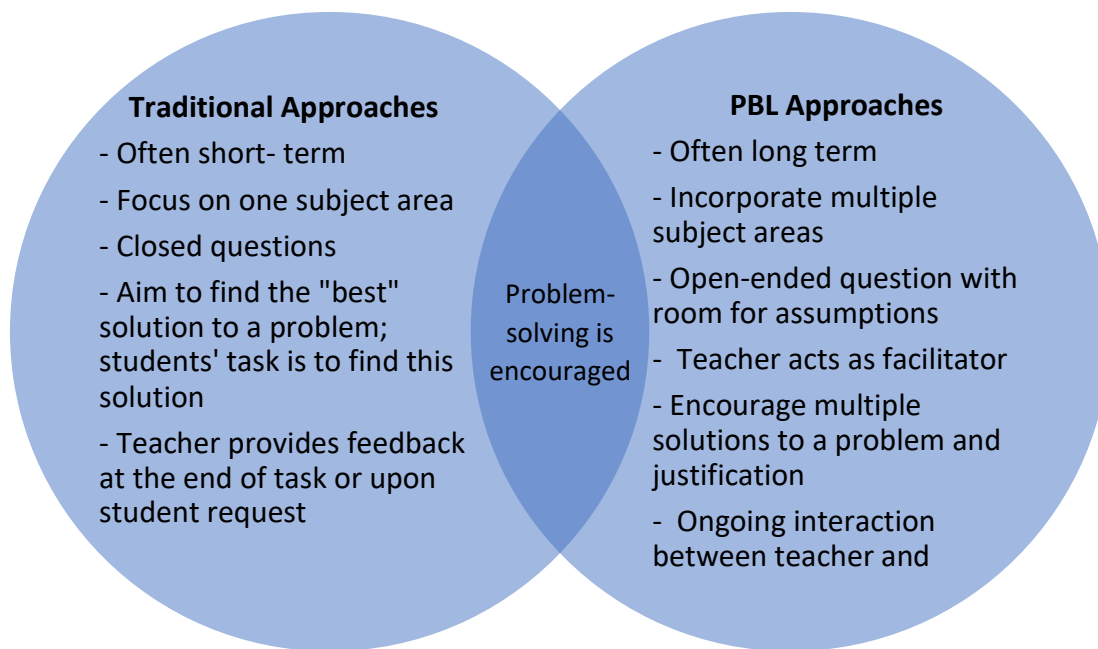


Figure 3.1: Comparison between traditional and PBL approaches to mathematics instruction (Fogarty, 1997; Hmelo-Silver, 2004; Savery & Duffy, 1995).

Engaging in problem-solving in mathematics creates *thinking classrooms*; spaces that encourage collective thinking, learning together and creating knowledge and understanding (Liljendahl, 2015). Schools where problem solving is the foundation of instructional practices, students show greater improvement in open-ended tasks, reasoning and communication (Boaler & Stein, 2003, p.250). Students who have had opportunities to engage in problem-solving approaches in mathematics perform as well as or better than students who have been taught traditionally (Boaler & Stein, 2003; Silver & Stein, 1996).

Goals and priorities

In working towards addressing the problem of practice involving the implementation of PBL in mathematics, the goal is to support teachers and build capacity through the process, ultimately leading to improved student learning outcomes. The position of MLT gives me the agency of a teacher leader, facilitator, and coach. As a teacher leader and change agent, priorities for this implementation plan include garnering formal leadership support, sharing the rationale behind PBL, eliciting understanding surrounding this learning theory, developing and sustaining a collaborative culture, and providing individualized support for teachers. Through the incorporation of collaboration, the focus of the professional learning sessions and check-ins during implementation will be on teacher learning and capacity-building. These sessions will be designed with the intention of increasing teacher capacity in PBL and fostering relationships that are collaborative in nature and encourage co-teaching, co-learning, and supporting one another professionally during implementation of not only PBL, but other change initiatives pertaining to mathematics.

The position of MLT is relatively new and is not a formal leadership position. Thus, the focus will be on the conversations, dialogue, reflection, and support so that all stakeholders can

reach their highest potential. The individualized nature of support which characterizes this organizational strategy will differ slightly from the way that mathematics related change has been shared at EGPS in the past. Generally, these initiatives have been shared at staff meetings with all teachers, information is disseminated by the principal or vice-principal followed by an activity where teachers engage in the proposed initiative by completing a task that students might complete, and finally some planning time or consolidating activity. The timeline is then shared and the principal performs intermittent check-ins and observations in the classroom to ensure that teachers are doing what they have been asked to do. This OIP proposes that the model through which organizational improvement and initiatives are implemented be changed such that it reflects the diverse needs of teachers who are implementing the change.

The philosophy of collaborative learning and capacity-building that characterizes this OIP was explicitly picked to fit with the agency of the MLT. From the outset, this will be made clear such that teachers understand the difference. Collaborative learning involves the engagement of teams of educators, such as the principal, teachers and teacher leaders in discussion surrounding student learning (Ontario Ministry of Education, 2016d). This results in educators working towards improvement, thereby helping students do the same to reach their learning potential (Dweck, 2010). Collaborative inquiry is comprised of the following stages:

- *Plan and reflect*: focusing on inquiry, creating an action plan, building criteria to describe learning outcome for students and discuss evidence and documentation that will be gathered.
- *Act and reflect*: implementing planned strategies, adjusting where needed, engaging in professional learning and reflecting and revising the plan as needed.

- *Observe and reflect*: understanding what data can tell us, documenting student learning and challenging practice that highlights what student learning needs are and aligning them with educator learning needs (Ontario Ministry of Education, 2016e, p.4-5).

The Plan, Do, Study, Act (PDSA) model (Langley et al, 2009) has been adapted by the BHDSB. The Systems Implementation Learning Cycle (SILC) includes plan, act, observe and reflect stages. The three phases of collaborative inquiry are designed to align with these stages in the SILC.

During the *plan* phase, all the planning and pre-work for change implementation takes place. A mathematics committee will be created and all staff members will be invited to attend. It will be critical for special education and English Language Learner (ELL) educators to become members to ensure that the needs of all students are met. The mathematics committee will have created sample problems for mathematics teachers to share with their students. Teachers will act as facilitators in their classrooms, as is characteristic of PBL, and observe students as they are working. Where possible, MLTs will be made available to assist those teachers who request support. Given that this is geared only towards trying PBL, it will not entail much MLT guidance, unless teachers who feel uncomfortable or overwhelmed explicitly request support.

Teachers will meet in grade teams and collaboratively analyze student solutions and strategies. As a team, they will create a report or summary and give this to the MLTs, who will then share the summary information with the principal. At the next staff meeting, MLTs will share research and rationale behind PBL, as well as definitions and examples of practice. Teachers will be encouraged to participate in the discussion and ask questions. At this point,

teachers will work together with the principal and MLT to co-create a vision for change. Our collective learning goals will serve to guide the steps we take to move forward.

The *act* phase of the SILC is where the planned action is implemented. To further support teachers, each of the MLTs will host a model classroom where he or she demonstrates a PBL lesson in mathematics. Teachers will have the option to participate in any of the model classrooms depending on the language of instruction and grade-level. After all interested teachers have had the chance to observe a model classroom, the MLTs will meet with the principal and organize professional learning sessions for teachers. In designing these sessions, MLTs will use the feedback and information gathered during the staff meeting and the co-creation of the vision.

The professional learning sessions will be designed to take place with two-week implementation intervals in between. In organizing these sessions, the following questions will be considered:

- Does it engage teachers?
- Does it accommodate teacher learning differences?
- Does it respect and incorporate teacher and student voice?
- Does it allow for collaborative inquiry?
- Are teachers equipped with tools to help them implement learning in practice?

(Hunzicker, 2011, p.179).

Teachers who are comfortable with PBL or are members of the mathematics committee will be paired with other teachers. As part of the first professional learning sessions, teacher pairs will co-plan and co-create a PBL lesson. During this time, mathematics leads will act as facilitators, providing individual, language and grade-specific support throughout planning.

Following this session, teacher pairs will co-teach the PBL lesson to each of their classes. Where requested, MLTs will be available to support co-teaching and to step in to work with a teacher who does not have a partner.

Observation will involve regrouping at the end of the two-week implementation of co-teaching PBL lessons. During a full staff meeting, teachers will come together and share their experiences. This sharing can take the form of oral recounts, photographs, video clips or student work samples. Teachers will collectively discuss and reflect, then participate in a second round of co-planning and co-creating lessons followed by co-teaching in each of their classrooms. Once again, MLTs will act as facilitators. A *Learning Wall* will be created in the staff room where student work samples, quotes, thoughts and planning will be shared. Teachers will be encouraged to post samples of student learning and share some of their thoughts on the wall. This is geared towards serving as a visual representation of the learning that has taken place as well as to highlight the next steps.

The MLTs will meet individually with each teacher to conference one-on-one conversations about how the teacher feels and what he or she requires in terms of individualized support. Maintaining the role of facilitator and protecting privacy is critical in ensuring that teachers feel comfortable. This will be discussed further in the ethics section of this chapter.

Reflection will take place after two weeks and will entail the second round of sharing of implementation experiences, learning and feedback. Although this process is like the observation stage, it differs in that the goal is to highlight the successes and challenges and to have a thorough conversation surrounding teacher and student learning that has taken place. Questions pertaining to how teachers felt during the process will also be critical, as will the level of support they felt and the support helped them in building their professional capacity as mathematics

teachers. Reflection on student learning will also be important: did the use of PBL approaches have a positive effect on student learning? MLTs will once again meet with each teacher privately to get a sense of their understanding about the learning intentions and to discuss next steps. Discussions surrounding implementation challenges will also be important during reflection.

The conversations between teachers and MLTs will help the leads and the principal decide on next steps. If individual teachers are struggling or want further support, then a math lead can work with the teacher on an individual basis, providing personalized support. For those who feel that they are comfortable enough to continue practicing on their own, intermittent check-ins will be made through email or face-to-face conversation to ensure that they continue to feel supported and are able to continue.

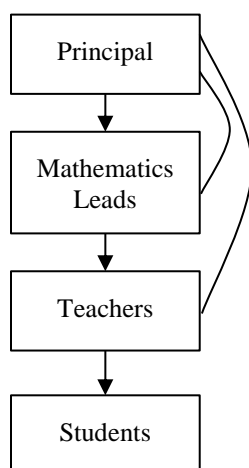
New strategic organizational chart

Current change initiatives pertaining to mathematics are shared by the principal with staff as an agenda item during the second half of a staff meeting. Following the staff meeting, the principal asks to meet with people interested in helping to lead the initiative. After the creation of the position of MLT, I was designated the lead MLT and now work with the principal, who outlines what is expected and gives the MLTs advice on how best to proceed. The MLTs work together to create a plan for professional learning that is shared with the principal who makes revisions and gives his approval. Ultimately, teachers participate in professional learning and the MLTs provide support to teachers at staff meetings or whenever requested. The principal checks in with teachers through classroom observations and one-on-one conversations.

The shift proposed in this OIP involves changing the linear nature of the organizational structure. The MLTs may discuss potential ideas for change initiatives with the principal who

might also initiate an idea he believes is an important area of focus. The ideas may also have come from another teacher who approached either the MLT or the principal. Following this, the sharing of information would be inclusive, the vision co-created and stakeholder voice and opinion would be used to make decisions about next steps and how those next steps are designed (see Figure 3.2).

Current model:



New model:

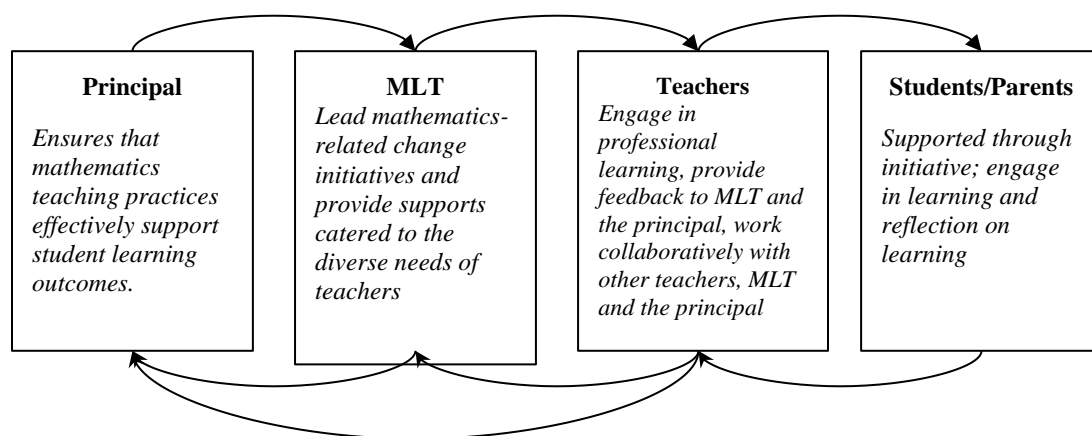


Figure 3.2: Current and Proposed New Models of Organizational Strategy for EGPS.

Managing the Transition

Stakeholder reactions. Teaching staff may be hesitant at the outset due to the numerous mathematics initiatives that have been brought forth. The RMA, although mandated, is different

in that it is designed to give MLTs and school administrators the agency to decide what sort of mathematics change is required and is contextually relevant to specific school sites (Ontario Ministry of Education, 2016). It will be important to make this clear to teachers prior to co-creating the vision for change.

Including teacher voice at each stage of the implementation process is designed to help mitigate resistance to the change and ultimately make the change more successful because of the powerful impact that stakeholders have on the direction of change (Timperley, 2011). In the same vein, for some students and parents this approach to learning in the mathematics classroom will be very different. Parents may have a difficult time accepting this new way of teaching, given that it might be at odds with their experiences. EGPS has a very active parent council, and to appropriately mitigate these concerns, the MLT will present the vision for change and be available for any questions.

Required resources and supports. Collaboration is the cornerstone of the solution to this problem of practice as outlined in this OIP. Human resources are required for various reasons but most of the human resources are already part of EGPS, such as the MLTs, the principal and teaching staff. Central school board staff, such as the central learning coach, may be required as well. Since collaborative planning and co-teaching are critical, release time will be required, which necessitates occasional teacher coverage. Financial resources are primarily linked to paying for occasional teaching staff to provide release time, however any teaching resources that are required will also need to be purchased. Funds are provided to schools as part of the RMS initiative in addition to the funds allocated to mathematics in the budget, in order to adequately cover the costs.

Engagement and empowerment. Throughout implementation there will be various stakeholders who will be taking on certain roles geared towards empowering and encouraging others. The principal is the stakeholder representing formal leadership in the organization, whose support and guidance throughout the implementation of this plan is important not only to support the MLT, but also to provide guidance and expertise during staff meetings, planning sessions and the establishing of new procedures and policies.

The MLTs will lead implementation and thus their role is essential. As described in this chapter, these leads will be involved in linking other stakeholders at every stage of the process. They will be planning and facilitating professional learning sessions as well as supporting teachers in their classrooms. The MLT will be modelling the vision for change by hosting model classrooms and will engage in group and individual conversations with teachers to provide personalized support throughout the change. In doing this, the MLTs are actively involved in teacher capacity building and supporting teachers, which is the foundation of this OIP.

Potential implementation challenges. This OIP is based on the following assumptions: that teachers will be willing to participate in the change, that everyone in the organization will believe that the need for change can be addressed through changes in teacher practice, that participants will be open during the process, that participants will accept support and that all teachers will be open to collaboration. Other assumptions include that everyone will agree on the required changes in teacher practice or the reasons for students not meeting provincial standards. It may also be the case that not all teachers will be interested in the change of practice. This can be mitigated by beginning with those teachers who are interested, who will then share with and inspire others through modelling and conversations.

From these assumptions certain weaknesses of the implementation plan arise. The Ontario Ministry of Education has published numbers pertaining to the lack of growth in student achievement in mathematics. As mentioned in Chapter 1, the Renewed Math Strategy (RMS) was drafted, along with the allocation of funds and the creation of the MLT position. In speaking with colleagues however, it appears that there are many interpretations to the role of MLT.

This issue can be mitigated by including teachers in the creation of testing questions as well as incorporating moderated marking of student work. This allows for more than one teacher to assess student work and pinpoint areas of need. Where possible, exemplars of levelled answers will be used. To further alleviate this shortcoming, students can also be provided with a self-assessment questionnaire tailored to their age-level pertaining to their feelings surrounding mathematics. These questionnaires can be administered after testing both at the beginning during the Plan phase and when the second round of testing takes place during the *observe* phase.

A further implementation issue will be designing professional learning that caters to teachers who are at various stages in their careers. In order to mitigate this issue, professional learning sessions need to involve both formal and informal learning opportunities that seek to “extend and deepen teachers’ professional competence, including knowledge, beliefs, motivation and self-regulatory skills” (Baumert & Kunter, 2006). Formal learning will include organized professional learning sessions, while informal learning will be comprised of co-teaching, co-planning and classroom supports. This differentiation allows for teachers to engage in professional learning in a way that is authentic to them and meets their respective learning needs.

Professional learning will need to be varied such that it addresses the varied needs of teachers based on professional experiences and goals. Beginning teachers are at a survival and discovery phase of their professional lives (Richter, Kunter, Klusmann, Ludtke & Baumert,

2011). These teachers require mentorship, collaborative study groups, classroom observations, frequent check-ins and formal professional development sessions (Glazerman, Dolfin, Bleeker, Johnson, Isenberg, Lugo-Gil, 2008). Middle teachers, those who have been teaching for more than 7 years engage in experimentation and activism (open to change), reassessment and self-doubts (change averse), serenity (loss of engagement and ambition) or conservatism (sceptical of change) (Richter et al., 2011). These teachers benefit from scheduled collaboration and formal professional development, as well as co-planning opportunities (Choy, Chen & Bugarin, 2006). Teachers in the final stage of their career have taught for around 30 years and tend to focus more on personal goals while withdrawing from the profession, given that they are closer to retirement (Richter et al, 2011). These teachers generally engage in professional learning opportunities that are based on direct links to improvement in student learning (Choy et al., 2006). In designing professional learning throughout implementation, the diverse needs of teachers at various stages in their careers will be taken into account while still understanding that each teacher is different as an individual. Thus, some element of choice will not only allow for teacher voice but also meet varied needs across all groups of teachers.

The dual track nature of EGPS creates another issue for this implementation plan. Half of the school is comprised of students who are in the French Immersion program and the other half are in the regular English instruction program. For the most part, the teachers from the two sides have not been open to collaborating together. Some teachers have gone so far as to state at staff meetings that they would rather collaborate with other French Immersion teachers than with teachers on the English side who teach the same grade level. They feel that the issues in French Immersion are different, given that students are not only learning and communicating about math, but in a different language.

During school improvement, “professional collaboration provides a context for the type of teacher development, curriculum innovation, and site-based decision making” necessary for meaningful change (Brownell, Yeager, Rennells & Riley, 1997, p.340). Collaboration provides the opportunity for teachers to share ideas, take risks and discuss their professional and personal experiences and opinions (Hargreaves, 1992).

As the lead MLT at EGPS, I have taught math both on the English side and the French side. This puts me in a strong position to understand the issues in both programs and perhaps this might help bridge the gap between the two tracks. One of the other MLTs is francophone while the third teaches on the English side and does not speak French. Among the three of us, we will balance the issues that arise as the three MLTs cover both tracks in the school. We will also endeavour to find resources in both languages and, where they do not exist in French, we can create them as we have done in the past.

For successful teacher collaboration to take place, there must be a shared vision for student learning and teaching; a common commitment to collaborating; a caring environment needs to be established; positive interactions between teaching staff and leaders take place often; and leadership is shared (Brownell et al., 1997). Different communities deal with conflict during collaboration in a variety of ways. Achinstein (2002) describes a continuum of micropolitical processes at play during collaboration. Some communities are *avoidant*: they exclude, absorb and transfer conflicts; they seek unanimity and low levels of dissent; and debate is discouraged. Other communities are *embracing*: they acknowledge and own conflict through critically reflecting on differences in practices and beliefs; opportunities are provided for the voicing of alternate views and dissent; and structures are in place for healthy debate (Achinstein, 2002, p.441). It will be important to establish a culture for embracing and validating differing

viewpoints and diverse experiences in order to respect and appreciate teacher voice throughout implementation.

Building momentum

Building momentum and maintaining motivation will be critical throughout the change process. Part of this involves celebrating small gains during the change process to foster motivation for stakeholders to continue working towards organization goals (Cawsey et al., 2016). In order to encourage stakeholders to join the change process and buy in, communication is key, given that stakeholders participate in the change process in a gradual manner (Cawsey et al., 2016). One way to do this is to maintain open communication during the process. In addition to the invitation to communicate, all professional learning sessions will be designed with collaborative inquiry in mind. Check-ins will be made with teachers in the form of pre and post reflection activities as well as feedback forms, one-on-one conversations and group discussions. The vision for change will be co-created as described and will be referred to often as well as being posted around the school and on the *Learning Wall* in the staff room. It will also be essential to celebrate quick wins and successes through recognition by email, announcements and meetings. Providing opportunities for and encouraging the sharing of implementation successes will help maintain momentum throughout the change process, bridging the gap between those who support the change from the beginning and those who bought in along the way (Komives, Lucas & MacMahon, 2013).

Short-Term Goals. One of the short-term goals that will aid in building momentum will be the creation of the vision for change. This will be a collaborative activity with all staff contributing during a meeting to ensure the inclusion of teacher voice. As mentioned, this vision for change will be communicated widely and will demonstrate the success of the first step in the

development of a culture of collaboration when dealing with mathematics-related change initiatives. An additional short-term goal will be the planning of professional learning sessions that cater to the needs of teachers.

Mid-Term Goals. The mid-term goals that will assist in building momentum for change involves collaboration during the professional learning sessions and the successful co-planning and co-teaching of PBL lessons. These are critical steps in the implementation of the proposed solution and will indicate whether the collaborative nature of the initiative is supporting teachers. Success here will be measured by how teachers feel about the change process, the level of learning, and whether supports met their individual needs.

Long-Term Goals. The long-term goal of this change plan is to establish policies and procedures on the school level that support teachers through the implementation of similar initiatives in mathematics, all in the service of building professional capacity. Teacher capacity building in mathematics involves fostering professional learning communities, developing teachers' mathematical knowledge pertaining to teaching and making the learning applicable to teachers' professional contexts (Koellner, Jacobs & Borko, 2011). Facilitators of teacher capacity building activities must have knowledge of the subject matter, information about teachers and students at the school, knowledge of pedagogy and andragogy, as well as knowledge pertaining to effective professional development practices (Carroll & Mumme, 2007). As the lead MLT, I have the skills necessary to facilitate teacher capacity building with the support of the principal who has the necessary knowledge of instructional leadership.

Teacher capacity building places an emphasis on the reflection and feedback from teachers, because it will be this dialogue and information that will indicate which activities and concepts were successful. This will entail teachers feeling that they have improved their teaching capacity

in mathematics and feel that they have received enough support or will be receiving adequate support to continue (Jacobs, Seago & Koellner, 2017).

Limitations. This change implementation plan proposes that all mathematics teaching staff engage in the change process together. This decision was made with the expectation that in doing so, all teachers will have the opportunity to work together and engage in discussion surrounding different viewpoints and perspectives. The possibility still exists, however, that difficulties may arise between teachers in the French and English tracks due to different experiences and different needs pertaining to the way classes are taught, the difference in class sizes or the different struggles faced. The limitation can be mitigated through the emphasis that is placed on differentiation to meet the diverse needs of teachers. Although some of the plan involves full-group settings, opportunities for one-on-one conversations and reflections are interlaced throughout the change implementation plan. The MLTs at EGPS also have diverse backgrounds in terms of teaching in both streams and can adapt to meet the needs of the staff.

Change Process Monitoring and Evaluation

The SILC cycle will be used to monitor and evaluate implementation of the change as proposed in this OIP. The concepts of open communication and ongoing feedback are integral to the monitoring and evaluation of the change process. This communication will take various forms because for change to be successful, it is essential that several methods of communication be used (Kitchen & Daly, 2002). This will be discussed further in the Change Communication section of this OIP.

Table 3.1: Implementation and corresponding monitoring and evaluation actions.

Tools & Actions	Plan	Act	Observe	Reflect
Implementation	<ul style="list-style-type: none"> Teachers experiment with PBL Co-creation of vision for change Planning of first professional learning session Create mathematics committee 	<ul style="list-style-type: none"> Sharing and discussion about PBL approaches First professional learning session Model classrooms Co-planning and co-teaching PBL lesson 	<ul style="list-style-type: none"> Full staff meeting for sharing experiences during co-teaching of PBL Second professional learning session Co-planning and co-teaching of second PBL lesson 	<ul style="list-style-type: none"> Regroup as a staff and share experiences Full group reflection
Monitoring and Evaluation	<p><i>MLTs:</i></p> <ul style="list-style-type: none"> Record observation notes Individual one-on-one conversations with teachers and sharing of feedback <p><i>Principal:</i></p> <ul style="list-style-type: none"> Help guide co-creation of vision to ensure it meets SIP goals <p><i>Teachers:</i></p> <ul style="list-style-type: none"> Pre-reflection activity Participate in mathematics committee 	<p><i>MLTs:</i></p> <ul style="list-style-type: none"> Record observation notes Keep log of conversations with individual teachers and issues during implementation <p><i>Principal:</i></p> <ul style="list-style-type: none"> Engage in conversation with MLTs and support teachers where needed by engaging in professional learning sessions <p><i>Teachers:</i></p> <ul style="list-style-type: none"> Anonymous questionnaire Optional tracking sheet <p><i>Students</i></p> <ul style="list-style-type: none"> Exit-card reflection on learning 	<p><i>MLTs:</i></p> <ul style="list-style-type: none"> Record observation notes Create a report with trends Individual one-on-one conversations with teachers and sharing of feedback <p><i>Teachers:</i></p> <ul style="list-style-type: none"> Share experiences during full group discussions <p><i>Students:</i></p> <ul style="list-style-type: none"> Exit-card self-assessment on mathematical processes 	<p><i>MLTs:</i></p> <ul style="list-style-type: none"> Meet individually with teachers to determine sentiments and plans moving forward <p><i>Teachers:</i></p> <ul style="list-style-type: none"> Post-reflection questionnaire (Google Forms) <p><i>Whole Staff:</i></p> <ul style="list-style-type: none"> Reflection activity and discussion Discuss report by MLTs and create next steps

Plan. During the planning phase the focus will be on setting the stage for the act phase. Teachers will be able to experiment with PBL and become members of the mathematics committee, facilitated by MLTs. The vision for change will be co-created with staff and MLTs

will plan professional learning sessions in conjunction with the principal. Throughout this, MLTs will be monitoring progress by recording observation notes during staff meetings and meeting individually with teachers to discuss any feedback and questions they may have. It is critical to gather stakeholder opinion on change before moving forward because they can heavily impact the direction of an organization in times of change (Berry & Wechsler, 1995).

Act. The act phase involves the bulk of the action component of the implementation plan. Sharing and discussion surrounding PBL approaches will take place with all staff. MLTs will host model classrooms where they will demonstrate the shift from traditional teacher-centred instruction to student-centred PBL. The first professional learning session will also take place, along with co-planning, co-teaching and co-assessment of a PBL lesson by teacher pairs.

To monitor and evaluate the process, MLTs will record observation notes during sharing and discussions about PBL at the staff meeting. They will meet with teachers one-on-one and keep a log, tracking discussions with individual teachers and information regarding issues during implementation. As mentioned in the previous section of the OIP, the focus will be on teacher learning and differentiation, such that teachers can be supported in accordance with their specific needs. Teachers will have the opportunity to fill out a questionnaire where they can indicate what supports they feel they may need in between each of the sessions and the MLT will endeavour to provide this support during each of the implementation intervals. Teachers will also have the option of using a student tracking sheet during their PBL lessons to track student progress. Finally, students will complete an exit-card reflection at the end of the lesson, which will be shared by teachers at the staff meeting during the next phase.

Observe. A full staff meeting for the sharing of experiences during co-teaching of the PBL lesson will inform the second professional learning session at this phase. MLTs will use the

feedback and discussions when planning the second professional learning session with the principal. The voice, viewpoints and feedback gathered from teachers during the staff meeting will play an instrumental role in planning the session given that the session is designed to help move them forward in their learning. As such, questionnaires, sharing of exemplars and one-on-one conversations will be important. As before, the session will involve the co-planning of a second PBL lesson but will also incorporate activities specific to the needs and experiences of teachers and students in the time since the first professional learning session.

In evaluating and monitoring the change process, MLTs will record observation notes based on conversations during the full staff meeting and visits to classrooms where they were invited by teachers co-teaching the planned PBL lessons. Once more, MLTs will engage in one-on-one conversations with teachers before creating a report with trends that they noticed. Teachers will share their thoughts and experiences and reflections on the learning that has taken place, while students will complete a second exit-card activity in the form of self-assessment of mathematical processes. These responses will be submitted to the MLTs who will incorporate a summary in the report.

Reflect. During reflection, all staff will regroup and share their experiences not only during the observation phase, but throughout the other phases as well. Staff will engage in full group reflection as well. The following questions will be used during the full group reflection activity:

1. What did we set out to do?
2. What actually happened?
3. Why did it happen?
4. What are we going to do next time? (Garvin, 2000, p.7)

Collaborative reflection on change or the learning that results from the change implementation process can help inform the policies, procedures and cultures within the organization (Mento, Jones & Dirndorfer, 2002). If the change vision has not been fully reached, the SILC cycle will continue and the resulting reflection ensures that the learning that has occurred will become part of the organization and that the successes and obstacles will inform future change. Teachers will complete a post-reflection questionnaire pertaining to what they have learned through the process. Teachers will meet individually with MLTs to share their sentiments and plans for moving forward.

Leadership Ethics and Organizational Change

A consideration of leadership ethics is extremely critical to this organizational improvement plan because any major change process will have ethical ramifications. Given that this problem of practice involves issues surrounding pedagogy and teacher practice it will be important to respect the privacy and emotions of all stakeholders involved. Ethical leadership can take different forms; it is a framework where the leader engages in a constant process of inquiry, modeling the “rightness” or “wrongness” of certain actions to stakeholders (Freeman & Stewart, 2006; Guy, 1990). It is “the demonstration of normatively appropriate conduct through personal actions and interpersonal relationships, and the promotion of such conduct to followers through two-way communication, reinforcement and decision-making” (Brown, 2005, p.120). In the context of education, school leaders benefit from using an ethical leadership decision-making approach characterized by the following criteria:

- Ethical relationships, trust and integrity;
- Cultural proficiency and understanding;

- Understanding the diverse perspectives and experiences of others; and
- Reflection and learning (Gardiner & Tenuto, 2015, p.7)

In respecting these concepts and applying them during times of change, leaders can engage in ethical relationships and understandings of differing viewpoints and conflicts that may arise (Gardiner & Tenuto, 2015).

This problem of practice involves looking at the supports required to empower and support teachers throughout the implementation of PBL in the mathematics classroom. Stakeholder voice and particularly teacher voice play a large part in this OIP. As mentioned in previous sections, this will lend a critical perspective to the solution of this OIP. The use of teacher and student perspectives also requires extra consideration in terms of the ethical implications of issues surrounding privacy.

As discussed in the communication section of this plan, at various stages teachers and students will have the option of completing various self-assessment and reflection activities. Some of these activities will take the form of questionnaires. The rationale as previously explained for including these activities in the OIP is to ensure stakeholder involvement in implementation. It also serves as method of differentiating and personalizing support such that it is tailored to the individual needs of each teacher. If teacher names are disclosed as part of this process of providing feedback or participating in reflection activities, teachers may feel disinclined to fully disclose their thoughts, feelings, and concerns for a variety of reasons. As an MLT, I am a colleague to the staff at the school and my agency as a leader is that of a supporter, coach, and facilitator. It would be detrimental and unethical if teachers felt pressured to respond in a certain way or felt judged by one of the MLTs. Furthermore, a teacher may feel

uncomfortable responding in a fully honest manner when the information will be shared with the principal and a teacher may be inclined to censor or alter his or her responses. The privacy needs and expectations of teachers will need to be respected, thus anonymity will be guaranteed.

To mitigate this issue, an ethic of care amongst teachers would necessitate the establishment of trust, support and confidentiality. Ehrich, Harris et al. (2015) state that the ethic of care involves concern for “the well-being and opportunities for all students” (p.204). It is characterized by the desire to ensure that students are supported to achieve their potential, develop positive feelings towards learning and build knowledge and skills to succeed (Ehrich et al., 2015). In terms of students, this ethic of care will be used when collecting information, such as self-assessment responses but also for the sharing of student work. The ethic of care forms part of the foundation of this plan because the ultimate goal is to improve student learning outcomes. The other part, the essence of the problem of practice, is to support teachers. The ethic of care as described above will be used throughout this plan. First and foremost, it will be used to mitigate the concern surrounding teacher anonymity. When reflective and self-assessment activities are completed, they will be voluntary and anonymous in nature.

The ethic of care is also listed as one of the ethical standards for the teaching profession in Ontario as described in the *Foundations of Professional Practice*. The ethic of integrity is another standard from this document, which deals with honesty and moral action through continuous reflection (Ontario College of Teachers, n.d.). This ethical standard will be demonstrated throughout this OIP to serve as a rationale for changing practice. The ethic of care incorporates a commitment to well-being and learning by means of “positive influence, professional judgement and empathy in practice” (p.9). Although it is described in terms of the ethical considerations between teachers and students, for the purposes of this OIP this ethic of

care will be extended to the relationship between teachers and specifically, the MLTs and teachers.

Change Process Communications Plan

Communication that is clear, varied and frequent is the foundation of this OIP. When communication during the change process is not effective, it can result in a lack of understanding, rumours and resistance to change (Elving, 2005). There are two goals for communication in an organization during the change process: information about the change and why it is needed as well as creating a sense of community. Both goals address the uncertainty that occurs in a time of change by leading to readiness for change and, ultimately, effective change (p. 134).

To communicate the change plan in this OIP with stakeholders, Klein's (1996) key principles of organizational communication will be used:

- Message repetition leads to message retention;
- The use of various communication methods is more effective than using just one method;
- Face-to-face communication is most effective;
- Existing structures in an organization are the most effective channels of communication;
- Observation is the best method of collecting information to be communicated;
- Opinion leaders are effective in changing attitudes and altering opinions; and
- Personally and contextually relevant information is better retained than unfamiliar or general information (p. 34).

Essentially, these principles demonstrate that communication during organizational change needs to be repeated through different methods to be effective. Emails, staff meetings,

conferencing, surveys and questionnaires are examples of communication methods that will be used throughout this OIP. As discussed in the Change Monitoring and Evaluation section, most of the communication in this OIP is conducted face to face with written methods being used as back-up or for repetition.

Communication in this OIP is viewed as an avenue to support teachers through the implementation of PBL at EGPS. Effective communication helps establish stakeholder ownership of the change process and prompts others to commit to the change (Dannefer, Johnston & Krackov, 1998). Klein (1996) states that observation is critical when gathering information to be communicated, a concept that ties in with his last principle which stipulates that personally relevant information is better retained. A foundational understanding of this OIP is that change comes about because of shared and transformational leadership, such that the change is relevant to EGPS and the stakeholders that are a part of the organization. Instead of making decisions behind closed doors and telling stakeholders what will be happening, decisions are made in a communal and transparent manner with direction from the MLT and the principal. Similar to monitoring the change, this involves constant observation, discussion and reflection throughout the change process. Furthermore, the idea that opinion leaders are critical when convincing others with regards to the merits of change connects directly with the agency of math leaders as coaches working collaboratively with teachers to facilitate learning and growth.

Table 3.2 summarizes the communication strategies that will be used throughout this OIP.

Table 3.2: Summary of communication strategies.

Plan	Act & Observe	Reflect
<ul style="list-style-type: none"> ● Sharing of information about PBL ● Pre-reflection to be completed by teachers (questionnaire) ● Co-creation of a vision for change during a face-to-face meeting ● Infographic of vision sent by email, posted around the school ● Professional learning session for staff; designed to elicit collaboration ● Information from session will be saved to Google Team Drives 	<ul style="list-style-type: none"> ● Teachers work collaboratively in pairs to plan PBL lessons in math ● Teachers co-teach PBL lessons ● Ongoing teacher feedback throughout the planning and teaching ● One-on-one meetings between teachers and MLT as needed or requested ● Meetings of the mathematics committee ● Open and ongoing communication regarding successes and challenges through face-to-face informal discussions, email, Google Classrooms 	<ul style="list-style-type: none"> ● Post-reflection by teachers to gauge learning ● Teachers asked to indicate whether they need further support and what that might look like ● Student self-assessment on their learning (e.g., exit-card) ● Sharing of successes and challenges at staff meeting ● Sharing of new policies and procedures by principal ● Modeling of PBL and ongoing support

Plan

During the planning phase, organizational objectives include preparing EGPS for change by introducing PBL. This will involve pre-planning for the change, amassing resources, figuring out the structure of the professional learning sessions, administering questionnaires and engaging in discussions surrounding PBL. Connected to these activities are the following communication needs: explanation of issues, needs and rationale, co-constructing a shared vision and first steps, reassurance and the collecting of feedback (Klein, 1996, p.37). All these needs will be met

through face-to-face communication in meetings with follow-up emails and infographics or handouts as required. The questionnaires will be completed either on paper or using a technological platform such as Google Forms. Communication is considered critical during change implementation because it is the avenue through which change agents can prepare stakeholders for change and the effects of change (Spike & Lesser, 1995).

Information surrounding PBL will be shared using various media, including emails, infographics and in-person meetings and conferences. These communications will be geared towards co-creating a vision for change, sharing rationale for change and planning activities and expectations for the change. Much of this will take place in full-group meetings or meetings of the math committee, while others will take place between the MLT and the principal. For example, the planning of professional learning sessions will take place between the MLT and the principal, but only after having met with all interested members of the math committee to generate ideas. The principal will also be instrumental in assessing trends in teacher perceptions and teacher need with the MLTs to help inform the stages that follow.

At this phase, the MLT will communicate the bulk of the information surrounding the change, generating discussion during meetings and sending emails conveying similar messages to the content of dialogue during those meetings. However, the principal will also play a critical role due to his agency and position in the organization. He will act as a guide throughout the planning phase and engage in discussion with MLTs throughout. The principal will be part of communication not only with staff members but also with the learning coach and central school board personnel. In a shared leadership model, principals have a strong influence on teaching and learning (Murphy, Smylie, Mayrowetz & Louis, 2009). As such the principal will also model

behaviour by engaging in professional learning sessions, participating in planning and will be a member of the mathematics committee.

Act and Observe

During the act and observe phases, the actual change will be taking place. The organizational objectives at these phases include beginning the change process, developing momentum and evaluating preliminary efforts (Klein, 1996, p. 37). This entails implementing change, monitoring the impacts of the change, adjusting the process and altering the initiative as needed. The communication needs during these phases involve informing stakeholders of progress and success, gathering input and eliciting dialogue on the effect of the change process, challenging misconceptions and reassuring and supporting stakeholders. Similar to the planning phase, communication at this stage will take place predominantly in the form of face-to-face communication between the MLTs and teachers. To document this in person communication, notes will be taken, follow-up communication through email will take place and reports will be written all while maintaining teacher privacy and anonymity.

Communication during these phases will be frequent and mirrored in person and on a technological platform, such as Google Classrooms. This platform is used frequently in our school, as are Team Drives in Google Drive, which will be used as a repository for shared documents and communications after they have been delivered or discussed. The mathematics committee will meet weekly throughout the act and observe phases to discuss implementation and successes or challenges that are being faced by teachers. This OIP is based on the premise that stakeholders require support and coaching to be successful, thus the avenues for face-to-face and anonymous communication will be open throughout. It should be noted that the mathematics committee is open, and all interested staff are encouraged to attend. Communication during these

stages must be ongoing and open, such that it elicits feedback and discussion that caters to the diverse needs of teachers during implementation. This will mean that the MLTs can support each other as well as each teacher in accordance with their specific needs.

Reflect

The organizational goals at this stage involve the reinforcement of change, dealing with challenges or shortcomings, demonstrating the level of success of the change and institutionalizing the change by making it a way of doing in the organization (Klein, 1996, p.37). Successes will be recognized and rewarded and supporting structures will need to be solidified. The communication goals at this phase will be to make successes known, updating policies and procedures and sharing information with teachers.

Given that the lines of communication have been opened and maintained throughout, it will be integral that this communication does not fall apart during the reflecting phase. This will be the stage at which the change will be *made to stick* by making collaboration and open-communication a way of doing in the organization. PBL will be embedded as a model for the way mathematics is taught, a concept that will require a certain amount of follow-through. Teachers will be encouraged to communicate their feelings through a post-reflection activity, which will help MLT provide further personalized support moving forward.

The successes and challenges faced throughout implementation will also be shared with community stakeholders, such as parents and school board members who are invested in the initiative. These may include the superintendent for the family of schools and central learning coaches. According to Klein (1996), communication tends to fall apart during this final phase and misconceptions arise. At times, the change falls by the wayside and does not become part of

the structure of the organization. As a result of this, it will be critical to ensure that communication in both formal and informal forms be maintained during the reflection phase.

The communication plan as outlined is critical to ensure the success of this organizational improvement plan. Constant communication of the change vision, process and successes and failures using different methods and media as well as open lines of communication for feedback and discussion will allow for seamless implementation of the proposed solution and appropriate support for teachers and other stakeholders.

Next Steps and Future Considerations

Despite the descriptive implementation plan, the change process monitoring, ethical considerations and the emphasis placed on communication, there are further steps that need to be considered. The implementation is designed to fit within one academic year, but depending on implementation issues that may arise or tangential changes that may change. As mentioned throughout this OIP, a culture of collaboration is a large part of the solution to the implementation of PBL. Cultures of collaboration are more likely to be established when authentic problem solving and inquiry take place (Sutton & Shouse, 2016; Cochran-Smith & Lytle, 1999). A rich culture of collaboration can only flourish and be maintained when risk-taking is encouraged and errors are opportunities for learning (Sullivan, 2010). The culture of collaboration needs to be nourished and made a procedure at EGPS to ensure that the changes made through this OIP are institutionalized. Furthermore, MLTs will need to ensure that all mathematics related change initiatives are brought forth and implemented through the use of this culture of collaboration. In terms of future considerations, more empirical evidence is required regarding the nature of the difference between English and French Immersion programs and the ways in which these differences impact professional learning.

The role of MLT is relatively new, but as the lead MLT at EGPS I am in a unique position to use my role as a teacher and leader in conjunction with my knowledge and interest in mathematics in the implementation of PBL in mathematics. Leading this initiative will pave the way for future leadership opportunities in mathematics at EGPS and perhaps with other schools.

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