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A Knowledge Synthesis of Large-Scale Assessments Relative to Canadian Educators

By
Silvana Nawalany

A Major Research Paper
Submitted to the Faculty of Graduate Studies
through the Faculty of Education
in Partial Fulfillment of the Requirements for
the Degree of Master of Education
at the University of Windsor

Windsor, Ontario, Canada

2018

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A Knowledge Synthesis of Large-Scale Assessments Relative to Canadian Educators

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November 28, 2018

Declaration of Originality

I hereby certify that I am the sole author of this major research paper and that no part of this major research paper has been published or submitted for publication.

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Abstract

Canadian culture puts great emphasis on large-scale assessments (LSAs) as a representation of how our students understand curriculum expectations in core subjects such as math, literacy, and science. LSAs are used to compare students' rankings within major subject matter at both an international and national level. Through research it has been determined that there is a strong correlation between a teacher's pedagogical practice, job satisfaction and thusly student experience with reference to the stresses and expectations of LSAs. A knowledge synthesis analysis was used to direct the following three questions: (1) What is the goal of LSAs within the Canadian educational system? (2) What type of pressures or stipulations do LSAs pose in Canada place on teachers? (3) What are the consequences, both positive and negative, of these expectations on teacher job satisfaction and student experience? LSAs have had a positive effect on curriculum reform and have been a key source for comparative data. However, with its evolution, negative viewpoints and judgments amongst teachers have emerged. These opinions have spread to students and have affected their performance and educational experience. This synthesis sheds light on these factors based on research in the Canadian educational school system.

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Introduction

Large scale assessment (LSA) scores, such as those of the Education Quality and Accountability Office (EQAO), have long been a part of school improvement plans. Achieving and exceeding the provincial standards for both numeracy and literacy has been an increasing focus within the school system. Great emphasis, time, and money have been put forth in terms of professional development and planning time in order to develop and discuss novel ways to assist teachers improve LSA scores. With such emphasis being placed on the importance of test scores, teachers sometimes feel that they are the primary focus when the scores are released while students often feel anxious, experiencing test anxiety (Copp, 2016). The release of these scores, can be either a sense of relief for teachers when the students are performing well or a sense of dread when the scores are below the provincial standard. Even though large-scale assessments are placed within school systems to assess student achievement amongst other purposes, teachers feel as though it is a reflection of their teacher competency.

Standardized testing (ST) has recently been the focus of many debates, however it has also been a part of our culture for many years. ST dates back to the fifth century where the Chinese began to implement a form of standardized testing as part of “the Imperial examination...different tests were used to determine aptitude for various levels of government posts, with specific knowledge required for specific jobs” (Kempf, 2015, p. 31). For the most part, all testing was completed orally until the first written standardized test permeated our school systems in 1845, introduced by Horace Mann (Gershon, 2015). During WWI the military continued to use different variations of standardized testing to assess a soldiers’ mental competencies. Also, during this time, “standardized assessment moved from a focus on intelligence to a focus on achievement” (Kempf, 2015, p. 33).

The Canadian and U.S. systems are similar in education values. Both countries are often paralleled and compared in regards to standardized testing. However, in the U.S.A., LSA are often monitored federally, and it was during the 60s that Canada deviated from U.S.A.'s path. Kempf (2015) specifies that, "Canada's education landscape is rigidly divided by province (ten in total) and territory (three in total), each of which is responsible for education within that jurisdiction" (p. 35). Initially, Alberta was the first province to implement a norm-referenced¹ standardized test, an evaluation comparing students' scores with other peers based on the same pre-determined standards. Kempf (2015) notes that provinces (other than Alberta) and territories began either implementing or establishing standardized tests in the 1990s. Whereas, Ontario initiated the process of putting into practice a standardized test in 1994 at the discretion of the Royal Commission on Learning (Kempf, 2015). EQAO was established and began the endeavor of standardized testing provincially in Ontario. It wasn't until 1997 when the first EQAO test was administered to Grade 3 and 6 students (Education and Quality Accountability Office [EQAO], 2013-a). According to EQAO (2013-a), the Ontario Secondary School Literacy Test (OSSLT) was introduced in 2000 followed by Grade 9 Mathematics assessment in 2001; it wasn't until 2004 where results were shared amongst the education community including administration, teacher, and parents.

Although, EQAO testing is on a provincial level, Canada has participated in standardized tests on a national level long before EQAO was established. The Council of Ministers of Education, Canada (CMEC) founded in 1967 became a key player in the education system in

¹ A **norm-referenced test (NRT)** is a type of [test](#), [assessment](#), or [evaluation](#) which yields an estimate of the position of the tested individual in a predefined population, with respect to the trait being measured. (Wikipedia)

1989 where “(after nearly a decade-long economic crisis) under pressure to better equip Canadian Students for changing economy and workforce” (Kempf, 2015, p.36). The CMEC is still in charge of large scale national and international testing. In Ontario, the EQAO office works jointly with CMEC on the following large-scale assessments. According to the EQAO (n.d.-b), the following is a current list of national and international LSA:

- Trends in International Mathematics and Science Study (TIMSS)
- Progress in International Reading Literacy Study (PIRLS)
- Programme for International Student Assessment (PISA)
- Pan Canadian Assessment Program (PCAP)
- The International Computer and Information Literacy Study (ICILS)

In short, the evolution of the standardized test surely has evolved over time, not only in delivery of assessment, but also in its purpose. Through research, it is also evident that LSA will continue to impact our education system as, “the new world of educational policy and the role that numbers and metrics now play” (Lewis & Lingard, 2015, p.621) currently guide how, what and when our students learn based on the education policies developed by the Ministry of Education. For the purposes of this research paper, the synthesis will focus on LSA within Ontario. As previously noted, LSA either directly or indirectly places great pressures on teachers and their own philosophy on education and their practice. This is supported by Kempf’s (2015) work he argues that, “when testing drives instruction, it also inevitably drives instructional methods, so in addition to time spent on some things in place of other, pedagogy itself is narrowed” (p. 56).

The Ministry of Education may write the curriculum, the EQAO may facilitate LSAs, and administration may impart rules and enforce policies; however, I argue that it is the teacher who

has the greatest effect on student achievement. A teachers' attitude and practice has a direct effect on students' achievement and experience. The EQAO is seen as a low stake assessment in comparison to high stakes, due to the fact that there are no direct teacher/student consequences (Volante, 2013). However, this idea contrasts the fact that teachers must adhere professionally to all EQAO, Growing Success, and other board policies or otherwise face a potential charge of professional misconduct. Sanctions may be imposed by the Ontario College of Teachers (OCT), for those teachers, "who have been found in violation of the EQAO testing rules" (Education Quality and Accountability Office [EQAO], 2009-e, p. 335). Such sanctions may include professional misconduct, suspension of OCT certificate, potential loss of salary and demotion (Governing Ourselves, 2018). The potential of being charged induces a form of math anxiety for teachers and may have a negative effect on attitude; thusly affecting pedagogy.

Winton (2013), through a qualitative analysis, has noted that Canadians relate success to EQAO scores, and found that the higher the score, the more successful our schools and students. Kempf (2015) noted that a teachers' resentment and unease of standardized testing dates back to the 1800's; stating that the "use of ST immediately led to resistance and controversy based on the perception by teachers and school administrators that tests were unfair" (p. 32). As a society, we strive for success in life, both personally and professionally. As a teacher, it is difficult to not feel anxious about test scores knowing that your students may reflect your professional competency (Copp, 2016). As such, these scores are seen as an indicator of how competent is in delivering curriculum expectations. There is also added pressure as the scores are shared with parents, administration and are published. "We typically measure not only a student's aptitude and achievement with standardized tests but also the effectiveness of instruction and indeed the quality of education provided by the school" (Ashcraft & Moore, 2009, p. 201).

As stated above, a teacher feels like these LSA scores reflect their own competency as a teacher. The anxiety which ensues from being judged is then translated to the student; “students often develop math anxiety ins schools, frequently as a result of learning from teachers who are themselves anxious about their mathematical abilities” (Finlayson, 2014, p.101). In addition, a students’ math anxiety may be aggravated by a teacher’s own feelings about the subject. “If math instruction is to be effective, it must start with teachers portraying a positive, confident attitude about the subject” (Shields, 2007, p. 55). This is also supported by Aiken (1991) who affirms that not only does standardized testing affect the student, but also the teacher in terms of efficacy and attitude (as cited by Rogers, 2014).

Educators, parents, and community stakeholders strive to impart skills upon our children that will help them thrive as well-rounded individuals upon graduation, in hopes that they will be able to serve their community and contribute to society. However, this goal is unattainable if we negatively affect a students’ experience. Math anxiety is a major reason why students may have a negative experience at school. Math anxiety not only affects the psyche, but also the body. Shield (2007) clearly states some of the symptoms a student suffering from math anxiety may experience “sweaty palms, muscle contractions, difficulty breathing, tightness in the throat and chest, nausea, headaches, heart palpitations, restless behavior and forgetfulness” (p. 56). I argue that, a student cannot be expected to perform well on a large-scale assessment if they are physically being affected by their math anxiety.

Math anxiety in students has been reported in a variety of journals. The most common conclusion reported is that “the most notable consequence of math anxiety is poor math achievement” (Shield, 2007, p. 59). There is a negative correlation between math anxiety and

math performance; the more anxiety one experiences the worse he/she will perform in their math class and on math tests, in particular LSAs (Foley *et al*, 2017; Ashcraft & Moore, 2009).

One of the purposes of LSA is to motivate students, and to encourage friendly competition. Nonetheless, this is not the case for all students, in particular those facing math anxiety because, “Competitive performance and testing environments can create anxiety about meeting math performance expectations” (Foley *et al*, 2017, p. 55). These expectations are based on scores, which are not only reported to the student and their family, but also the teacher, administrators, and school board trustees. These scores are made public and are also included in student records. Finlayson argues that;

In testing situation, we typically interpret a students’ score on the standardized test as an indicator of the student’s mastery of math, literally of his or her math achievement (or of the quality of instruction)” (Ashcraft & Moore, 2009, p. 202). Nonetheless, is the score on the LSA really a representation of the “student’s mastery of math” if “tests and exams cause a lot of math anxiety for the students[?]. Students sometimes would draw a blank when faced with an exam” (Finlayson, 2014, p. 108).

In short, math anxiety can clearly affect how a student learns. It is exacerbated in a testing situation, even more so in an LSA setting (Ashcraft & Moore, 2009). Consequently, if the student is facing math anxiety and thusly does not perform well on a test, the students experience is affected along with their math practice and understanding, as well their academic experience and competency and the social experience of education.

Statement of Problem

As the Ontario Ministry of Education (OME) (2014) notes “our education system will be characterized by high expectations and success for all. It will be responsive, high quality,

accessible and integrated from early learning and child care to adult education” (p. 1).

Nonetheless, with the emphasis on Large scale assessment (LSAs), we must revisit this mandate and ensure that our students are receiving a well-balanced education. As Adamowycz (2017) clearly states “education is a multi-leveled process and includes social, cognitive, emotional, cultural and developmental elements” (p. 15). Furthermore, Growing Success (2010) makes note that “Ontario’s education and career/life planning program has been designed to ensure that all students develop the capacity to achieve their personal goals for work and life, make successful transitions throughout life, and make positive contributions to their communities” (p. 7). There is limited research that looks at the impact of LSA on the social, emotional, cultural and development (Kempf, 2015; Stiggins, 2002).

Purpose Statement

The purpose of this major research paper is to conduct a knowledge synthesis of large-scale assessments test scores and its effects on Canadian educators.

Research Questions

For the purposes of this paper, the following questions guide this knowledge synthesis:

1. What are the main objectives for administering large-scale assessments (LSAs) to students within the education system? In particular, what is the main focus of the EQAO within our Ontario schools?
2. What are the main effects of LSA on teacher pedagogy, job satisfaction, and morale? Is this precursor to math anxiety within our teachers thereby affecting our students?
3. What are some suggestions from current literature to alleviate the negative effects of LSAs on our teaching staff?

Locating Myself in the Study

I identify myself as an educated woman with two post-secondary degrees, and a teacher with qualifications in both guidance, cooperative education, and an honours' specialist in mathematics. I am an educator in good standing with the Ontario College of Teachers and as such abide by the ethical standards of the teaching profession; care, respect, trust, and integrity. As stated by the OCT (2018) the ethical standards for the teaching professions are:

- to inspire members to reflect and uphold the honour and dignity of the teaching profession
- to identify the ethical responsibilities and commitments in the teaching profession
- to guide ethical decisions and actions in the teaching profession
- to promote public trust and confidence in the teaching profession.

As a mathematics teacher in the secondary school system for the past eleven years, I have been exposed to the intensity of Ontario's province-wide assessment. On a personal level, I have administered the test and prepared students for the test and thusly have experienced my own anxiety as a new and now a seasoned teacher while observing its effect on my students and myself. This experience has motivated me to write this paper.

My role in education is pertinent to the success of my students and future graduates; to guide them in their academic endeavors so that they become well-rounded contributing citizens of society. LSAs may have their place and positive benefits when considering policies, curriculum, international economic growth, however I believe it is important to advocate for my fellow educators about the physiological stress that LSAs have on both teacher and students. Winton (2013) discusses how a school defines success and the fact that a positive attitude lays the foundation of a progressive and well-rounded education. This synthesis will emphasize both the positive and negative effects of LSAs on education.

Terminology

The following is a list of terms used throughout this knowledge synthesis:

- The acronym EQAO refers the Education Quality and Accountability Office where the office is responsible to facilitate, assess, and report students' reading, writing and math skills within Ontario schools (Education and Quality Accountability Office [EQAO], 2013-d).
- The acronym PISA refers to the Programme for International Student Assessment which is an international test administered to 15 year olds. The goal is to evaluate students within content area of science, math, and literacy (Program for International Student Assessment, n.d.).
- The acronym PISA refers to the Trends in International Mathematics and Science Study. This is an international test based on core subject's math and science (TIMMS & PIRLS, n.d.).
- This term knowledge synthesis refers to a type of study which attempts to collect and summarize pertinent studies focused on the statement problem. The goal is to identify gaps, existing inconsistencies and to define potential future research (Kastner et al., 2006).

Methodology

Knowledge Synthesis

In 2002, Thompson, Johnstone, and Thurlow addressed the growing use of LSAs within our culture, starting from health care and extending to our education system. The focus of their scoping study was to synthesize the seven major elements of an LSA and provide gap clarity and recommendations. Arksey and O'Malley (2005) provided a systematic guide for conducting a scoping study (knowledge synthesis). Authors Arksey and O'Malley (2005) defined a scoping

study² as an “aim to map rapidly the key concepts underpinning a research area and main sources and types of evidence available” (p. 21). The authors Arskey and O’Malley (2005) make note of the following five stages when conducting a scoping study or knowledge synthesis:

Stage 1: Identifying the research question

Stage 2: Identifying relevant studies

Stage 3: Study selection

Stage 4: Charting the data

Stage 5: Collating, summarizing and reporting the results (p. 22)

Using these five stages as a guide the following synthesis was developed.

Stage 1: Identifying the Research Question

1. What are the main objectives for administering large-scale assessments (LSAs) to students within the education system? In particular, what is the main focus of the EQAO within our Ontario schools?
2. What are the main effects of LSA on teacher pedagogy, job satisfaction, and morale? Is this precursor to math anxiety within our teachers thereby affecting our students?
3. What are some suggestions from current literature to alleviate the negative effects of LSA on our teaching staff?

Stage 2: Identifying Relevant Studies

This knowledge synthesis adapts DeCoito’s (2016) four knowledge sources in order to capture studies relevant to the research questions:

² Scoping study is a form of knowledge synthesis

1. Type 1 includes empirical and descriptive studies published in peer-reviewed education and policy journals.
2. Type 2 knowledge sources include empirical and descriptive studies published (including in venues other than peer-reviewed journals).
3. Type 3 sources include published expert knowledge, opinion, and/or advice (not research) located in periodicals or on websites.
4. Type 4 sources were collected through visits to various locations to meet with stakeholders (community partners, university programs, outreach, school board, etc.)

For the purposes of this paper, I conducted a knowledge synthesis from the following peer-reviewed journals focusing on LSAs and their effects on the teaching profession:

1. Math education journals
2. Science education journals
3. Psychology journals

The research questions listed were focused on the Canadian school system and their teachers.

However, the sampling size of available journal articles is limited. Consequently, further sources as cited by authors, were investigated.

Stage 3: Study Selection

The peer-reviewed journals focused on LSA and their effects on teacher pedagogy and morale were collected online. These articles were strategically chosen because they were related to the research questions, within the Canadian context, offered and available, and written within the last 10 years, 2006-2017. Searches were conducted within the following databases:

1. University of Windsor Library
2. Google Scholar

3. ERIC
4. ProQuest
5. Taylor & Francis Online
6. Statistics Canada
7. JSTOR
8. Directory of Open Access Journals (DOAJ)
9. Springer

The following journals were used to collect literature:

1. Canadian Journal of Education
2. Journal of Education Psychology
3. Education Policy Analysis Archives
4. Curriculum Journal
5. EAF Journal
6. Educational Researcher
7. Educational Studies in Mathematics
8. Canadian Journal of Higher Education

The following are sources not included: empirical and descriptive studies published (including online) in sources other than peer-reviewed journals, major papers, professional development trade book, and magazines. In researching the topic, the peer-reviewed journal articles concentrated on the following list of the core topics:

1. Appropriate title and abstract relevance
2. History of LSAs
3. International/National/Provincial LSAs

4. Math anxiety
5. LSAs implications and expectations
6. Research gaps
7. Relevant references

A combination of the following key words was used to research the topic in research databases necessary to collect literature for this synthesis:

1. Large-scale assessments
2. Standardized testing
3. Math anxiety
4. Ontario/Canada
5. Education
6. Mathematics/math
7. Pedagogy
8. EQAO
9. Teacher

Stage 4: Charting the Data

After completing the study search the following 7 articles met the criteria. Table 1 is a summary of the articles and their contributions.

Table 1					
Summary of Articles to be Analyzed for Knowledge Synthesis					
Title	Author(s)	Date Published	Qualitative/Quantitative	Pop.	Pop. Size
1. Mathematics anxiety and the affective drop in performance	Ashcraft, M., & Moore, A	2009	Qualitative and quantitative	Historical analysis	

2. The impact of teacher attitudes and beliefs about large-scale assessment on the use of provincial data for instructional change	Copp, D. T.	2016	Qualitative and quantitative	K-12 participating school divisions across Canada	Emailed surveys sent in 2013-2014; target was Canadian public school teachers
3. The math anxiety-math performance link and its relation to individual and environmental factors: a review of current behavioral and psychophysiological research.	Chang, H., & Beilock, S. L.	2016	Qualitative		United States
4. Tensions and fissures: the politics of standardised testing and accountability in Ontario, 1995–2015	Pinto, L. E	2016	Qualitative	Ontario teachers	Ontario, Canada
5. Improving the utility of large-scale assessments in Canada	Rogers, W. T.	2014	Qualitative		Canada
6. Canadian policy responses to international comparison testing	Volante, L	2013	Qualitative	K-12 education across Canada	Canada
7. How schools define success: The influence of local contexts on the meaning of success in three schools in Ontario	Winton, S.	2013	Qualitative	Three elementary schools; total of 34 people were interviewed	Ontario, Canada

Stage 5: Collating, Summarizing and Reporting the Results

Summary of findings from each of the articles considered:

1. Mathematics anxiety and the affective drop in performance (Ashcraft & Moore, 2009)
 - a. Ashcraft and Moore found that “math anxiety causes an “affective drop,” a decline in performance when math is performed under timed, high-stakes conditions” (p. 197).
 - b. When math anxiety plays then a true level of understanding of material can not be determined, as it is skewed due to psychological issues.
 - c. Math is strongly based on memory. One reason math anxiety occurs is lack of working memory; therefore, affecting math performance.
 - d. High-stake settings, such as that of a standardized test, promotes anxiety within math-anxious individuals thus a decline in test scores.
 - e. Other indicators of math anxiety is the classroom setting itself. The environment, expectations, teachers and students.
 - f. There are long term effects of math anxiety; there is a clear avoidance of anything STEM related in terms of post-secondary pathways.
2. The impact of teacher attitudes and beliefs about large-scale assessment on the use of provincial data for instructional change (Copp, 2016)
 - a. Through interviews, the researcher uncovered that there was ambiguity as to how the data should be used. Nonetheless one consistency unveiled by Copp as that
 - b. LSAs has “become a standard tool used to measure educational effectiveness and to make teachers and schools accountable for academic performance” (p. 3).

- c. The researcher also reported that students are affected by high-stakes testing; it was reported that they “substantially increase the pressure on students to perform” (p. 3)
- d. Through interviews of educators at different levels (teachers, administrators and district-level staff) teachers and their pedagogical practice are affected by LSAs.
- e. Copp discusses that LSA have instructional effects on not only the quality of the test but also the teacher and student alike.
- f. Through Copp’s qualitative research and literature review, the author uncovered that LSAs narrowing the curriculum, educators tend to overlook other subjects with a focus on LSA topics tested, reduced staff morale, teachers’ ethical values are questioned as coaching and teaching to the test becomes an issue, and cheating amongst students questions the validity of the test.
- g. Copp clarifies that even though teaching to the test is seen as a negative consequence, when test preparations are done ethically then the data is able to be used in a positive way. As such, when the test scores are valid then their data can be used to improve curriculum expectations, policy, may act as a reflection on a teacher’s own pedagogical process, and may provide more relevancy to professional development.
- h. The article also focuses on the role of Canadian teacher attitudes toward LSAs. A teacher’s willingness to implement policy change emerging from test scores must be embraced by the educator in order for it to be effective. Also that professional development and its relevancy to aid teachers use the results effectively is key.

- i. Copp through his findings also stated that teachers find the test scores a reflection of how they teach more so than what the student is learning. Also, that consideration must be taken that LSA are biased and flawed.
 - j. Furthermore, with respect to teacher attitude, the study presented by Copp concluded that “regular and consistent emphasis on teaching to the test strategies does narrow the curriculum made available to students and also limits the means by which they can demonstrate their understanding” (p. 7).
3. The math anxiety-math performance link and its relation to individual and environmental factors: a review of current behavioral and psychophysiological research (Chang & Beilock, 2016).
 - a. “Math anxiety is defined as ‘a feeling of tension, apprehension, or fear that interferes with math performance” (p. 33).
 - b. Math anxiety is a growing global issue; PISA reported in 2012 that 33% of 15-year old students suffered through the standardized test with respect to solving math problems.
 - c. Problems associated with math anxiety include social and psychological issues.
 - d. One factor effecting a student’s math anxiety is the teacher themselves. A teachers own relationship with math and their own perspective affects the level and degree of math anxiety a student experiences.
 - e. The author provides multiple interventions.
4. Tensions and fissures: the politics of standardised testing and accountability in Ontario 1995-2015 (Pinto, 2016)

- a. Pinto clearly identifies that assessments, in particular LSA influence educational policies and change
- b. Pinto refers to the establishment of the EQAO and makes notes that the provincial tests are aligned with the Ontario curriculum.
- c. The author cites both advantages and disadvantages of LSA within Ontario. Advantages include “positive effects on student achievement, identification of targeted professional learning needs, and confirmation of whether the curriculum has been adequately addressed” (p. 96). On the contrary the article also discusses that LSA tend to narrow the curriculum, promote teaching to the test, limits the teacher’s pedagogical practices, promotes teacher stress and affects job satisfaction.
- d. As of 2011, Statistics Canada reported that “Ontario represents approximately one-third of the nation’s population, and accounts for 40% of Canada’s gross national product” (p. 96).
- e. Every province in Canada has jurisdiction of their own education programs, run by the Minister of Education for each of the ten Canadian provinces and three territories.
- f. Ontario is the only province where a LSA is not facilitated directly by the government. The EQAO, a third party who is independent but heavily tied to the government creates, facilitates, and assesses and reports testing results.
- g. Through further research Pinto notes that EQAO is not considered to be high-stakes. EQAO promotes transparency in reporting the test results however, in doing so poor test scores reflect poorly on schools making it high-stakes. Poor

rankings affect school culture, test bias, and reality in the surrounding school areas.

- h. There is a distinct contradiction between what the EQAO reports as testing be low-stakes due to the fact that they do not directly affect teacher, student or funding. However, teachers are able to use a portion of the assessment for evaluation purposes, poor test scores will undoubtedly result in more professional learning for teachers the following school year.
 - i. Pinto also clearly defines how the EQAO on a provincial level affects teacher morale and job satisfaction. In order to avoid a poor ranking, schools will often place pressures on teachers to perform better, and “teachers perceive the tests to be high stakes because they feel professionally responsible for their schools’ results” (p. 101).
 - j. With respect to teacher pedagogical practices, LSAs create competitive environments further promoting teacher anxiety.
 - k. In considering the math stream, EQAO has seen a steady decline and as such one suggestion by the Ministry of Education was to set aside a prescribed amount of time for math education; thereby promoting narrowing of the curriculum and teaching to the test. This inevitably affecting an educator’s pedagogical practice.
 - l. Test results were to be used to improve curriculum and student learning. However, further stresses have been placed on teachers with the ever growing initiatives the government has placed on educators to improve test scores.
5. Improving the utility of large-scale assessments in Canada (Rogers, 2014)

- a. One factor which affects the effectiveness of any LSA is the ability to use the results to further promote student learning and teacher pedagogy. Rogers contends that results are not being used efficiently because they arrive too late, they do not reliably identify strengths and weaknesses, and lastly administrators and educators alike do not know how to use the results.
- a. Rogers proposes in this journal that in order for LSA (which are inevitable) should be re-evaluated. Re-evaluation includes timing, subject matter, and education of how to use results.
- b. Benefits of LSA included in the article are: discover that students with special needs require extra attention; promote student achievement; results can be used to focus professional development for educators and administrators; ensure that the curriculum is being taught; and hold educators and students accountable.
- c. Disadvantages of LSA included are: narrow instructional time; lack of inquiry thinking; teaching is focused on lower order; teaching to the test; increase in cheating; narrowed curriculum; teacher stress; and reduced expectations.
- d. Similarities in education across Canada: subject curriculum is common between all provinces and territories; educators are responsible to provide an equitable and inclusive learning environment; and LSA are used to inform and support school initiatives and learning.
- e. Journal proposes three major changes to LSAs across Canada. The first being that LSA “relevant and justifiable evidence to foster a conversation about how to improve instruction of all students (p. 5). The second suggestion is that there is sufficient time allotted to administrators and educators to collaborate in order to

discuss and implement instructional change. Lastly, the third recommendation is that the results of LSAs are integrated with purpose and in order to do so educators and administration must be educated as to how to interpret the results.

- f. In order to successfully implement these three changes, the author argues that there is a need for credible diagnostic information, and more time and instruction for teachers to learn how to use the information.
 - g. In order to account for these changes and promote the success of a LSA, Rogers proposes a change to the assessment schedule, provide adequate support, and increased assessment reliability.
6. Canadian policy responses to international comparison testing (Volante, 2013)
- a. Volante used comparative analysis to review existing literature with respect to three major sub-topics: Large-scale testing, international testing in Canada, and trends in policy and practice.
 - b. The author identifies that there is a spur in the educational field to improve LSA test scores on both a national and international level as it is an indicator of how Canadians will be able to compete on a global level.
 - c. The author makes note that international testing focuses on key areas; math, reading, and writing whereby “Canadian educators are expected to use large-scale test results to inform and support their own improvement efforts” (p. 170).
 - d. Volante provides advantages and disadvantages of LSAs cited in literature throughout the analysis
 - e. Advantage: “raising the intellectual capital of a nation will undoubtedly enhance economic standing” p. 170).

- f. Advantage: Volante's research has found that LSAs are often used to promote excellence and motivation within students.
- g. Advantage: Test results provide teachers a benchmark for their students; they are able to gauge students and address areas of concern.
- h. Advantage: Supporters of LSAs suggest that they promote consistency and accountability within the education field.
- i. Disadvantage: LSA's "can be culturally biased" (p. 171) and a disadvantage to minorities and students with learning challenges.
- j. Disadvantage: Volante's research suggest that LSAs narrow the curriculum and do not allow for growth in other subject areas, in addition, they delineate the importance of critical thinking.
- k. Disadvantage: Due to a potential low test scores, dropout rates may increase due to lack of motivation.
- l. Canada participates in international testing (PISA, PIRLS, and TIMSS) and uses these results as a benchmark against national test (Pan-Canadian Assessment Program (PCAP)).
- m. Since 2014 when the author reported his findings, "collectively, the results suggested that Canadian students performed well on this international assessment program" (p. 172).
- n. In analyzing the literature, Volante discusses how LSAs affect policy across Canada. Namely that curriculum reform and school improvement efforts are strongly tied to large scale test results and how these compare to international benchmarks.

- o. Policies and efforts set in place by the government are focused on strategies to help improve national and international scores, for example the establishment of the Literacy and Numeracy Secretariat (LNS).
 - p. Furthermore, in Ontario it led to the creation of EQAO where it has been supported by all three major political parties and oversees all three international testing program.
 - q. Lastly Volante's analysis also reflects on the fact that policy makers may lose sight of the bigger picture and once again narrow the curriculum, ultimately affect student achievement and thusly graduation rates.
7. How schools define success: The influence of local contexts on the meaning of success in three schools in Ontario (Winton, 2013)
- a. School success is influenced by several factors including impacts from local, national and international perspectives.
 - b. Winton provides different definitions or explanations of success within a school. For example, "one definitions might equate school success with high student achievement while another could define it as a democratic environment" (p. 2). The notion of success is strongly connected to education objectives and strongly correlated to what each community or society values; citizenship, graduation rates; and scores.
 - c. The purpose of education is centered around three basic framework; aesthetic, economic, and ideological. In particular, economic where being competitive is key and a main focus.
 - d. Ontario has four publicly funded educations systems.

- e. In Ontario, “success was defined at 75% of students meeting the provincial target...on standardized reading, writing, and math assessments administered by Ontario’s Education Quality and Accountability office” (p. 3)
- f. Within Ontario, there is a direct correlation success relative to scores on the EQAO.
- g. In discussing pedagogical focuses, these are often centered around economic objectives which in turn are based on LSAs.
- h. Winton argues through her comparative study that the Ontario government places much more emphasis on student achievement rather than student well-being.
- i. Winton found that “Ontario citizens share the Ontario government’s prioritizing of schools’ economic purposes and use of standardized test scores as indicators of success” (p. 4).

Research Analysis

The seven articles chosen for this knowledge synthesis shared common themes. The following is a discussion of these themes and the commonalities present which are relevant to the research topic of this major paper.

Theme 1: Purpose of Large-Scale Assessments.

The first theme shared by authors Copp (2016), Pinto (2016), Rogers (2014), Volante (2013), and Winton, 2013 were the reasons discussed for the purposes of large scale assessments in Canada. Reasons central to all papers noted included that LSAs are linked to economic growth. All authors have included in their journals that there is a direct correlation between levels of achievement on standardized tests and economic growth; “achieving the provincial target on EQAO tests is often explicitly linked to economic purposes of education” (Winton,

2013, p. 3). The thought process is that if our students excel on testing throughout their elementary and secondary education that they will be able to contribute positively and thusly be a factor in Canada's economic growth compared to other countries; "proponents of...large-scale testing have argued that raising the intellectual capital of a nation will undoubtedly enhance its economic standing" (Volante, 2013, p. 171). Aside from the consideration of the economy, another target for LSA noted by the journals is to reform education policy and curriculum, "departments of education and school district personnel can use large-scale assessment results to confirm that the curriculum has been addressed effectively" (Rogers, 2014, p. 3), and aid in improving professional development "benefits of assessment as: data for school improvement planning, implementation of the curriculum" (Pinto, 2016, p. 100). Copp (2016) combines these factors as the purposes of LSA are to "indicate what might prove to be relevant professional development (PD)...greater awareness to curriculum standards by school leaders" (p. 4). Other common factors listed in journals 2, 4, 5, and 6 are that LSAs promote student achievement, allows for a more equitable education, and identifies students who are struggling. Rogers (2014) states that "large scale assessment results have positively affected the need for increased attention to students with special needs" (p. 3). Coupled with Volante's (2013) findings that "establishing and raising standards, and measure the attainment of those standards, are intended to encourage excellence in student performance" (p. 170) which emphasized the shared purpose of a LSA among these authors.

Theme 2: Math anxiety with LSA

LSA can promote feelings of unease or the math anxiety induced in both students and teachers which may affect their perspective of education in a negative way. This theme was common amongst the journals written by Ashcraft and Moore (2009), Copp (2016), Chang and

Beilock (2016), Pinto (2016), Rogers (2014), and Volante (2013). This commonality was one of the reasons that these articles were optimal choices for this synthesis. With respect to students, Ashcraft and Moore (2009) concluded that “every time a math-anxious individual is asked to perform math in a timed, high-stakes setting, the individual’s math anxiety is aroused and causes affective drop, a significant decline in performance” (p. 204) this in turn illustrates that a LSA is not an adequate assessment of their math skills and has a negative affect. Equally important “students may become less motivated, and there is a higher dropout rate when high-stakes decisions are attached to large –scale results” (Volante, 2013, p. 171). Furthermore, the anxiety induced also manifests itself in a physical form “high levels of math anxiety are known to be associated with increased cardiovascular activity...and negative emotional processing” (Chang & Beilock, 2016, p. 35). With respect to a teacher’s psychological response to LSA, journals most often focus on the altering of their pedagogical practices and not on their mental wellness; a gap further discussed in this major paper. However, Pinto (2016) does state that “teachers perceive the tests to be high stakes because they feel ‘professionally responsible for their schools’ results” (p. 101) thusly leading to “poor staff morale” (Copp, 2016, p. 3). Rogers (2014) reinforces this point that LSAs “reduce teacher professionalism...questionable evaluations of school personnel and teacher stress” (p. 4).

Theme 3: Instructional Change with LSA

Another common theme which resulted in the selection of Ashcraft and Moore (2009), Copp (2016), Pinto (2016), Rogers (2014), Volante (2013) and Winton (2013) was the unintended or intended occurrence of instructional change when a LSA was planned. The journals reported that instructional change affected a teachers’ pedagogical approach in the forms of teaching to the test and curriculum shortening. Rogers (2014) notes that LSAs “narrow

instructional content...emphasis on students learning lower order thinking skills at the expense of higher order thinking skills...neglect of content not covered by the assessments” (p. 4).

Authors of the journals included in this synthesis mirrored the same observations. Copp (2016) goes one step further and connects teacher stress due to LSAs pedagogical approach, “results show that teacher attitudes about these assessments are strongly correlated to the classroom level instructional change” (p. 1). In addition, other negative consequences noted are “the reduction of time for regular instruction...side-lining of those topics/subjects not covered in LSAs...the over-use of assessment strategies rooted in specific test designs” (Copp, 2016, p. 3).

All six articles were connected in themes and moreover through this search it was clear that there is a distinctive gap in research with respect to effects of LSAs on teacher anxiety and stress level. The themes uncovered in this synthesis illustrated several negative impacts which indirectly affect a teacher’s morale and anxiety. Which opens the opportunity for further research stemming from this knowledge synthesis.

Gap Analysis-Additional Research

Living in a digital age where information is readily available can be both advantageous and disadvantageous. EQAO continually updates their website with new information, and different reports. As an organization, they continually strive to improve both tests and reporting strategies. However, there is still a long list of policies and procedures which affect both teacher and students. Consider the language used – low stakes assessment. Miller and Safer (1993) discuss the use and misuse, interpretation and misinterpretation of the word evidence and how it may affect policy. Parallel to this theory, one recommendation would be to revisit the language used in policies in regards to LSA. For example, how the word “accountable” or “high and low

stakes assessments” is used and in what context. This would improve the implementation and purpose of the policy.

Also consider the implication of who is writing these policies and procedures.

Considering, these policies on a national scale “the CMEC is as close as Canada comes to a federal body on issues of education, and its work (from assessment, to policy recommendations, to reports on licensing directives for teachers) is widely instructive but not prescriptive for education policy at the provincial/territorial and school board levels” (Kempf, 2015, p. 36).

Consequently, involving teachers and students, those at the front lines of education, might make the policies more meaningful and efficient. We have to remember that teachers and students are a part of the ecology metaphor described by Weaver-Hightower (2008) “every contextual factor and person contributing to or influenced by a policy in any capacity, both before and after its creation and implementation, is part of a complex ecology” (p. 155). Thusly, in order to affect teacher attitude/pedagogy and student experience positively, all levels of education need to be included in its development at a national and provincial level.

Lastly, this knowledge synthesis has implied that policies and procedures from large scale assessments are indeed a cause of math anxiety for both teachers and students. The topic of student math anxiety is well studied and reported in a variety of journal articles. However, there is a gap in research with respect to teacher anxiety associated with LSA. A strong recommendation for future work is to study how the effects of LSA preparation, data results, and reports affect a current full-time math teachers’ efficacy and mental state.

Limitations

The focus for this knowledge synthesis were peer-reviewed journals. These were excellent resources and one limitation for the knowledge synthesis is that it refrained me from

analyzing websites, such as EQAO, or any non-peer-reviewed article. Also, most articles, were based on qualitative analysis. Finding quantitative data was very limited. As mentioned a gap in research exists with respect to teacher anxiety and LSA, quantitative was non-existent. Also, a combination of the key words used yielded minimal peer-reviewed journals due to the lack of research available. Lastly, being a teacher in the secondary school system is also a limitation due to my own biases with respect to LSAs.

Discussion

After a knowledge synthesis of seven peer-reviewed articles, common themes and analysis were evident. The following discussion is based on the initial guiding questions:

1. What are the main objectives for administering LSA to students within the education system? In particular, what is the main focus of the EQAO within our Ontario schools?
2. What are the main effects of LSA on teacher pedagogy, job satisfaction, and morale? Is this precursor to math anxiety within our teachers and thereby affecting our students?
3. What are some suggestions from current literature to alleviate the negative effects of LSA on our teaching staff?

Large scale assessments have long been a part of our history. Education has seen a rise in the use of the data from large scale assessments, both nationally and provincially. Through this knowledge synthesis Copp (2016), Pinto (2016), Rogers (2014), Winton (2013), Volante (2013) and Ashcraft and Moore (2009) all suggest that one of the main reasons for LSAs is to compare our students on both a national and international scale. In the province of Ontario, standardized tests include both numeracy and literacy skills, whereby these scores influence all educators and students at all levels of academia, including education policy (Volante, 2013; Copp, 2016; Rogers, 2014). Student scores provide concrete data and an overall picture of where academic

(numeracy and literacy) weaknesses and strengths lie so that policy makers (CMEC) are able to make informed recommendations in hopes of improving our educational system as reinforced in the research analysis of this knowledge synthesis.

This knowledge synthesis cohesively points out that LSAs are used as motivation for both students and teachers. Volante (2013) suggests that LSA can improve student learning, accountability, and motivate students to excel. LSAs spark competition within students to compete against each other and do better, one may consider this to be a healthy form of competition. (However, literature indicates otherwise). Also, the articles point out that teachers are motivated when the EQAO results are publicized.

Lastly, it is argued that large-scale assessments serve as an indicator with respect to future economic growth and competitiveness in the global market (Volante, 2013; Winton, 2013; Roger, 2014). Canada is one of thirty-five members of The Organisation for Economic Co-operation and Development (OECD), where their mission “is to promote policies that will improve the economic and social well-being of people around the world” (OECD, n.d.). According to Volante (2013), raising scores on LSAs is directly correlated to an increase in gross domestic product (GDP), which improves one’s economic status and the ability to compete in a global market. Consequently, scores from LSA are seen as tools to foreshadow potential national economic growth.

This knowledge synthesis has listed several benefits and reasons for LSAs and provincially the EQAO. Winton and Milani (2017) best describe EQAO as “an independent organization at arm’s length from the Ontario Ministry of Education, [that] was set up to design and oversee the testing process” (p. 5). EQAO facilitates four levels of provincial standardized tests. Junior divisions are administered within the last two months of each school year. The

junior divisions include all Ontario students in Grades 3 and 6, where they are tested on subject matter pertaining to reading, writing, and mathematics. At the secondary level, all grade 9 academic and applied students are tested at the end of each semester. The focus is on the “skills The Ontario Curriculum expects students to have learned” (Education Quality and Accountability Office [EQAO], 2017-d, p. 1). The curriculum for both pathways is subdivided into strands, as is the PISA and TIMSS. For example, at the academic level the curriculum strands include number sense and algebra, linear relations, and analytic geometry (Ministry of Education, 2005-a).

The main focus thus far has been on the subject of math. However, OSSLT requirements have been noted due to the high stakes for students which will aid in further discussing this paper’s research question, mainly the implications that LSA can have on a teacher’s practice, attitude and student’s experience. Educators, parents, and our community strive to impart skills upon our children that will help them thrive as well-rounded individuals upon graduation. In hopes that they will be able to serve their community and contribute to society. However, this goal is unattainable if we negatively affect a students’ experience. Math anxiety is a major reason why students may have a negative experience at school. Math anxiety not only affects the psyche, but also the body as pointed out in the research analysis. Chang and Beilock (2016) clearly states some of the symptoms a student suffering from math anxiety are physical such as muscle contractions, difficulty breathing, tightness in the throat and chest, nausea, headaches, heart palpitations, restless behavior and forgetfulness. How can a student be expected to perform well on a large-scale assessment if they are physically being affected?

Math anxiety in students has been reported in a variety of journals. The most common conclusion reported is that the most notable consequence of math anxiety is poor math

achievement (Copp, 2016; Rogers 2014; Pinto, 2016)). There is a negative correlation between math anxiety and math performance; the more anxiety one experiences the worse he/she will perform in their math class and on math tests, in particular LSAs (Ashcraft & Moore, 2009).

One of the purposes of LSA as noted previously was to motivate students in a friendly competition. However, this is not the case for all students, in particular those facing math anxiety. As discussed in the knowledge synthesis, Chang and Beilock (2016) have reported a direct correlation between high stakes testing and math anxiety. These expectations are based on scores, which are not only reported to the student and their family, but also the teacher, administrators, school board trustees, and the lists goes on. “In testing situations, we typically interpret a students’ score on the standardized test as an indicator of the student’s mastery of math, literally of his or her math achievement (or of the quality of instruction)” (Ashcraft & Moore, 2009, p. 202).

In short, math anxiety can clearly affect how a student learns and preforms. It is exacerbated in a testing situation, even more so in a LSA setting (Ashcraft & Moore, 2009). Consequently, if the student is facing math anxiety and thusly does not perform well on a test, the students experience is completely affected. Not only their math practice and understanding, but also their academic and the social experience of education.

The Ministry of Education may write the curriculum, the EQAO may facilitate LSA, and administration may impart rules and enforce policies; however, it is the teacher who has the greatest effect on student achievement. Consequently, a teachers’ attitude and practice has a direct effect on a student’s achievement and experience. The EQAO is seen as a low stake assessment in comparison to high stakes, due to the fact that there are no direct teacher/student consequences (Volante, 2013). However, this idea contrasts the fact that teachers must adhere

professionally to all EQAO, Growing Success, and board policies otherwise face a potential charge of professional misconduct. Sanctions may be imposed by the Ontario College of Teachers (OCT), for those teachers “who have been found in violation of the EQAO testing rules” (Education Quality and Accountability Office [EQAO], 2009-e, p. 335). The potential of being charged induces a form of math anxiety for teachers and may have a negative effect on attitude thusly effecting pedagogy.

Winton (2013) has related what Canadians perceive as success with respect to EQAO test scores, the higher the score the more successful our schools and students. However, does success supersede the mental wellness of our students and educators? This knowledge synthesis has shown that LSAs lead to resistance and controversy as perceived by the teachers. We strive for success in life, both personally and professionally. As a teacher, it is difficult to not feel anxious about test scores knowing that your students reflect your competency (Copp, 2016). As such, these scores are seen as an indicator of how well a teacher is teaching. Recall, that the scores are shared with parents, administration and are published. “We typically measure not only a student’s aptitude and achievement with standardized tests but also the effectiveness of instruction and indeed the quality of education provided by the school” (Ashcraft & Moore, 2009, p. 201).

The anxiety which ensues about being judged as a teacher is then translated to the student. As teachers we are role models, and our own views or feelings are often unknowingly imparted on students. Thusly if teachers are feeling a sense of imbalance or often develop math anxiety themselves, students will mimic or feel anxious themselves. In addition, a students’ math anxiety may be aggravated by a teacher’s own feelings about the subject. Lastly, not only

does standardized testing affect the student, but also the teacher in terms of efficacy and attitude (Rogers, 2014).

Conclusion

In conclusion, it is clear that LSAs have their purpose and more importantly will continue to be integrated in our education system. In light of our need to be on the forefront of economic development, we must learn ways to foster our students' knowledge and continue to improve, enlighten, motivate and educate our students in order to effectively compete with other countries as part of the OECD. However, at what cost do these policies, which are imposed on both students and teachers, affect ones' experience, self-efficacy, attitude, and mental well-being?

Math anxiety is not a localized problem and does not only affect students, but teachers alike. In particular, when faced with a high stakes test setting. This is a major factor in how our students respond to LSA, such as the EQAO, and how a teacher may instruct students and how their own concerns and apprehensions affect the learning environment. These factors must be taken into consideration along with data when redrafting future policies in order to truly ensure a positive experience for students and teachers.

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