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Research Insights
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COMPARISON OF 3RD GRADE MATHEMATICS CLASSES IN TERMS OF MATHEMATICS CURRICULUM AND THEIR IMPLEMENTATION IN THE CLASSROOM ENVIRONMENT: THE CASE OF TURKEY AND CANADA (THE PROVINCE OF ONTARIO)

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Abstract. Canada is one of the countries with the highest scores in mathematics achievement tests according to OECD and PISA reports. In this connection, the current study was planned with the intention of comparing Turkey and Canada in terms of both their mathematics curricula and practices in mathematics classes. In the current study, it was aimed to compare 3rd grade mathematics curricula and mathematics classes in Turkey and Canada (Ontario) in general and to compare them in terms of curriculum and any educational and instructional activity conducted in the classroom environment so that similarities and differences could be determined. The study was structured as a comparative case study. For the Canadian part of the study, the 3rd grade mathematics classes of a private primary school in the Ontario Provincial Region were observed in the classroom for 3 months. Similarly, the 3rd grade mathematics classes of a state school located in a central district of high socio-economic status in the city of Ankara were observed. The data were obtained from in-class observations conducted throughout the whole process, interviews with the teacher, and the teaching materials and curricula used by the teachers and students in the process. The results of the study revealed that mathematical process skills were presented in a little more detail in the Canadian curriculum and that skills such as reflection, choosing the appropriate electronic equipment were associated with problem solving and reasoning. It was observed that the inclusion of different skills in the curriculum caused differentiation in the roles of teachers in the classroom. It was determined that Canadian mathematics classes were student-centred, were dominated by the active learning process and richer cognitive content that supported the development of problem solving and reasoning skills.

Keywords: comparative education; primary school 3rd grade; curriculum

1. Introduction

The investigation of countries' education systems, education policies and practices through comparison is called the comparative education study (Güzel 2010). The aim of such studies is to compare the education systems, curricula, course materials and teacher training policies of two or more countries according to some criteria and some themes and to reveal the differences and similarities between them. Comparative approaches refer to a discipline built on the comparison of the education systems of countries with each other (Yıldız, Yılmaz & Albanna 2020) to provide guidance and make suggestions by comparing different and similar aspects of the education systems (Erdoğan 2003; Mavi, Yaykıran & Elçevik 2020; Türkoğlu 1985).

Curricula determine the educational-instructional visions of countries. Comparative education studies are of great importance in terms of the development and enrichment of educational sciences and with the perspectives and information they provide, educational sciences can be placed within a more effective framework (Erdogan 2003). Comparative education can be seen as a means of gaining information about new approaches and practices (King 1979), so comparing different education systems and practices with the education system of our country is important in terms of gaining insights about how to improve our education system (Türkoğlu 1985; Güzel 2010). Curricula are the main guidelines of educational-instructional activities. All educational-instructional activities are carried out by adhering to a prepared curriculum. For this reason, it seems to be good to compare different curricula to open new ways for the development and change of an education system. Arrangements made in education systems become meaningful and serve the purpose when reflected in the curriculum (Ünal & Ünal 2010).

Mathematics education in primary school or basic education is very important. The knowledge and skills gained at this level form the basis for both the school success in the following years and lifelong learning. Two important parts of an effective mathematics teaching are the curriculum and the teacher. The characteristics and knowledge of the teacher, who prepares the students for learning in the classroom environment, plans and conducts the educational process in communication with them, prepares the whole environment, and guides the students, make an important contribution to student success. Since primary school teachers are responsible for the teaching of all branches, they need to have more knowledge and skills. Younger students encounter school mathematics for the first time when they start primary school. This period has a significant impact on children's attitudes towards mathematics and their understanding of the nature of mathematics (Özmantar, Öztürk & Bay 2015). Especially primary school teachers have an important responsibility in the formation of first impressions about mathematics. The most important process

of the educational and instructional process is the primary education process. The primary education process is a process in which the student starts a more organized and formal school life, different from the kindergarten, and experiences a more critical period in terms of development (Gürkan & Gökçe 1999). Compulsory education in Turkey has been increased to 12 years as of the 2012/2013 school year, consisted of 4 years of primary school (1st, 2nd, 3rd and 4th grades), 4 years of middle school (5th, 6th, 7th and 8th grades) and 4 years of high school (9th, 10th, 11th and 12th grades). Primary education is for children between the ages of 66 months and 10 years and is carried out under the responsibility of the Ministry of National Education General Directorate of Basic Education. According to the basic law of national education "*It is to equip every Turkish child with the basic knowledge, skills, behaviours and habits necessary to be a good citizen, to train him/her in accordance with the understanding of national morality and to prepare every Turkish child for life and higher education by training him/her in compliance with his/her interests, talents and abilities"*[2].

Studies to evaluate international student achievement are carried out in order to create a basic database through which countries can compare the functioning of their own education systems with other countries (Toptaş, Elkatmış & Karaca 2012). Canada is a country which is at the top of the world lists in terms of development in every field. Compared to Turkey in international exams, it is also in a very good position in mathematics achievement. According to 2018 PISA Exam in the field of Mathematics, Turkey's rank and score were 42 and 454 while Canada's rank and score were 12 and 512 1). The federal capital of Canada is the city of Ottawa and this city is located in the province of Ontario. Primary education in Canada covers the age range of 6 to 12 years. Primary education consists of 6 grade levels ranging from grade 1 to grade 6. The common education system in Canada is the 6+3+3 education system. Although the education systems differ across the provinces, primary school is compulsory in all the provinces. Instead of a centralized education system, Canada has a local education system where the provinces determine their own educational needs. In Canada, there is no single national curriculum which was centrally developed as in Turkey. Provincial governments are responsible for education and training programs. The most distinctive feature of the education system in the country is its not being centralized. Although the policies followed by the provinces are mostly the same, there are some differences (Bakioğlu & Pekince 2020). Compulsory education is usually between the ages of 6 and 12, although the school starting age may vary from province to province.

1.1. Purpose and Significance of the Study

Comparative education research refers to a set of studies that enable readers and researchers working in the field to identify and influence the factors affecting education in their countries (Mavi, Yaykıran & Elçevik 2020). The main purpose

of these studies is to reveal the similarities and differences between the education systems and curricula of two or more countries in line with the determined goals. Canada is a highly developed country and is one of the countries with the highest scores in mathematics achievement tests according to OECD and PISA reports. In this connection, the current study was planned with the intention of comparing Turkey, a developing country, and Canada, a developed country, in terms of both their mathematics curricula and practices in mathematics classes. Comparative education studies are mostly based on the comparison of the education systems of the countries with each other (Yıldız, Yılmaz & Albanna 2020). This kind of studies create a documented knowledge domain of similarities, differences, comparisons, and mutual learning (Connely & Xu 2019).

In the current study, the similarities and differences were tried to be revealed by comparing both the curricula and the classroom teaching practices through in-class observations. The study was structured within the context of the primary school 3rd grade mathematics course. The purpose of the current study is to comparatively examine the primary school 3rd grade mathematics classes in Turkey and Canada (Ontario Province) in terms the curriculum, the role of the teacher, teacher-student interaction, classroom culture, teaching principles and strategies, classroom management, measurement and evaluation approaches, planning-timing, physical structure of the classroom and classroom teaching activities. Moreover, it is aimed to determine the similarities and differences in the classroom teaching activities carried out by teachers in order to impart problem solving and reasoning skills addressed in the primary school mathematics curricula in Canada and Turkey to students. To this end, answers to the following research questions were sought.

1. What are the general similarities and differences emerging when the primary school mathematics curricula of Canada (Ontario Province) and Turkey (Ankara Province) are compared in terms of general objectives, content, teaching principles, skills, instructional technologies and materials, instructional strategies, methods and techniques?

2. What are the similarities and differences emerging when the primary school third grade mathematics classes of Canada (Ontario Province) and Turkey (Ankara Province) are compared in terms of physical structure of the classroom, instructional activities, classroom culture, teacher role and measurement and evaluation approaches?

In addition to the scientific value of the findings to be obtained at the end of the study, another contribution of the current study to the literature can be the demonstration of the fact that comparison of the education systems of two or more countries can yield positive outcomes through the evaluation of the applicability of different practices.

2. Method

2.1. Research Design

The current study was structured as a comparative case study. A comparative case study refers to the conduct of two or more case studies and comparison of them. In the current study, Turkey Ankara Province and Canada Ontario Province 3rd grade mathematics class comparison areas were determined as follows in order to seek answers to the research problems.

– For the Ontario Province of Canada, the 2005 mathematics curriculum was used while for Turkey, the 2018 mathematics curriculum was used.

– Instructional activities, teacher role, teacher-student interaction, classroom culture, teaching principles and strategies, classroom management, measurement and evaluation approaches, planning-timing and the physical structure of the classroom.

The Case of Canada (Ontario Province)

For the Canadian part of the study, the mathematics classes of the 3rd graders of a private primary school in Toronto, Ontario Province, were observed by the researcher in the classroom for 20 class hours for 3 months. There is one private school in Toronto, Canada. In each grade level, there is one class and one teacher. In each class, there are about 20 students. The weekly lesson schedule includes 7-8 class hours for mathematics. At the end of the lesson, the researcher talked to the teacher about the lesson and the reasons for the teacher's questions and behaviours in the lesson were wanted to be understood in detail.

The Case of Turkey (Ankara Province)

For the Turkish part of the study, mathematics lessons delivered in a third grade class in a state school in the city of Ankara were observed by the researcher for a total of 25 class hours during two terms. In order to make a comparison, not only the teacher was focused on, but also concepts such as his role in the teacher-student interactions and the mathematics classroom culture he created were also focused on. In the case of Turkey, only the interviews conducted with the teacher were audio-recorded, the lessons were not videotaped in order not to disturb the students in the classroom environment, and the notes taken by the researcher during the lesson were used as one of the data collection tools.

2.2. Data Collection Tools

The data were obtained from in-class observations, interviews with the teachers, curricula and teaching materials used by the teachers and students throughout the process.

2.2.1. In-class Observations

In both parts of the study, the researcher was present as an observer in the classroom environment during the lessons and took observation notes. During the lesson, the researcher took notes about all kinds of behaviours and discourses of the teachers, and at the end of the lessons, she made short interviews with both teachers on the points that were not clearly understood. The researcher wanted to record the whole

process with video or audio recording, but she was able to take only observation notes because the legal regulations in Canada did not allow this. The teacher at the school in Ankara did not want to be recorded in the digital environment.

2.2.2. Semi-structured interviews conducted with the teachers

At the end of the observations made by the researcher, a semi-structured interview lasting 30 minutes was conducted to determine the teacher's teaching philosophy, demographic information and teaching background. The questions asked in the interview were aimed at getting to know the teacher better, getting information about his/her philosophy of teaching, and understanding in detail all kinds of teaching activities carried out by the teacher regarding mathematics teaching in the classroom.

The same questions were asked to both of the teachers. Some of the questions used in the interview are given as "*What is your philosophy of teaching? Can you explain?, What is your philosophy of teaching mathematics?, What are the teaching strategies, methods and/or techniques you use when teaching mathematics?, What are the materials you use when teaching mathematics*? ".

2.2.3. Documents

The data collection tools used in the current study as documents include the textbooks that teachers use in the classroom environment, the written materials they bring to the classroom environment, questions or worksheets, and the primary school mathematics curriculum. The curricula used in the study are The Ontario Mathematics Curriculum for Grades 1-8 and the Ministry of National Education Primary School Mathematics Curriculum MoNE 2018. The Ontario school curriculum was updated after 2020. However, since the former curriculum was used during the study period, comparisons were made over the old Ontario curriculum. The old program was being used at the time of the study.

2.3. Data Analysis

In order to find answers to the research questions of the study, a content analysis on the curriculum was conducted.

2.4. Validity and Reliability

During the class observations in Canada, the researcher sometimes adopted the role of participant observer and sometimes the role of non-participant observer. In some lessons, she was present only by observing and writing detailed reports, and sometimes she was involved in the process as an assistant teacher, checking the students' work and giving feedback. This role sharing did not go in planned manner during the process. The researcher reported the lesson process in detail after the class in which she was in the role of a participant observer. However, in Turkey, the researcher was in the role of non-participant observer during the process. In both cases, the researcher made short interviews to illuminate the process and wrote detailed reflective reports. Apart from the reports, it was tried to establish the reliability by including another researcher who was an expert in the field. There are no specific

definitions, tests or methods in qualitative research to ensure validity and reliability, as in quantitative research. Instead, there are precautions to be taken and strategies to be used for validity and reliability (Yıldırım & Şimşek 2008). In the current study, it was tried to ensure consistency in the processes of data collection, analysis and interpretation. For external reliability, the obtained results and their interpretations are presented in a way that allows them to be compared with the raw data.

4. Findings and Interpretations

4.1. Findings related to the first research problem "*What are the general similarities and differences emerging when the primary school mathematics curricula of Canada and Turkey are compared*?"

For this research problem, the primary school mathematics curricula of both countries were examined in detail and the similarities and differences were tried to be revealed by comparing them under the headings of basic issues, skills, learning areas, sub-learning areas (subjects), measurement and evaluation approaches. Skills, basic issues, measurement and evaluation approaches were derived from the general approaches of the primary school curricula. Major learning areas, concepts and skills were written by making use of the subjects, expectations and objectives addressed in the 3rd grade mathematics curriculum. The obtained findings are presented in the table below.

Table 1. General Comparison of the 3rd Grade Mathematics Curricula in Turkey and Canada Ontario Province

The Area of Comparison	Turkey	Canada
Basic Issues	➢ Basic values: justice, friendship, honesty, self-control, patience, respect, love, responsibility, patriotism, benevolence ➢ Communication in the mother tongue ➢ Communication in a foreign language ➢ Mathematical competences and science/technology basic competences ➢ Digital competence ➢ Learning to learn ➢ Social competences and citizenship-related competences ➢ Taking initiative and entrepreneurship ➢ Cultural awareness	➢ English as a Second Language and English Literacy Development ➢ Importance of instructional approaches ➢ Planning mathematics programs for students with special education needs ➢ Anti-discrimination education in mathematics ➢ Literacy and inquiry/research skills ➢ Counselling and mathematics ➢ Health and safety in mathematics

Skills	➢ Mathematical literacy ➢ Problem solving ➢ Reasoning ➢ Meta-cognitive skills ➢ Estimation skill ➢ Mental calculation skill ➢ Skill to use representation ➢ Affective skills ➢ Valuing mathematics ➢ Communication skill ➢ Association skill	➢ Problem solving ➢ Reasoning and proving ➢ Reflecting ➢ Selecting from among devices and computational strategies (calculators, computers, communication technologies, manipulatives, calculation strategies) ➢ Association ➢ Representation ➢ Communication
Major Learning Areas and Concepts	➢ **Numbers and Operations** **36 objectives (**natural numbers, addition, subtraction, multiplication and division with natural numbers, fractions**)** ➢ **Geometry** 10 objectives (geometric objects and shapes, spatial relations, geometric patterns, basic concepts in geometry) ➢ **Measuring** 23 objectives (measuring length, measuring circumference, measuring area, measuring liquid, our coins, measuring time and weighing) ➢ **Data Processing** 3 objectives (data collection and evaluation)	➢ **Number Sense and Numeration** 18 special expectations (quantity relationships, counting and operational sense) ➢ **Geometry and Spatial Sense** 13 special expectations (geometric properties, geometric relationships, location and movement) ➢ **Measurement** 16 special expectations (attributes, units and measurement sense, measurement relationships) ➢ **Data management and Probability** 8 specific expectations (collection and organization of data, data relationships, probability) ➢ **Patterning and Algebra** 10 Specific expectations (patterns and relationships, expressions and equality)
Measurement and Evaluation Approaches	➢ It is flexible ➢ Non-standardized categories for both cognitive and affective domains ➢ Multifocal measurement and evaluation is essential	➢ It is not in a flexible structure with a determined four-stage achievement chart ➢ Cognitive categories determined in the achievement chart: Knowledge and understanding, Thinking, Communication and Application ➢ Multifocal measurement and evaluation is essential

The Turkish curriculum aims to train individuals who have integrated knowledge, skills and behaviours in the eight key competences it has determined. These eight

competences are; communication in the mother tongue, communication in a foreign language, mathematical competences and basic science/technology competences, digital competence, learning to learn, social competences and citizenship-related competences, taking initiative and entrepreneurship, cultural awareness. In the Canadian curriculum, under the heading of basic issues, there are seven areas addressed including English as a second language and English literacy development, instructional approaches, planning mathematics programs for students with special needs, anti-discrimination education in mathematics, literacy and inquiry/research skills, counselling and mathematics and health and safety in mathematics.

When the Canadian curriculum is evaluated as a whole, it is seen that it is a curriculum written to emphasize that mathematics requires a knowledge and technology-based society, individuals who have a critical perspective on complex issues, have the ability to analyze and adapt new situations and show the ability to solve various problems and express their thoughts effectively, and that mathematics in such a society will equip students with the knowledge, skills and mental habits necessary for successful and rewarding participation. In the curriculum, the roles and responsibilities of students, parents, teachers and school administrators in mathematics education are clearly stated.

When the skills in both curricula are examined, it is seen that in both curricula it is emphasized that the skills specific to mathematics should be addressed. However, it is seen that the skills are not clearly written in the Turkish mathematics curriculum. In the last two curricula before 2018, it was seen that skills were included and determined under this heading, while no such heading is included in the last curriculum. By evaluating the whole curriculum, the emphasized skills were tried to be determined. When the whole curriculum was examined in detail from this point of view, it was determined that mathematical literacy, problem solving, reasoning, metacognitive skills, estimation skill, mental processing skill, representation skill, affective skills, valuing mathematics, communication skills, and association skill are emphasized. Compared to the Canadian curriculum, it was determined that the skills mentioned are generally similar. These skills are clearly defined and explained in detail in the Canadian curriculum. The most important difference identified here is that the Canadian curriculum includes the skill to choose devices and computational strategies (calculators, computers, communication technologies, manipulatives, calculation strategies) while in the Turkish curriculum, affective skills are specified as valuing mathematics only under the term of general skills.

In the Canadian curriculum, the skills are explained in detail, the sub-skills that students will acquire under these skills are again explained in detail, and the special sub-skills expected from students for these skills for each grade level are determined.

The major learning areas are generally included under similar headings in both curriculum. The Canadian curriculum also includes the learning areas of patterns

and algebra. The algebra learning area is included in our curriculum starting from the 5th grade. While major learning areas are included in the Turkish curriculum with the names of learning domains and sub-learning domains, they are referred to as strands in the Canadian curriculum. For each strand, overall expectations and specific expectations are defined. Specific expectations are presented under separate cognitive behaviours such as quantity relationship, counting. A total of 65 special expectations are determined for 5 strands. A total of 72 objectives are determined for 4 learning areas in the Turkish primary school curriculum.

For the measurement and evaluation learning area, in the Canadian curriculum, it is stated that the basic goal of measurement and evaluation is to improve student learning, and that the information obtained through evaluation will help teachers determine the strengths and weaknesses of students in terms of the accomplishment of the objectives in the curriculum. In the curriculum, evaluation is defined as the process of collecting information that accurately reflects how well a student is meeting the expectations of the curriculum through a variety of sources (homework, daily observations and talks/lectures, demonstrations, projects, performances and tests). In order to ensure that measurement and evaluation are valid and reliable and lead to the improvement in student learning, 11 strategies are identified and these are clearly defined in the curriculum. These include basic ideas such as being fair to students, checking what students are learning and how well they are learning, and the measurement and evaluation approaches used being appropriate for learning activities, teaching purposes and students' needs and experiences. It is stated that while evaluating the success of the student, all curriculum expectations will be taken into account, but the evaluation will focus on students' compliance with the general expectations, and students' meeting the general expectations and the relevant specific expectations (including the mathematical process expectations).

Given that all schools in Canada have almost the same standards, it is likely that they will set the same criteria and descriptors for all students in the same province and city. Another different understanding determined is that in the Turkish curriculum, education will be given not only for "knowing (thought)" but also for "feeling (emotion)" and "doing (action)", so only cognitive measurements cannot be considered sufficient. The evaluation criteria in the Canadian curriculum are given only for the cognitive domain.

4.2. Findings related to the second research problem *"What are the similarities and differences emerging when the primary school third grade mathematics classes of Canada and Turkey are compared in terms of physical structure of the classroom, instructional activities, classroom culture, teacher role and measurement and evaluation approaches*?"

The similarities and differences emerging when the primary school third grade mathematics classes of Canada and Turkey are compared in terms of physical

structure of the classroom, instructional activities, classroom culture, teacher role and measurement and evaluation approaches are given in the table below.

Table 2. Comparison of the third grade classes in Canada and Turkey in terms of physical structure of the classroom, instructional activities, classroom culture, teacher role and measurement and evaluation approaches

Area of Comparison	Case of Turkey (Ankara Province)	Case of Canada (Ontario Province)
Physical structure	Traditionally positioned teacher's desk, blackboard and student desks facing the blackboard There are student lockers There are no materials and their cupboards Smart board Students have personal lockers	A living classroom environment that provides the integration of all courses There are themed corners where students are seated depending on the subject to be addressed (a chat and reading corner with carpets and cushions, a writing and study corner with tables and chairs, a library corner etc.). A section allocated to group works, a section with carpets and a library where students can study by sitting and read books, a section with computers Students have personal lockers There are any kinds of materials (unit cube, geometry board, counting stamps, pattern blocks and stationery) Small file presentation boards are available in the classroom for students to use and in almost every lesson, students present their solutions to the class by using these boards instead of notebooks. Separate desktop computers available for the use of the teacher and students Smart board and projector A classroom library
	Mostly teacher-centred approach Question-answer, constructivist from time to time Quick homework checking Strong adherence to the textbook Use of smart board In-class evaluation tools Traditional approach Showing different solutions Application of problem solving applications	Research and inquiry-based approach Constructivist teaching approach Brainstorming Inquiry-based questioning Problem solving based teaching Group work Detailed homework checking Multiple mathematical tasks Handling higher-order problems Use of different technological tools Use of rich course materials

Instructional Activities		Active learning Conscious handling of mathematical language and multiple representations Conscious handling of the metacognitive process Use and encouragement of reasoning skills such as estimation and generalization Encouraging students to develop their own methods
Classroom Culture	Democratic approach, sometimes peer bullying	Multiculturalism, Ethno mathematics Democratic approach Philosophy of every idea's being valuable, regardless of its being true or false Ensuring that the student feels mentally and physically comfortable (freedom of dress)
Teacher Role	Traditional teacher role, guide and mentor	Guide Inquisitive, enthusiastic for self-improvement innovator, participant in conferences and congresses Knowledgeable about the terminology of mathematics education
Measurement and Evaluation Approaches	In-class evaluation tools	Standardized tests used in the whole province, teacher opinions and classroom evaluation tools

When the table is examined, it is seen that there are differences in mathematics classrooms of the two countries in terms of physical structure of the classroom, instructional activities, classroom culture, teacher role and measurement and evaluation approaches.

When evaluated physically, it is seen that the classroom in Canada is structured to create a rich learning environment for students and to support their personal development. There are computers, projectors, screens, all kinds of materials (unit cube, geometry board, counting stamps, and pattern blocks) and stationery that are located separately for the use of teachers and students in the classroom environment. In the classroom environment, themed corners are planned, where students can sit and study according to the subject (such as a chat and reading

corner with carpets and cushions, a writing and study corner with tables and chairs, a library corner). Students have personal lockers where they can leave their personal belongings outside the classroom and take only water and worksheets requested by the teacher into the class. There are small presentation boards for students to use in the classroom, and in almost every lesson, students present their solutions to the class by using these boards instead of notebooks. The school in Turkey is a public school. More similarity could have been obtained had the study been conducted in a private school. The observed school in Canada is a private school. In the interviews with the teacher, she stated that Canadian school have similar physical standard.

There is freedom of dress for both students and teachers. There are studies carried out in all corners of the classroom, and an environment where students can feel comfortable has been created. There is no textbook followed. Students use worksheets and activity sheets given by the teacher. The role of the researcher here was that of the assistant teacher. She supported the students in one-to-one question solutions and helped the teacher from time to time. The teacher is a primary teacher with professional experience of 17 years. She is an innovative teacher following trainings, conferences and congresses and is open to self-development. She is willing to participate in in-service training. She stated that the most important subject in mathematics education is conceptual learning. From both the interviews with the teacher and in-class observations, it was observed that she had a good command of the terminology used in mathematics education, and she consciously tried to include it in his practices. Based on the constructivist approach as a teaching method, she offered a learning environment enriched with materials and he used brainstorming and question-answer techniques and problem-solving approaches. It was observed that he allowed enough time for students to explore and frequently gave directions to allow students to experience cognitive conflict by asking inquiry-based questions. A sample in-class dialogue is given below.

"*In the last lesson, for the 3x24 operation, I first multiplied twenty by three, then multiplied four by three, and added the two. This was my solution strategy. Let's continue with a similar question.*

6x48=?

*First, what is asked in the question? Who wants to explain?" (*teacher*)*

"*It means multiplying 2 numbers."* (student)

"*Well, you know these numbers. You know how to multiply. You can solve it however you want.*" (teacher)

"*I couldn't find a strategy.*" (student)

"*It doesn't matter, whatever it means to you, you can solve accordingly.*" (teacher)

Meanwhile, he is examining the solutions of the students and giving directions.

"*I can see that you have found a lot of strategies. This is nice.*".

When the table is examined, it is seen that the Canadian classroom has a wealth of cognitive tasks, contents and approaches to develop students' problem-solving and

reasoning skills. The teacher handles problem solving and reasoning together and displays a constructivist teaching approach based on research and inquiry in the process. Brainstorming and cognitive conflict are techniques he uses to increase student interest and motivation in discussions and introductions. Classroom activities are carried out both individually and in groups. The teacher performs a detailed homework checking and gives feedback. More higher-order problems and situations involving multiple tasks are presented in the lessons, and rich course materials, including technology, are allowed to be used for solutions. He provides the opportunity to use different solutions and tries to give the right to speak to each student in every lesson. He includes guiding questions for control and going back for the metacognitive process to work actively. He includes skills such as estimation, generalization and inference in order to develop students' reasoning skills. He encourages students to use different mathematical language and develop their own methods when explaining their ideas. A sample in-class dialogue is given below.

The teacher writes the following operation "*67x3=?"* on the small board in his hand. She asks everyone to solve this operation using their own strategies.

She gives them time by saying *"everyone should have a strategy", "When you have solved it, think of another solution".* Meanwhile, he examines students' solutions then he starts a whole class discussion. She asks guiding questions such as "*How many students solved using the close number*?", "*Which close numbers did you use*?", "*Which other numbers could have been used*?"

She waits students to answer after asking the following question "3x70?" and then asks a new question *"3x60?"* He gives them the opportunity to explore different solutions by using the differences and number relations between the close numbers.

A very democratic classroom environment was observed during the entire time the researcher made observations. A learning environment, a classroom environment where different cultures, different languages and different religions have the same value, and where all thoughts are valued has been constructed (by celebrating the festivals and important days of different religions and cultures in the classroom). Although the official language used in the classroom is English, figures written in Chinese are hung in one corner of the classroom for a while during the observation period. Celebrations and holidays (Ramadan festival or Easter) belonging to different faiths are celebrated in the classroom environment. It is a common pattern of behaviour to express mathematical opinions and ideas without worrying about being wrong and to listen to each other respectfully. During the whole time the researcher was in the classroom environment, no physical or verbal humiliation or peer bullying was observed. Although the teacher follows the curriculum, there is flexibility in planning and timing. For measurement and evaluation, standard tests used on a provincial basis, teacher opinions and in-class evaluation tools are used.

The school in the case of Turkey is a public primary school located in the Çankaya district of the city of Ankara. As the source of the course, the textbook prepared by the Ministry of National Education and the worksheets given by the teacher are used. The teacher has 25 years of professional experience. He gives information mostly through lecturing, which we can call a traditional approach, and uses the question-answer method and rarely the constructivist approach. Concepts and definitions are given by the teacher; he is of the opinion that activity-based teaching is important for mathematics education, but traditional teaching is more dominant during practices. A sample in-class dialogue is given below.

"*Now we can proceed into a new subject. Our subject is patterns, now look at your books.*

"Last year, we handled patterns, what do we understand when we say pattern?"

"Ordering of numbers" (student)

"What else?"(teacher)

"Numbers, objects" (student)

"What do we call the ordering of numbers and objects according to a certain rule? Pattern ...is this ordering a random ordering? is this ordering a random ordering?"(teacher)

Silence in the classroom ...

"No, of course, it has to be in a certain order, for example, 2 squares, 1 triangle, 3 pencils and 1 eraser, we can also create patterns with the items in our house, right? ...." (teacher)

"Yes" (the whole class)

"We arrange them according to a certain rule, such as 2 beans and 3 chickpeas. We also do it with numbers ..." (teacher)

"How is the numbers ordered? one by one or two by two, how the numbers increased or decreased, 4,8,12,16,20,....yes, the numbers increase by 4, now let's look at this ...1,3,2,4,3 ..... they increase by 2 and decrease by 1"

"Do you remember?... well, we have even and odd numbers, what is an odd number? and what is an even number?"

Without waiting for students to answer, "*the following numbers are odd numbers 1, 3, 5, 7 and 9 and the following numbers are even numbers 0, 2, 4, 6 and 8"*

"*For example, what is the ones digit in the number 13*?"

"3" (the whole class)

"*3 is an odd number then the number is odd, as well. Is the number 20 an even number*?" (teacher)

"*Yes*" (the whole class)

"*Why is it an even number? Because its ones digit is an even number, isn't it*?" (teacher)

"*I want everyone to given an example in turn.*"

After this dialogue, the teacher starts using the smart board by telling them to write the information part in the textbook in their notebooks. Then, they proceed with the teaching of the subject and sample solutions. After the teacher poses the questions, he usually answers them without giving them a chance to find the answer.

In the case of Turkey, the teacher uses rather traditional approaches. Students are in the role of passive listeners and are less likely to encounter situations that will allow them to develop their own solutions. Group works and an effective discussion environment are observed less. It is seen that the teacher mostly uses the textbook and an online social education platform, does not use materials, does not manage an effective questioning process, and does not use problems involving higher-order and multiple mathematical tasks. A sample in-class dialogue is given below.

"Last year we learned how to perform addition operations with 2-digit numbers. Today, we will perform addition operations with 3-digit numbers. Now, everyone look at the board."

The teacher writes the operation 245 + 143.

"*Remember that addition always starts with the smallest digit. Addition, subtraction, division, and multiplication always start with the ones digit. The digits of the numbers to be added are always written one under the other. Now let's sum up. Five plus three is eight, four plus four is eight, two plus one is 3. What did we find? ....388*."

Much of her observed teaching is structured in what we might call traditional, where the teacher is dominant and gives information to the student by means of lecturing.

5. Results, discussion and suggestions

When all the findings are evaluated, it is seen that there are mostly differences as well as some similarities in terms of the general objectives of the curricula of both countries, in-class instructional activities and the physical structure of the classroom. In both curricula, objectives related to the development of similar skills are specified. In the Turkish curriculum there is no detail on how and in what way these skills are handled and statements about these skills are given only within the general objectives that the curriculum tries to achieve. It is prepared in a simpler format, definitions and long explanations are avoided. Mathematics skills are given only within the general objectives. In the Canadian curriculum, all skills are explained in detail and which skills should be addressed together is explained, as well.

In the Canadian curriculum, with the conviction that the students who know mathematical concepts well may still have difficulties in applying their knowledge in problem solving activities, because they have not yet internalized a model that can guide them throughout the process, a 4-stage problem solving model is defined and what is expected from students according to this model is explained. In the Turkish curriculum, statements about problem solving skills have been tried to be given only

within the general objectives. There are no informative statements about how problem solving will be carried out, problem solving philosophy, process, model proposal that can be handled, and evaluation of problem solving. When compared in terms of the instructional activities carried out by the teachers to help students develop problem solving and reasoning skills, it was observed that the Canadian teacher handled problem solving and reasoning skills together, and worked on problem solving throughout the lesson. In addition, it was determined that she used methods and techniques making the student active, such as research and inquiry-based and problem solving-based approaches, brainstorming, discussion and group work. The teacher's creating a state of cognitive conflict in students by means of higher-order questioning was observed in almost all the lessons. It was also observed that the problem situations used in the lessons included higher-order and multiple mathematical tasks, and the solutions and ways of thinking were definitely discussed in each lesson. In the case of Turkey, the teacher's approach was largely teacher-centred. Group works and effective discussion environments were observed very little. The teacher mostly used the textbook and an online education platform, rarely use materials and problems involving higher-order and multiple mathematical tasks. It can be said that the differences observed in all the instructional activities used by the teachers is due to the differences in the curricula. It was observed that the Canadian teacher integrated the situations mentioned and suggested in the curriculum into his lessons.

For parent involvement, it is seen that the importance of involving student parents in the process is emphasized and it is stated that parents have an important role in supporting student learning in Canada curriculum. It is also emphasized that by becoming familiar with the curriculum, parents can learn what is taught in each class and what their children are expected to learn, and this awareness will improve the ability of parents to discuss schoolwork with their children, communicate with teachers, and ask questions about their children's development. Another difference identified is that the duties of school principals are also included in the Canada curriculum. School principals work in partnership with teachers and parents to ensure that every student has access to the best possible educational experience. In order to support student learning, principals ensure that the Ontario curriculum is appropriately implemented in all classrooms, using a variety of teaching approaches, and provide appropriate resources for teachers and students.

As known, Canada receives thousands of immigrants every year. Thus, it can be possible to make changes on some or all of the expectations of the curriculum, depending on the student's competence of English, in order to minimize the problems to be encountered by the children of immigrant families. Mainly as a natural consequence of immigration, the cultural makeup (religious, racial, and linguistic) of the school-age population in Canada is diverse. This situation directly affects school life in terms of many factors such as education and instruction given in schools. Considering this cultural diversity, a suitable learning environment has

been created for students from different cultural backgrounds. Ethnomathematical situations have been observed in the Canadian classroom as a reflection of multiculturalism. A democratic environment has been created in which opinions can be easily expressed whether right or wrong, teachers and students do not judge each other, do not humiliate each other, and peer bullying is not observed. Canada's most important educational goal is to create understanding between all cultures in a country that is a cultural mosaic (Yazıcı 2009).

In Turkey, a democratic classroom environment were mostly observed but peer bullying was also been observed from time to time. Peer bullying is a striking situation that emerged in the observations of the mathematics lessons. In Turkey, selection exams are held for entrance to high schools and universities. These exams have become a part of the system. The reflections of the enacted competition can be seen even in primary school times. Peer bullying may be due to the idea of seeing a friend as an opponent.

The physical infrastructure of the school in Canada is better than that of the schools in Turkey. This might be related to factors such as resources allocated to education, teacher training and teaching conditions, economic conditions, number of students and population. The Canadian classroom is a living classroom environment designed to make the student feel mentally and physically comfortable.

With this study, the differences and similarities between the two countries were tried to be revealed. There is a need to compare the results with more comprehensive studies. Naturally, nations are not expected to change their education systems immediately based on the results of comparative international studies, but the effects can be observed over time.

NOTES

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