CHAPTER 28

Mobility of Syrian–Canadian Students and Continuity of Math Education: A Comparative Curriculum Mapping Approach

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Introduction

The increased mobility of students in education poses new challenges to our schools (Herzog-Punzenberger et al., 2017; Le Pichon, Siarova, & Szonyi, 2020). How can we welcome these students taking into account their previous learning? Typically, the school integration of newcomer students is based primarily on the expectations of the host country's system. The expectations of the host school systems are not only expectations related to the language of the school but also the curriculum. Each country and each Canadian province defines learning objectives according to the age of the students. What we too often forget is that school curricula vary considerably from country to country and, in Canada, from province to province. If the above reasoning is accurate, then teachers cannot expect the same from a student coming from Syria, China, or even Alberta to Ontario. The curricula of the countries in which the students have studied need to be considered in order to understand what these same students have already learned and how they learned it. Therefore, we propose that a constructive strategy in this regard should include a thorough exploration of the curriculum of the country in which the students have been

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schooled. In this study, funded by a SSHRC Institutional Grant (Le Pichon, 2018–2019), we explored the extent to which the identification of curriculum similarities and differences between home and host countries can be used to support the educational mobility of the students. The expected benefit from developing a comparative curriculum mapping of math education in Syria and Ontario (Canada) was that it could help teachers gain a clearer picture of previously acquired academic skills, as well as potential areas requiring extra attention.

In our explorative study, we examined this strategy as applied to the mathematics curriculum at the junior and intermediate levels. First, we compared the Ontario and Syrian mathematics (Grades 4–8) curricula in terms of content, language, and approach to teaching mathematics. The goal was to identify differences and similarities between the programs. Once the expectations of the Ontario and Syrian programs were matched, we developed a comprehensive resource for teachers and parents and posted it on a bilingual website. The ultimate aim was to use this study to inform teachers of these differences, help them adjust their expectations to the newcomer population from Syria, and provide them with a clearer picture of previously acquired academic skills and potential areas requiring attention.

Overview of the Curricula

The Province of Ontario

Education in Canada is a provincial responsibility. Therefore, curriculum documents are issued by the Ministry of Education in each province. In Ontario, the Ministry of Education sets overall and specific expectations that teachers must teach in their program at a particular grade. The mathematics curriculum outlines a set of expectations in different strands, including number sense and numeration, measurement, geometry and spatial sense, patterning and algebra, and data management and probability. The curriculum also outlines basic considerations to accommodate the needs of language learners, such as language learning strategies, and a discussion of antidiscrimination in Math education. It includes recommendations to accommodate language learners, whether in English or French (Ontario Ministry of Education, 2005).

It is interesting to note that increasing attention is being paid to the language learners of the school in the curricula. In 2020, the curriculum was revised, and considerations for language learners included additional recommendations such as an emphasis on the orientation toward language as a resource (Ruiz, 1984): "Translingual practice is creative and strategic, and allows students to communicate, interact, and connect with peers and teachers for a variety of purposes" (Ontario Ministry of Education, 2020, p. 96). The document also emphasized the importance of building on students' strengths, social and cultural background, and acknowledging the need to provide tasks that are accessible and mathematically challenging. Finally, the ministry recommends representing concepts in different languages and to work with families and community members to support student learning (Ontario Ministry of Education, 2020).

The Context in Syria

Education in Syria is centralized. The Syrian Ministry of Education issues curriculum textbooks that are taught across the country. These textbooks include a student copy and a teacher guide for each subject. Mathematics textbooks include different units, with each unit consisting of different lessons that teachers are expected to teach throughout the year. A lesson includes learning objectives, concepts, descriptions, rules, properties, and activities. Each unit includes a set of problems to be solved by students.

Teachers across Syria are expected to go through the textbooks, teach content, and students work on the problems that are in the textbook. Some teachers use additional questions, visuals, or manipulatives to support teaching, but teaching is primarily based on the ministry-issued textbooks. These textbooks can be accessed online (see Syrian Ministry of Education, 2021). The language of instruction in Syria is Arabic with some English and French concepts included in some subjects such as math and science (Wattar, 2014).

Curriculum Mapping

We analyzed the documents identified as official curriculum. With respect to the Ontario curriculum, we examined the mathematics curriculum for Grades 1–8 (Ontario Ministry of Education, 2005), with a focus on the junior and intermediate levels (Grades 4–8), which are critical in the transition to secondary school. This document defines general and specific expectations for each grade level. With respect to the Syrian curriculum, we considered the official textbooks issued by the Ministry of Education from Grades 4 to 8 (Syrian Ministry of Education,). The analyses include the repertoire of topics taught for each grade level and the different characteristics of the text, including the language of instruction, numbers used, and teaching strategies. The identification of the topics studied at each level is based on the identification of more general strands that are taught throughout the years. To illustrate the flow of topics for Grades 4 to 8 in the Syrian math curriculum and facilitate curriculum mapping, we followed the model established by the Ontario Ministry of Education on its resource website for teachers (Edugains, n.d) (see Table 28.1).

Table 28.1: This chart is a summary of the topics taught in mathematics in Ontario from Grades 1–8 on the Ministry of Education website (Edugains, n.d.). This document is often used by Ontario teachers to understand how each topic (e.g., addition and subtraction) is taught progressively over the years

Table 28.1 Reproduction of the synthesis of the Ontarian Curriculum in math, Grades 1–8 (Edugains, n.d.)

Grade 1	*Grade 2*	*Grade 3*	*Grade 4*	*Grade 5*	*Grade 6*	*Grade 7*	*Grade 8*
Addition and Subtraction Problems with Sums to 10 • Add, subtract and identify strategies • Solve a variety of problems that involve addition and/or subtraction	**Addition and Subtraction Problems with Sums to 20** • Add, subtract and identify strategies • Solve a variety of problems that involve addition and/ or subtraction	**Addition and Subtraction Problems with Sums to 100** • Add, subtract and identify strategies • Solve a variety of problems that involve addition and/ or subtraction	**Operations Involving Numbers 0 to 10 000** • Add and subtract four-digit whole numbers • Multiply and divide 2-digit by 1-digit whole numbers • Investigate and apply the commutative and distributive properties	**Operations Involving Numbers 0.01 to 10 000** • Multiply 2-digit by 2-digit whole numbers • Divide 3-digit by 1-digit whole numbers • Solve whole number multiplication and division problems	**Operations Involving Numbers 0.01 to 1 000 000** • Solve problems involving addition and subtraction of whole and decimal numbers • Multiply and divide 4-digit by 2-digit whole numbers • Solve problems involving multiplication and division up to 4-digit by 2-digit whole numbers	**Represent, Compare, Order and Operate Using Decimal Numbers** • Represent, compare, and order decimal numbers to hundredths • Add and subtract decimal numbers • Multiply and divide to thousandths by whole numbers	**Multi-Step Problems Involving Whole and Decimal Numbers** • Add, subtract, multiply, and divide whole and decimal numbers • Solve multi-step problems involving whole and decimal numbers

Grade 1	*Grade 2*	*Grade 3*	*Grade 4*	*Grade 5*	*Grade 6*	*Grade 7*	*Grade 8*
			• Connect between student-generated and standard algorithms for multiplication and division • Solve problems involving addition, subtraction, and multiplication	• Add and subtract decimal numbers to hundredths • Solve problems involving addition and subtraction of decimal numbers	• Solve problems involving multiplication and division that involve decimal tenths with whole numbers	• Apply order of operations to evaluate numerical expressions involving whole and decimal numbers • Solve single-and-multi-step problems involving operations with whole and decimal numbers Convert between first degree metric units Solve real-life problems that require conversions	

(continued)

Table 28.1 (continued)

Grade 1	*Grade 2*	*Grade 3*	*Grade 4*	*Grade 5*	*Grade 6*	*Grade 7*	*Grade 8*
Compare and Order Numbers to 20 • Estimate quantities • Compare and order numbers to 20 based on quantity • Compare and order numbers to 20 using a number line	**Multiplication and Division with Products to 20** • Decompose numbers into groups of equal size • Investigate combining equal groups (multiplication) • Investigate partitioning into equal groups (division) • Investigate division as equal sharing: – find the number of items in a group – find the number of groups for a set of items	**Multiplication up to 7 × 7 and Division to 49 + 7** • Multiply and divide using a variety of mental strategies					

This table allows teachers to understand what is essential for the academic progress of the students and in the introduction of new subjects. For instance, a teacher who welcomes a twelve-year-old student will refer to the chart to determine the essential learning expectations for further learning. Diagnostic assessment is done in reverse order, starting with the expected knowledge corresponding to a particular age and working backwards to the essential knowledge of previous years if the expectations are not met. This allows teachers to understand what is essential to progress and what is not.

Since the topics are organized differently in the Syrian curriculum, the classification of topics in Arabic was done in three steps. The first step was to identify the themes common to both curricula (Syria and Ontario). This was followed by identifying the organization of these topics over the years of elementary school in Syria. The final list of themes, organized by grade level, allowed the creation of summary tables (see Table 28.2) similar to those developed by the Ministry of Education in Ontario.

Figure 28.1: This image includes four Syrian mathematics textbooks. Each textbook was incorporated in the analyses. The different strands were identified and organized into units categorized by grade level. This classification allowed the elaboration of a table in Arabic (see Table 28.2), later translated into English. The table includes each of the strands and the details of the content by grade level (see Tables 28.2 and 28.3)

Table 28.2: This table represents the organization of topics in the Syrian math curriculum from Grades 4 to 8. Thus, the table provides an overview of how each topic (e.g., operations) is taught progressively over the years.

Table 28.2 Synthesis in Arabic of the Syrian curriculum grades 4–8

الصف الثامن Grade 8	الصف السابع Grade 7	الصف السادس Grade 6	الصف الخامس Grade 5	الصف الرابع Grade 4	
الأعداد العادية والعمليات عليها الجمع والطرح الضرب القسمة تمرينات ومسائل قوى الأعداد العادية قوى العدد ١٠ قواعد على العدد ١٠ قوى صحيحة لعدد نسبي الجذور التربيعية وخواصها	الأعداد الطبيعية الأعداد الصحيحة الجمع والطرح الضرب القسمة الأعداد العادية العمليات على الأعداد العادية الأعداد العادية ومعلم المستوي	الأعداد الطبيعية جمع الأعداد الطبيعية وطرحها ضرب الأعداد الطبيعية قسمة الأعداد الطبيعية	الأعداد الطبيعية قراءة وكتابة الأعداد الطبيعية بالملايين(الآن تستعمل الأرقام الإنجليزية) كتابة الأعداد بالصيغة العددية والصيغة اللفظية استخدام جدول الخانات تقريب الأعداد الطبيعية تقريب العدد إلى منزلة محددة جمع الأعداد الطبيعية و طرحها: جمع الأعداد ضمن الملايين طرح عدد من عدد آخر مقارنة الأعداد الطبيعية حتى الملايين ترتيب الأعداد الطبيعية حتى الملايين ضرب الأعداد الطبيعية	لأعداد حتى ٩٩٩٩٩ تمثيل العدد في جدول المنازل كتابة العدد بالصيغة التفصيلية والصيغة اللفظية موازنة الأعداد(مقارنة) من خمس منازل وترتيبها التقريب إلي أقرب عشرة التقريب إلى أقرب مئة جمع أعداد مؤلفة من خمس منازل طرح أعداد مكونة من خمس منازل معنى القسمة كتابة عبارة القسمة وتحديد المقسوم و المقسوم عليه والناتج (ناتج القسمة) حساب ناتج القسمة الربط بين الضرب والقسمة	**الأعداد العمليات الحسابية مقارنة الأعداد (موازنة الأعداد)** **الكسور والأعداد العشرية**

Fig. 28.1 Syrian maths books and mapping

Table 28.3 Synthesis in English of the Syrian curriculum Grades 4–8

Topic	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8
Numbers	• Numbers to 99999 *Note: The book for this grade uses the numbers ١، ٢، ٣، ٤ • representing numbers in place value table • writing numbers in details (using place value) and words • comparing and ordering numbers from five digits • even and odd numbers	• Natural numbers • reading and writing numbers in millions *note: numbers are written the same as in English (1, 2, 3) • comparing natural numbers (millions) • ordering natural numbers(millions)	• Natural numbers • adding, subtracting and multiplying natural numbers	• Natural numbers • writing numbers using digits and words • using place value table	Rational numbers • operations on large numbers
Operations	adding numbers from five digits division writing a division sentence and	adding and subtracting natural numbers adding and subtracting numbers (in millions)	Addition and subtraction of natural numbers Multiplication of natural numbers	Integers (addition and subtraction) Multiplication Division Rational numbers Operations on Rational numbers	(Addition and Subtraction Multiplication solving World problem

The table shows the progress made in each theme in Grades 4–8 based on each strand. For example, in the table above, the first row shows the topics related to the number strand. As can be seen, in Grade 4, Syrian students are expected to learn numbers up to 99,999, to represent numbers in a place value chart, and to write them. The expectations for the year are also to learn to compare, order numbers up to five digits, and even and odd numbers.

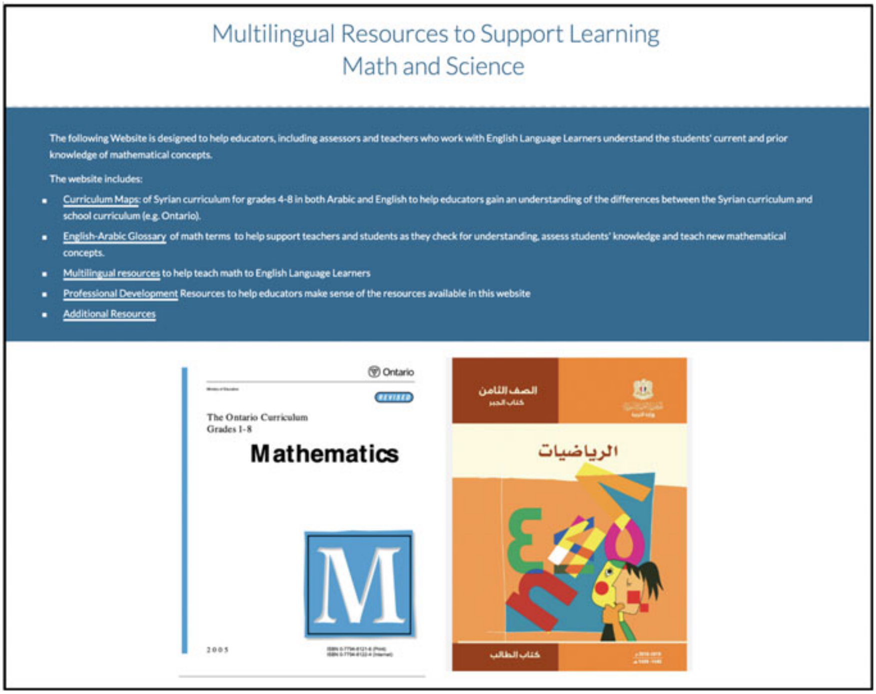

Fig. 28.2 The website features the multilingual resources as well as the curriculum mapping and the comparative analysis of the programs

In Grade 5, concepts are expanded and students are expected to learn to order, compare, and write numbers up to one million. In Grade 8, rational numbers are introduced and students are expected to apply operations on large numbers.

Table 28.3: This table shows the progress made in each topic in Grades 4–8 based on each strand in the Syrian curriculum

First Results

The Syrian Curriculum

One of the first observations when analyzing the Syrian curriculum is the change in the spelling of the numbers in the fifth grade. The first author of this chapter, having grown up in Syria, noted this discovery which represented a change in the 2000s in mathematics education in Syria. In Grades 1–4 textbooks, the Hindu–Arabic script of the numerals (i.e., ١،٢،٣،٤،٥،٦،٧،٨،٩،١٠) was used. In the 5th grade, the Arabic numerals used in Canada were introduced (i.e., 1,2,3,4,5,6,7,8,9,10). In addition, Arabic symbols (i.e., س، ع، ص) were replaced in 5th grade by the symbols of the Latin alphabet (i.e., x, y, z) in equations. One must be aware of these important changes when receiving a student from Syria in Canada. Indeed, assessing mathematical knowledge without taking this aspect into account could lead to thinking that students cannot read or count if they are presented with exercises containing the Arabic numerals in Grade 5, when in fact they have simply not learned to read the numbers in this script yet, which does not affect their ability to calculate but implies learning this new script.

To this difficulty is added the orientation of the mathematical writing. Indeed, the direction of writing equations in the textbooks from right-to-left is replaced in Grade 5 by equations written from left-to-right. On the other hand, the text explaining the equations is always written in Arabic and is read from right-to-left. Again, this observation is crucial because it means that Syrian students have to adapt to this new difficulty in fifth grade.

These initial observations, while seeming innocuous at first glance, greatly complicate the diagnostic evaluation of these students if they are ignored. However, if they are considered, they can allow teachers to adapt the right measures and to evaluate students at their proper level.

Analyses of the Differences and Similarities

The in-depth analysis of the curricula allowed for the perspective of differences in terms of program content and pedagogical approach to mathematics teaching.

Grade Expectations and Extent of Learning for Each Grade Level

Although by the end of Grade 12, Syrian and Ontario students have achieved roughly the same academic level in equivalent areas, including calculus and algebra, the levels at which topics are introduced differ across programs. For example, exponents appear in Grade 6 in Syria, while, in Ontario, exponential notation and area measurement are linked (e.g., cm^2), but the explicit introduction of exponents with repeated multiplication occurs only in Grade 8. Similar observations were noted for theoretical probability.

Theoretical probability is introduced in Grade 7 in Syria. Students are expected to learn how to calculate theoretical probabilities as well as events and complementary events (Syrian Ministry of Education, 2018, 2019c). In Ontario, complementary events appear in Grade 8, but the concept of theoretical probability is gradually introduced from Grade 6 as follows: in Grade 6, students are asked to predict the outcome of an experiment and to represent their prediction as a ratio, that is, the number of favorable outcomes to the total number of possible outcomes. Students are then expected to relate this ratio to theoretical probability. In Grade 7, they learn how to perform experiments involving two independent events and compare experimental and theoretical probability (Edugains., n.d.; Ontario Ministry of Education, 2005). These examples provide insights into the differences in the introduction of concepts in the two curricula and how these differences affect the expectations of teachers in both countries.

One might conclude that, in principle, Syrian students newly arrived in Ontario would be at a relative advantage in terms of content as students in Syria are often expected to apply theoretical concepts earlier than in Ontario. However, this does not mean that students in Ontario are learning less mathematics than in Syria. In fact, as we have seen in the preceding comparison, Ontario students are gradually introduced to the subject of probability and theoretical probability. Additionally, they are taught to conduct experiments, compare experimental and theoretical concepts, and apply the rules of theoretical probability to learn about complementary events.

Moreover, the comparison showed how both curricula differ in terms of process and pedagogy. In Syria, concepts are condensed into one grade and students are expected to learn different concepts in a short period of time. In Ontario, concepts are spread over three school years. While at first glance, the approach may seem diluted, one quickly realizes that the purpose of spreading a concept over three years is to develop a gradual and deeper knowledge of that same concept. This observation is reflected in the topic of data management.

In Ontario, students are expected to collect, organize, and represent data beginning in Grade 4. They learn to create and conduct a survey, and to organize and represent data in a simple manner. Each year, students are introduced to new types of graphs and build on what they have learned in previous years by going further. In Grade 5, students learn about pictographs, bar graphs, stem and leaf plots. Continuous line graphs are introduced in Grade 6, a variety of graphs to represent discrete and continuous data in Grade 7, and, in Grade 8, histograms are taught. Creating and conducting surveys develops throughout the year. Students begin by creating simple surveys and continue to learn important elements of survey creation, such as identifying bias (Grade 7) and creating a survey or experiment involving numerical data (Grade 8). In contrast, Syrian textbooks emphasize reading, interpreting, and constructing graphs. In Grade 7, the emphasis is on representing and reading different types of graphs, such as bar graphs, double bar graphs, histograms, and pie charts. They do not include designing surveys, experiments, and learning about bias.

Differences also appear in numeracy: while number comparison and rounding appear in Grade 6 in both the Syrian and Ontarian curricula, the range of numbers used in Ontario is up to one million while in Syria it is one thousand million. The explanation of this difference is often attributed to socio-economic circumstances: the value of the Syrian currency is much lower and fluctuating than the Canadian dollar. As a result, Syrian students have to learn how to manage higher numbers than their Canadian counterparts.

In the previous examples, we discussed how topics are presented and taught differently in Ontario and Syria. We focused on examples that illustrate different approaches to teaching content. In Syria, the approach is abstract, and knowledge is condensed. In Ontario, topics are introduced gradually and reinvested in an experiential learning perspective. However, this approach means that Ontario students access some topics later than their Syrian counterparts. The different approaches to teaching the subjects are also evident in the way the subjects are organized and presented over the years. In the next section, we will look at how subjects are organized differently in each program.

Strands and Organization of Topics

In Ontario, the curriculum includes five strands (number sense and numeration, data management, patterning and algebra, measurement, and geometry) (Ontario Ministry of Education, 2005). In 2020, the Ministry of Education introduced the strand of social emotional learning. With this change, a new name was introduced for each strand, the result being: number, algebra, data, spatial sense, and financial literacy (Ontario Ministry of Education, 2021). These strands are the same in Grades 1–8.

The organization of the Syrian school program differs greatly. The number of units and topics vary by grade. Units do not always have a "general" title, but often include a more specific title. For example, Grade 4 math includes 9 units. Unlike Ontario's general strands, the units vary: while some encompass many subtopics like geometry, other units address specific subtopics such as multiplication and division levels 1 and 2. For instance, Grade 6 includes six units, and each unit includes more than one topic or strand. Unit 1 includes representing graphs, natural numbers, lines, angles, and triangles. Grade 7 includes eight units: numbers and operations, algebraic expressions and equations, rate and ratios, symmetry, parallelogram, triangle and circle, 3-D shapes, statistics, and probability. While some topics such as number sense appear at each grade, other topics such as data management and probability are highlighted differently for each grade. In addition, in Grade 8, mathematics is grouped into two main strands: algebra and geometry.

Pedagogical Considerations

In addition to differences in the organization of subjects and in the extent of learning per topic and grade level, the curricula differ in the pedagogical approach to teaching mathematics. Syria generally follows a deductive approach: students learn a concept, memorize it, and then apply it by solving problems. Therefore, each lesson begins with the concept and its definition, a mathematical procedure, followed by examples and activities to learn how to solve such a problem. As an example, consider how the topic of events and probability is presented in Grade 7. The following structure appears: a connection to previous learning is presented in a short paragraph, followed by an example introducing the topic, the explanation of the results, and finally the rule of theoretical probability. The textbooks then include examples of how to use the rule, before another rule is introduced about the probability of events happening. Another concept is then introduced and the lesson concludes with problems.

The Ontario curriculum emphasizes exploration, the use of a variety of strategies to solve problems, and the approach to teaching. This represents a more inductive and explorative approach to learning. Using the example of probability, we see how the concept is gradually introduced: with the objectives of Grades 6–8 in mind, students from Grade 1 are introduced to experiments, the prediction of outcomes, their representations, the outcomes as a ratio, followed by the comparison of the results of their experiments to theoretical probability. Students are expected to represent the probability as a value between 0 and 1. Grade 7 includes research, prediction skills, and applications of the terms as well as experiments involving two independent events. Then, again a comparison between experimental and theoretical probability is added to the program.

Lastly, in Grade 8, students study the discrepancy between theoretical and experimental probability, making connections, complementary probability. Finally solving problems involving experimental and theoretical probability as well as complementary events are discussed.

This brief presentation of the comparison of curricula highlighted differences not only in terms of content or programming but also in terms of pedagogical approach. All of these aspects put together particularly complicate the diagnostic evaluation of newly arrived Syrian students in Ontario and the organization of the continuity of their education beyond the language difference.

With this in mind, we set out to understand the effects of our results on different groups: as both authors of this chapter are instructors at the Ontario Institute for Studies in Education, the first group was made up of Teacher Candidates (TCs) and graduate students. The goal was to help these future teachers develop an understanding of the challenges imposed by the mobility of newly arrived Syrian students in learning mathematics. The second group was composed more casually by Syrian parents whom the first author met through her work with a non-governmental organization and a private Islamic school. In the following paragraph, we report on our preliminary reflections on these presentations and how they led to the development of new research questions, which are the basis of our current projects on mathematics and science education in Canada.

Dissemination of the Results

After the curriculum mapping and glossary layout, we created a website and uploaded the curriculum mapping and glossary. As stated at the beginning of this chapter, the ultimate goal was to enable teachers to better assess their Arabic-speaking students from this country. In doing so, we realized that not only were we making the resources accessible to teachers but that these resources could also be useful to parents and communities.

Reflections Based on Teacher Candidates' Feedback

Workshops, discussions, and one-on-one sessions were conducted with teacher candidates in two courses on supporting language learners and students from refugee backgrounds in 2019 and 2020. During these sessions, students were provided with the results of the research presented above, summarized in a visual overview of both curricula. The goal was to help teachers understand their students' backgrounds in order to make a smoother transition from one school system to another. In addition, we wanted to ensure that teachers give students opportunities to develop their prior knowledge of mathematics and demonstrate their learning, and, in doing so, challenge them to succeed. Both similarities and differences between curricula were exemplified as well as some examples of teaching approaches in both systems. An activity invited TCs to solve some mathematical problems and shared their insights on the activity and its potential to help them support their students' learning.

Organization of the Sessions

A series of mathematical questions that addressed issues related to linguistic and cultural understanding were developed based on the results of the curriculum mapping. The levels of complexity increased as the tasks unfolded. The idea was to put TCs in a situation of linguistic and cultural insecurity by offering them mathematical texts as they are presented in the Syrian program. However, they were also presented with the key to solve the difficulties. For example, the operations were presented in the Hindu–Arabic script with their correspondence in the Arabic script; the mathematical sentences from right-to-left and not from left-to-right; and some of the problems to be solved required specific cultural knowledge which complicated the mathematical solution. Teachers would discover quickly that in order to solve the problems, they would have to use metacognitive strategies (inference, deduction, comparisons, ask for assistance, collaboration …). Additionally, the mapping of topics allowed teachers to make informed understanding of topics that were explored in different grades as well as how topics are taught over the years.

Effects of Training Sessions on Teacher Candidates

The first set of comments from the teachers crystallized around their feelings during these activities. By trying to solve mathematical problems in a different language and context, not being the creators of the activities themselves, they had to constantly check their work to solve problems that they usually solve with ease and became more self-aware. They declared spending more time than they were used to decoding, translating, and answering simple arithmetic questions.

A second set of comments from teachers about this experience was that this workshop gave them a better understanding of the many facets of mathematical learning. Some teachers explained that prior to this session, they wondered how students came up with certain answers in their classes. By confronting these difficulties themselves, they understood the possible errors induced by the context and not by the degree of mathematical difficulty. For example, a translation chart helped them decode numbers in arithmetic tasks. However, when they had to solve right-to-left problems, they were left with questions such as if the place value (e.g., the place of ones, tens, and hundreds) in a number was the same in Arabic and English. During the workshop, they understood the complexity that students face in their educational mobility and the importance of recognizing both the students' efforts and their backgrounds.

Third, teachers have been led to revisit the importance of metacognitive strategies. In one session, a teacher privately asked the presenter what place value was and how to understand the value of each digit in a number in Arabic. Another asked the question in the group. In another workshop, no one asked about place value and one teacher ended up guessing while trying different solutions. This experience opened up discussions about the importance of supporting students, presenting them with a welcoming environment, and encouraging them to collaborate. Even though collaboration is encouraged in Ontario, pairwise collaboration is not traditional in teaching and learning mathematics. Each student must learn to solve a problem on their own. Yet, a collaboration between these teachers was paramount in accomplishing this task. It is important to understand that students rarely use asking for assistance as a strategy (Le Pichon et al., 2009).

Fourth, these activities sparked discussions around the role of cultures in the construction of knowledge. Teachers were interested in learning about different number systems, an interest that led to talking about the contributions of Arab mathematicians to mathematics, or mathematicians from around the world. Students then raised the possibility of inviting their own students to explore the history of mathematics to engage the school community in recognizing the contributions of different civilizations to the development of this science. Some TCs subsequently sent follow-up messages in which they shared resources on number systems, the contributions of different civilizations to mathematics, or resources such as the 1001 Muslim Contributions to Learning (National Geographic Kids, 2012).

The sessions ended with discussions of the implications of this work for the teaching practices of the teachers in question. These discussions provided TCs with an understanding of the importance of building on students' linguistic and cultural funds of knowledge (Moll et al., 1992). Among the topics discussed in the different sessions were the need to build on students' prior knowledge and the possibility of using translanguaging practices (Vogel & García, 2017). These sessions allowed students to consider languages in a different light. Languages had become tools for transmission rather than an end in itself, allowing students to access academic content. Pedagogical practice involving clear instructions and the leverage of the languages present to convey information appeared essential. In this context, the legitimacy of monoglossic practices (one class, one language, see also Blommaert, 2009) was largely questioned. Finally, these exercises in cultural decentration allowed candidates to become aware of the possibility of providing a relevant and rewarding context for students to increase their motivation, through, e.g., historical research on the origin of a spelling or a concept and its discovery. In sum, TCs were able to challenge the assumption that learning of mathematics is neutral, and replace it with a linguistically and culturally situated science. They experienced firsthand the crucial role of language and culture in learning mathematics.

Although the project was primarily aimed at developing tools for teachers, the mapping and resources developed have proven to be particularly useful for parents and community inclusion.

Effect of Training Sessions on Parents

During the year of the project's development, the first author had the opportunity to disseminate the results through workshops, group discussions, and one-on-one sessions with parents involved in various associations. Despite the differences in socio-economic status, educational backgrounds, and length of stay in Canada of the parent communities, the reaction was unanimous: all were eager to better understand the Canadian school system and our approach proved to be particularly fruitful for this understanding.

Many parents expressed both (1) their dissatisfaction with the Canadian curriculum and (2) their sense of disempowerment.

(1) Dissatisfaction: As we saw earlier, the differences between the curricula are numerous and the density of the Syrian program was compared to the spread of the same subjects over three years in Canada. The parents' reactions to discovering the similarities and differences between the Syrian and Ontario curricula were invaluable. For them, it was also an opening to a new perspective: those who tended to think that their children were not learning because they did not have to memorize rules, spent their days experimenting, and took three years to learn a concept that they could have learned in one year, felt dissatisfied. They particularly appreciated the opportunity to discuss the advantages and disadvantages of both programs.

(2) Disempowerment: While feeling dissatisfied with the Canadian program, parents also felt incompetent and disempowered in their ability to help their children progress and learn. There was a disconnection between the children who were educated in a system inherent to their Canadian life and the parents who did not understand the system in which their children were being educated. Based on the

> recognition of parents' experiences, their knowledge, and a partnership approach, parents felt legitimized in their primary role as educators of their children. Importantly, the resources we developed made the Ontario curriculum accessible to them and gave them the opportunity to act upon the situation. We often repeat that students learn from what is familiar to them, forgetting that the same is true for parents. In this case, using the Syrian curriculum to help them understand the Ontario curriculum allowed them to feel connected to their children's education and to regain confidence in their abilities as educators of their children. Introducing them to these tools allowed us to consider their concerns in collective discussions and to value their own funds of knowledge.

Although the goal of our work was not to involve parents, circumstances have shown us that the simple act of comparing programs allowed us to influence both parents' satisfaction with the Ontario school system and their ability to take action in their children's education, regardless of their academic level.

Collaboration Between Schools and Parents Based on Reciprocal Understanding

While significant efforts have been made to provide resources on mathematics education in many languages (e.g., Ontario Ministry of Education, 2021), our project revealed significant gaps in the inclusion of families of newly arrived students, and in our case, Syrian families in particular. The recent shift to an asset-based pedagogy is challenging existing monoglossic approaches to the current curricula and evaluation practices. This expression used by Blommaert does not refer to the use of a single language but more broadly to the narrow perspective of a focus on a single culture and the separation of knowledge (Blommaert, 2009).

The research we undertook did not seek to solve the problem of the integration of language learners in the school system by addressing their individual needs but rather to better understand the different perspectives through the mapping of curricula in different countries. This research has revealed differences and similarities in content (curriculum content), script and syntax of mathematics (e.g., in the way mathematics is written), pedagogy (inductive versus deductive), and grade distribution. In spite of all these differences, an important aspect was that both programs allowed students to complete their schooling with broadly the same learning outcomes. This aspect allowed us to reassure the parents about the content of the Ontario curriculum.

Thus, an essential outcome of this preliminary research is that our approach reinforced this asset-based pedagogy by re-considering the linguistic and cultural richness that newcomers bring with them (see for instance Seals & Peyton, 2017; Guo, 2012). The sessions allowed teacher candidates to deepen their understanding of the many factors that influence the transition from one school program to another. Through an intercultural lens, they were invited to think beyond the curriculum that they teach and know. They became aware of the diverse ways of knowing, teaching, and learning. The workshops often allowed teachers to think about their students in new ways, rethink how they teach math to language learners and learn new insights about the contribution of different societies to mathematics learning throughout history (see also Le Pichon et al., 2020).

Additionally, and in contrast to previous work, which often focuses on the education of teachers and on language and translation issues, the comparative curriculum approach seems to have put parents back at the heart of their children's education. The enthusiasm of the parents toward the discovery of the differences and similarities of the systems seemed to restore their sense of empowerment. The transformation of parents' attitudes and willingness to support their children brought about by the workshops is both consistent with and goes beyond the emerging work on the inclusion of family languages in education (Piccardo, 2013). It involves in-depth work on our own system of teaching the school systems and curricula of the populations that join the Canadian school system. It also helps educators to work toward recognitive justice in their practice (Gale & Densmore, 2000). This finding allows us to assume that outreach to parent communities, which would include a comparison of home and target country knowledge, would pave the way for a strong partnership between parents and schools (as also suggested by Antony-Newman, 2020). This intercultural framework invites parents to become true partners in supporting their children's learning. It involves a consultative step of evaluating their contribution, which can lead to emancipation.

Similar to the study of Attar et al. (2020), one essential aspect to the success of our work with Syrian communities is the first author's membership in that community. She was raised in Syria and was able to conduct the workshops in Arabic. She was therefore a role model for the parents' community and the shared language and culture helped build trust within the mutual recognition. This aspect is an essential element of mediation between the parties represented by the school institution and the newly arrived families. The training of mediators from the communities in question, also called settlement workers in Ontario, could perhaps open the door to a policy of inclusion based on reciprocal understanding rather than a policy of integration that seeks to fill the individual gaps of newcomers to the target society.

While our project has been very beneficial from both TCs and parents' standpoints, it has not yet allowed us to reach out to the in-service teaching community. The resources developed were used as a basis to conduct workshops with TCs to develop intercultural understanding and metacognitive awareness. The question, then, is the following: how can we act to bring about sustainable change? What are their specific needs and expectations? The projects we are currently working on explore these questions more closely, seeking new opportunities for dialog. We believe that they represent a step toward emancipating the decolonization of curricula by broadening through the perspectives of newcomers in education.

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