Observing Teachers: The Mathematics Pedagogy of Quebec Francophone and Anglophone Teachers

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Abstract: *This text presents preliminary results of a study comparing mathematics teaching pedagogies of Quebec Francophone and Anglophone Mathematics teachers. This study is part of a new nationwide study on middle school mathematics pedagogies conducted in four different regions in Canada, where the main objective is to describe regional difference in mathematics teaching and underlying pedagogies in Canada, and to relate these differences in student achievement in mathematics. Four Anglophone and four Francophone Quebec teachers engaged in focus groups based on three types of lessons they each previously recorded: typical, exemplary and introductory. The focus groups discussions were analyzed and compared to reveal aspects of the teachers' pedagogies.*

Context of the Study

The large scale international assessments conducted by PISA have revealed that there is a considerable range of student achievement in mathematics across Canada. When compared to international results, some Canadian provinces rank among the top countries, while other provinces are significantly below the Canadian average. A number of factors have been claimed to contribute to these differences including curriculum, students' genders, attitudes, beliefs, aspirations, and time spent working outside school, parents' education, involvement and socio-economic status, other aspects of the home environment, and school resources (Anderson et al., 2006; Beaton & O'Dwyer, 2002; Schmidt, et al., 2001; Wilkins, Zembylas, & Travers, 2002). Those factors might have a strong influence on students' learning, but other factors might explain the difference of students' achievement in mathematics. For instance, the test sheds light on differences in language, curriculum, and culture as factors to consider when interpreting the results. But there is no insight into differences in teaching pedagogies. Teaching pedagogies imply the use of different approaches when teaching. Even if the mathematical content is the same, the pedagogies used by teachers might not be the same. So far, no comparison of teaching and pedagogy between regions of Canada has been made, in spite of the noticeable differences in student achievement between regions. The results analyzed here come from a Canada-wide research program intended to address this lack of knowledge (see https://www.mcgill.ca/dise/research/mathematics).

The objective of this research project is to describe regional differences in mathematics teaching and underlying pedagogies in Canada, and to relate these differences in student achievement in mathematics. The guiding questions for this study are: How do pedagogies in middle school mathematics in regions of Canada differ? How are these differences related to differences in average achievement and the range of achievement in regions of Canada?

This research report presents preliminary results of this study done in the province of Quebec, one of the regions chosen in this nationwide study. Here we focus on comparing the teaching practices and pedagogies between Quebec Francophone and Anglophone teachers. Our main research question is: How are the mathematics teaching pedagogies similar and/or different

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between Quebec Francophone Anglophone teachers?

Theoretical Framework

As our objectives are focused on pedagogy, it is important to clarify what this word means to us. We are referring to what Tobin et al. (2009) call "'implicit cultural practices' of teachers, by which we mean practices that though not taught explicitly in schools of education or written down in textbooks reflect an implicit cultural logic" (p. 19). As they note this concept is related to what Anderson-Levitt (2002, p. 109) refers to as "knowledge in practice" and "embodied knowledge" (p. 8) which refer to "professional knowledge rooted in national classroom cultures" (p. 109) as well as Bruner's (1996) concept of "folk pedagogy": "taken-for-granted practices that emerge from embedded cultural beliefs about how children learn and how teachers should 'teach'" (p. 46).

Method

The methodology for this research is an enactivist one (Reid 1996). Four Francophone and four Anglophone grade 7 and/or 8 (known as secondary 1 and 2 in Quebec) mathematics teachers participated in this study. The study was divided into two phases. During the first phase, all the teachers were recorded teaching three mathematics lessons: one that they felt was a typical lesson in their classrooms; one that they felt was exemplary; and one introductory lesson on a topic related to fractions. Each lesson recorded was then edited by members of the research team and 20 to 25 minutes of each lesson where kept. The content of the edited videos focussed on the different practices the teachers used in their lessons.

The second phase consisted of data collection via focus group discussions. The four Francophone teachers met with the research team for three focus group sessions. Three of the four Anglophone teachers met with the research team for three focus groups sessions at a different time. The fourth Anglophone teacher had to leave the project because she was on sick leave when the focus groups were held. She, however, gave us permission to use her videos. The first focus group was set up to discuss the typical lessons. The edited video of each teacher's lesson was shown and then discussed. Before viewing a video, the teacher presented the activity she did and her learning goals and answered questions from the group. After the video, a discussion on the practices she used occurred. After all the videos were shown, the teachers had the task of creating a set of criteria that defined a typical lesson and had to choose one of the four videos as the best typical lesson based on the criteria they set. The same process was repeated for the introductory lesson on a topic related to fractions and for the exemplary lesson. The Francophone teachers had a hard time setting up a list of criteria. They wanted to view and discuss all the videos before coming up with their criteria. A fourth focus group session was added so they could then create criteria for the practices found in all three types of lessons and then select a video for each type of lesson. The research team facilitated the discussions and the group of teachers came up with a table defining lessons that are exemplary, lessons that are typical, and what practices should be in lessons introducing fractions. The Anglophone teachers preferred to discuss the criteria before watching the videos but they refined their criteria throughout the process. In both groups, it was hard to come up with only one video for each type of lessons: all the teachers wanted to have parts from several videos.

All focus groups were video recorded and then transcribed using pseudonyms. A thematic approach was used to analyze the data (Butler-Kisber, 2010). A comparison was done for each type of lesson used in this study between the Francophone and Anglophone teachers by analyzing the practices mentioned in the corpus for each type of lesson based on the criterion from both the Francophone and Anglophone teachers (Butler-Kisber, 2010).

Results

Typical lesson

According to the Francophone teachers, a typical lesson is one that is done most of the time and follows a certain routine or a functioning method that was established at the beginning of the school year. There is also a particular sequence to a typical lesson that consists of: a follow-up on the homework, an explanation of the new content, and exercises. One of the teachers summarizes by saying, "In reality, a typical lesson, this is what we do 70% of the time: correcting homework, then present the new content and then students do some work… There is a particular routine and the students are used to it" (all quotations of Francophone teachers have been translated from French by the authors). For the Francophone teachers, the sequence also includes mini quizzes (either formative or summative) at the beginning of the lesson that mostly focus on mental math problems and short answer questions related to prior concepts learned during the year. Two of the teacher used that practice. One focused mainly on mental math while they poses different types of questions (mental math, review prior concepts and operations, short word problems). One of them takes this practice to heart by saying: "I do this because I want my students to find different strategies to solve different problems with whole numbers, fractions and percentages. I give some mental math problems and then we discuss each of them and I have the students share their strategies". The teachers also put an emphasis on using the proper mathematical vocabulary and having a synthesis of the content, which usually consists of taking or creating notes related to the content: "For me, we should always have a synthesis in not only a introductory lesson but also in a typical lesson. We have to let the students know where these mathematical ideas are inserted in the learning process. It should be some kind of conclusion that we do at the end". In addition, although these teachers believe in maintaining a particular sequence in a typical lesson, they also mentioned the importance of questioning students during the explanations or during the correction of the quizzes in order to reveal multiple strategies used in solving problems. For those who have access to technology, using multiple applets to present and work on the mathematical content is also part of their typical practices.

The Anglophone teachers also discussed the norms in class. They mentioned that in a typical lesson, expectations are set. They also talked about the classroom routine, which includes reviewing the homework, presenting new content and then assignments. One of the teachers said: "It is the norm. We should not be expecting anything less than this". The teachers also described the typical lesson as a talk and chalk lecture style of lesson where the questions asked and the brainstorming sessions are guided by the teachers and students respond to the teacher's prompt. The Anglophone teachers did put an emphasis on the type of students they have when describing the pedagogies in a typical lesson. They mentioned that: "when groups are weaker, there will be more modeling and prompting, but when they have stronger groups, they can use more student-centered approaches to teaching". Finally, as for work sessions, the teachers mentioned that there could be pair work during these types of lessons.

Exemplary lesson

The Francophone teachers believe that an exemplary lesson is more out of the ordinary and requires more planning, preparation and originality. "It is what we do less often", said one of the teachers present. In addition, for it to be successful, the teacher must know the curriculum very well. A teacher added: "I can't see myself doing exemplary lessons at the beginning of the school year and if it's the first time I teach this course because I am not comfortable with the curriculum or I don't know my students well enough during that time". In this type of lesson, the teachers mentioned that they must give more control to the students during the activities and the classroom management is different. Although students have more control in these types of activities, the teachers also mentioned the importance of guiding the students

throughout the process. As for the activities, the teachers believe that an exemplary lesson is centered on an initiating or consolidating task that involves pleasure, manipulation, exploration and collaborative work. One of the teachers summarized these practices by saying: “For me an exemplary lesson, we give the control to students and they are active. They experiment, they manipulate, they discover, etc.”. Even though more control is given to the students, the Francophone teachers added that it is important to set out the rules and expectations at the beginning of the task. The teachers also mentioned the importance of a synthesis at the end of the activity, but this one is different compared to the typical lesson. In this synthesis, the teachers must focus on the initial goals of the activity, different mathematical representations of mathematical ideas, and proper mathematical vocabulary. When discussing about the strength of the students mathematically, one teacher was a bit hesitant about exemplary lesson and seemed to associate this type of lesson with stronger students. She said:

> When I think of the different groups I have, I can’t see myself making exemplary lessons with my weaker students. I have some that still can’t differentiate the numerator and the denominator of a fraction. With stronger groups, I have no problems with exemplary lessons, but not with weaker students. I find sometimes that the groups we have are too heterogeneous.

Although the teachers agreed that exemplary lessons are not done often, one of them mentioned that since most of the content taught in grade 7 mathematics are concepts that the students learned during elementary school, it could be an opportunity to make more exemplary lessons. “I don’t know why we don’t do that many exemplary lessons when they have learned the content we are teaching. I think we should” .

For the Anglophone teachers, an exemplary lesson is one that offers opportunities for students and even teachers to learn and exhibits best classroom practices such as: creating a more student-centered classroom management dynamic in classrooms (students are engaged and involved in a task), questioning (eliciting higher order thinking questions), emphasizing mathematical vocabulary, representing mathematical understandings in various ways, and making connections to other concepts. “Teachers take risks and try new things … You can connect yourself with the real world with this and it allows the teacher and the student to deviate from the lesson plan at times”, mentioned one of the teachers. They also mentioned that in this type of lesson, students are exposed to tasks where they must answer “how and why” questions and where expectations are set and the mathematical content is conveyed in them. Also, in such tasks, students explain not only the procedures of their work, but must also justify their choices and their understandings. A teacher summarized that idea by saying: “In this type of lessons, students must not only explain the procedures of their work but also explain the why and their understandings”. Thus, according to the Anglophone teachers, exemplary lessons provide opportunities for students to share their mistakes or their alternative concepts and approaches. One teacher was clear about this point and said: “we celebrate mistakes in these lessons”. They also added that these types of lessons would be able to reach most students. In addition, the teachers suggested that an exemplary lesson establishes a safe environment for students to participate in the classroom. However, similar to the Francophone teachers, they also mentioned the importance of knowing and being comfortable with the curriculum. They added that it is important to know the content at other school levels in order to have a vision of continuity in the content across levels, to prepare students to go further and deeper into the content, and also to be aware of the students’ prior knowledge.

Introductory lesson

Similar to the typical and the exemplary lesson, the Francophone teachers emphasized the importance of mathematical vocabulary in introductory lessons; they mentioned it as an

important practice for that type of lessons. The teachers also talked about the importance of activating prior knowledge in introductory lessons, which was a practice not emphasized in the other types of lesson. In addition, in introductory lessons, the Francophone teachers also discussed the importance of varying the representations of mathematical ideas. For instance, for fractions, a teacher commented that in some contexts, it would be more beneficial to use rectangular shapes to compare fractions instead of circular representations, although both are area models. They were impressed by how a student understood that when comparing unit fractions, a part is smaller when the denominator is greater when the teacher drew rectangular pies instead of circular ones. “I always use circular pies or pizzas to represent my fractions. And I just realized in Valérie’s video how more clear it was using a rectangle instead of a circle” mentioned one of them. In addition, after seeing examples in a video where one teacher used the number line, others realized that they should use it more often to represent fraction concepts. For instance one mentioned: “After seeing Sophie’s video, I realize that I never use the number line to represent fractions. I need to use it more often because it could help some students” . The various representations seemed to have been an eye opener for most of the teachers here. Finally, the Francophone teachers also mentioned the importance of synthesizing the content. They mentioned that it is important to situate the concepts all through the teaching sequence.

The Anglophone teachers created only two videos of introductory lessons. After looking at both of them, the decision was clear for them which should be the one selected. Because of this, the Anglophone teachers did not feel the need to create a list of practices that should be included for an introductory lesson.

Discussion

While these results only allow us to compare pedagogies of teachers in two language groups in a single region, there are already interesting similarities and differences apparent.

The similarities include the structure of the typical lesson, an emphasis on mathematical vocabulary, the use of multiple representations (at least in exemplary lessons) and a belief that a high level of knowledge of the curriculum is important in planning exemplary lessons. The fact that these similarities exist support, in a very preliminary way, an assumption of the overall research project: that teachers working in a regional and/or linguistic community develop a shared pedagogy. As data from other regions is analyzed and compared with the Québec data it will be possible to identify more precisely the extent to which the similarities observed here between the two linguistic groups in Quebec are regional or pan-Canadian.

As researchers with experience in teacher education in a number of regions, it seems likely that the structure of the typical lesson and the focus on multiple representations are not unique to Quebec, although their prevalence may vary regionally. It is possible that the emphasis on vocabulary is a reflection of the prominent role given vocabulary in the Quebec curriculum documents, in which case we would expect less emphasis on vocabulary in other regions.

While teachers in Quebec follow the same curriculum documents, and in many cases use textbooks written specifically for use in the province, the presence of two language communities in the province means that within the region there could well be two distinct pedagogies divided on linguistic lines. More data is needed to establish this, but the differences between the two focus groups are suggestive. These differences include differences related to questioning, synthesis, and attention to student ability.

There is more emphasis on questioning for evaluation in the Anglophone group’s discussion of the typical lesson, compared to an emphasis on questioning as a means of revealing contrasting strategies in the Francophone group. The use of questioning to create such learning opportunities was mentioned by the Anglophone teachers more in the context of an exemplary lesson. Questions that ask for justifications, explaining how and why, were also

mentioned by the Anglophone teachers in the context of the exemplary lesson, but not by the Francophone teachers.
The Francophone teachers mentioned the importance of a synthesis in a lesson, although this plays a different role in the typical and the exemplary lesson. The Anglophone teachers, in contrast, did not mention any need for a synthesis of the content or of the lesson goals.
The Anglophone teachers commented that the perceived level of the students would affect the nature of a typical lesson. If the students are stronger, the typical lesson would have more features of the exemplary lesson. The Anglophone teachers also mentioned that the exemplary lesson would be able to reach most students, implying that different student levels are to be expected and affect teaching. In contrast the Francophone teachers seemed to be more hesitant of using exemplary lessons with weaker groups. Therefore, this was not found in their lists of practices. They mostly put the emphasis on teacher planning and preparation for the success of a lesson.
These three differences suggest that there may be two distinct pedagogies present in Quebec, divided along linguistic lines. This could partially account for the different levels of success of Francophone and Anglophone students on large scale mathematics assessments.

Conclusion

The results presented here only allow for very preliminary conclusions regarding the differences in regional pedagogies on Canada and their connection to student achievement. There are indications, however, of differences in pedagogy between the two linguistic communities in Quebec.
In the next phases of the research the discussions on the focus groups in other regions will be analyzed and compared with the discussions in the Quebec group. Additional data will be generated when the focus groups view and discuss the videos selected by the groups in other regions. The teachers' observations of similarities and differences in the teaching in other regions will provide further insight into their pedagogies.

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