

# From textbook to classroom: a research on teachers' use of pedagogical resources in the context of primary school in the French speaking part of Switzerland

Audrey Daina

HEP Vaud, UER MS and Geneva University, team DiMaGe, Faculty of Education, Switzerland;  
[audrey.daina@hepl.ch](mailto:audrey.daina@hepl.ch).

*In French speaking Switzerland, primary school teachers use uniform textbooks edited by the government. These official textbooks are specific, they provide a source of activities but don't give information about how to organize the teaching. In this context, it is interesting to observe how teachers choose and organize in-class activities, the different ways they use textbooks, and the consequences in the classroom. Our research is a case study, which is based on interviews with teachers and classroom observation. The analysis were conducted using two different theoretical frameworks: Margolinas' (2002, 2005) model of the teaching activity as a process of interaction between the teacher and the "milieu" and Robert's and Rogalski's (2005, 2008) model of teachers' choices as a coherent system that does not depend only on learning objectives but also on characteristics of the profession and on certain constraints.*

*Keywords: teachers' practice – textbooks -*

## Introduction

The results we are going to present in this paper are based on our PhD theses (Daina 2013), which aimed to describe and analyze how five teachers in Geneva use the official textbook for mathematics, considering their "ordinary" practices. How do the teachers prepare their lessons? How do they choose their *activities*<sup>1</sup> and build the sequence of learning activities? How do they manage, then, to carry out these activities in class? The teachers' practices we observe are they consistent with what the designers of this resource advocate?

To study these different questions, it's first required to present the context in French speaking Switzerland and describe how the official resources for mathematic in primary school, known as "Moyens d'Enseignement Romand pour les Mathématiques" (*MERM*), were created.

Switzerland has a highly decentralized system with no federal or national Ministry of Education. Each of the 26 cantons which composes the country has its own education legislation and supreme power in its educational organization, leading to 26 systems with notable regional differences.

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<sup>1</sup> We use thw terme "activity" because it's the terme used in the official textbook. Most of the activity are problems but it can be also an exercice.

However, the Swiss Conference of Cantonal Directors of Education (CDIP <http://www.edk.ch/dyn/11926.php>) assures a certain coordination throughout the confederation. It contains four Regional Conferences, including French-speaking Switzerland which is connected with the Ticino and is represented by the CIIP (<http://www.ciip.ch>). The CIIP have led to some even more effective coordination, drawing up common curricula, publishing material, jointly managing institutions and recognizing qualifications and admissions.

In all French speaking Switzerland, in the 1970s, a common official set of pedagogical resources, the *MERM*, was designed by the CIIP appointed group of experts and teachers from the different cantons. This first edition originates from a double necessity: a will of «inter-cantonal» coordination of education (mathematics but more widely all the disciplines) and the introduction of a new curricula (CIRCE I), linked with the reform of the "modern mathematics".

In the 1990s modern mathematics were abandoned and a new educational paradigm appeared based on problem solving. The pedagogical resources have been renewed in the 1990s according to the new objectives of mathematics teaching. The collection currently used in the classrooms is strongly influenced by the socio-constructivist approach. Most of the activities proposed in the *MERM* are Situations-Problems, and aim at making pupils build and use new notions and tools, in a context proper to provide meaning through a demanding thinking process.

Switzerland has therefore a long tradition of diverse cantonal educational policies but also the willingness to coordinate the educational system in order to facilitate in particular communication and student mobility. The *MERM* are the "symbol" of this process, especially in mathematics because there were the first to be done. In fact, the *MERM* are the result of a long process of discussions and compromises because they have to be amended by all the cantons of the French speaking part of Switzerland. It is necessary to allow three or four years to realize the *MERM* for one degree. We have to take into account this complex context in our observation and analysis of this resource. The *MERM* must for example be compatible with all the plans of studies. They cannot thus be too prescriptive and require an opening.

Besides, the pedagogical resources are central to the reforms and innovations regarding mathematics education and more than just simple resources, they have the role of promoting innovation, in particular thanks to the teacher's textbook which describes the didactic and educational choices. They have to introduce the changes and harmonize the practices. This is also a critical element we have to take into account in our analysis.

The *MERM* have been thought as a set of resources, therefore they mostly consist of a succession of activities for class, regrouped in 6 to 8 main themes, without hierarchy. Contrarily to textbooks in other countries, they do not give a day-to-day organised plan for teaching, which remains the teachers' responsibility.

The role of the teacher is to choose problems that give students a real responsibility in the construction of knowledge, to interact with them if necessary when searching for the solution proposing appropriate hints, to establish favorable conditions for a pooling of approaches and solutions. (Traduction of "Les objectifs d'apprentissage de l'école primaire", section Mathématiques, p. 3)

To do this, the teacher must provide a considerable amount of preparation prior the lesson and our PhD theses aimed to study the ordinary practices in connection with this resource in order to make visible this essential part of the work of the teacher.

## **Teachers' use of pedagogical resources in the context of primary school in Geneva**

### **Research design**

Our research is a case study, which is based on interviews with teachers and classroom observation. The data were collected from April to June 2009 in five classrooms in Geneva in two different schools.

We asked the teachers to contact us a month before the beginning of the teaching sequence on the theme of area measure. In every class, we collected the following data: an interview before the teaching sequence; the observations in class with video recordings of the various activities of the teaching sequence; an interview at the end of the teaching sequence. In June 2010, we conducted the last interviews with three of the five teachers observed to present them the beginning of our analysis and make a kind of "self-reflection" showing them a selected extract of video and asking them to react.

### **Theoretical frameworks and research questions**

Our project aimed to study the "invisible" part of the teachers' practices and we wanted to observe ordinary practices, with all the complexity implied. Therefore, to build our theoretical framework and our methodology we lean on two theoretical approaches: Margolinas' model (the structuration of the "milieu") and Robert's and Rogalski's model (Cross-analysis of the teacher's activity). We didn't combine this to framework, instead we asked different independent questions relating to this two theoretical frameworks which we study considering tools and methodology from the relevant framework. In this presentation, we will focus on the second model and the results relate to it.

#### Robert's and Rogalski's model: Cross-analysis of the teacher's activity

This model combines two different approaches. Firstly, a didactic approach: teacher's practices are linked with the learning objectives. In this sense, the knowledge content of the teaching and the way the teacher organizes his teaching are analyzed using a didactic theoretical framework. Secondly, a psychological approach from cognitive ergonomics: the teacher is considered as a professional whose practices are subject to a professional contract, with particular goals, repertoires of action, representations of mathematical objects and their learning, and, more generally, personal competencies which determine his activity.

Robert and Rogalski (2002) determined five dimensions to analyze teacher's activity.

- The cognitive and mediation dimensions which concern the set of teacher's choices about the content and the organization of the knowledge before (cognitive dimension) and during the class-time (mediation dimension).

The combination of this two dimensions allows us to trace what "kind" of mathematics is proposed in the class « la fréquentation des mathématiques qui est installée, ce qui est valorisé par les

scénarios et leur accompagnement et ce qui pourrait manquer » (Robert & Rogalski, 2002, p. 514). Referring to several lessons, we can then identify “logic of action” (Chesnais, 2009).

This first part relates to the description of the teacher activity, then we would like to interpret and highlight what determines these practices. We refer to three dimensions:

- The social, the personal and the institutional dimensions which permit to define the constraints and the personal aspects of each teaching project.

These three dimensions are studied based on interviews, the study of the institutional and local context. They are also deduced from the observed teaching sequence. (Chesnais 2009).

This brings us the following research questions:

- What type of mathematics is promoted by various teachers, according to different scenarios and their execution in different contexts? Which kind of logic of action can we observe? Are these practices compatible with the didactic and pedagogical choices of the MERM resource designers?
- What hypotheses can be formulated concerning the dimensions (social, personal, institutional) that determine the teachers’ practices of our study ? How do the MER influence the observed practices?

### **Method of analysis**

The analysis was realised according to the following stages:

- A transcription of the lessons we observed was made using Transana, a software which allowed us to have permanently the video and the transcription on the same screen and give the possibility to introduce time codes and keywords. Referring to methodology used in various research using the double approach framework, we divide each lesson in temporal phases, which we call an episode and corresponds to a content unity.
- The scenario of the whole teaching sequence was then reconstituted and analysed to clarify on the one hand what kind of mathematical content is presented during the teaching (cognitive dimension) and, on the other hand, the dynamics in which the content appears during the classes (mediation dimension). The episodes we defined in the first stage of the analysis were coded according to the mathematical content and the teaching strategies (for more details, see Daina 2013).
- All the activities proposed to the pupils were analysed according to the methodology of the double approach (Robert and Rogalski, 2002). This was made to bring to light the “cognitive route” organized by the teacher.
- we wrote a report based on the interviews with teachers which allowed us to define the “profile” of each teacher, a synthesis of all the information we collected.

### **Case study: Mathilde and Sophie**

To exemplify our methodology and present some results of our research, we will now present two examples of our case study. We will first give chosen information about their “profile”, then present and compare their teaching sequences.

Mathilde and Sophie were both young teachers (4 and 5 years of experience) and they worked in the same school. The year of our experiment, they taught at the same degree (6P) and they met twice a month and collaborated to develop mathematics lesson plans. We observed the meeting when they planned the teaching sequence concerning the theme areas measure. Mathilde had already taught 6P degree programme for three years, it was the first time for Sophie.

Looking at the exchanges between the teachers during this meeting, we saw that they spoke little about the teaching objectives which seemed to be implicitly known and shared. The aim of the meeting focused more on choosing a list of activities and making sure that all the programme would be covered. Besides, the teachers did not enter into a very thorough analysis of the activities.

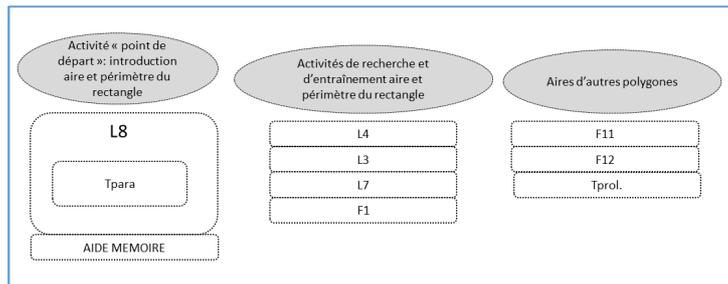
Mathilde said that the textbook was the reference and didn't feel the need to talk more about the objectives. She specified during the interview that her colleagues "trust" her concerning the choice of the activity because it's impossible, according to her, to choose the activities in the textbook without assistance. Mathilde based her choices on the list of activities which she had proposed in the last two years, which was initially the fruit of an older collaboration.

Sophie also speaks about "trust" during the interview what shows the importance of the collaboration in the preparation, by filling what is felt as a "lack" of the resource.

However, the study of Sophie's and Mathilde's profiles allows us to highlight that the objectives of both teachers are very different. For Sophie the calculating procedures in particular the introduction of the techniques of calculation of areas for triangles and parallelograms represent an important aim in the sequence, although it is not for the program of 6P. Furthermore, the formula of the calculation of area for the rectangle and the square is, according to her, something which was already approached in the previous years. For her part, Mathilde considers that the main objective concerns the understanding of the notion of area and the formula to calculate the area of a square. Even though their objectives are different, this point remains implicit throughout their collaboration.

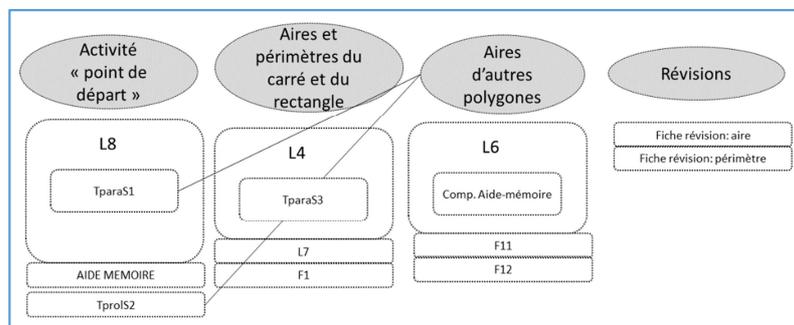
The scenarios analysis and their carrying out in class will allow to see how will evolve the educational projects of the two teachers whose starting point, by the way, is the same list of activities.

Figures 1 and 2 allow to have a global vision of Mathilde's and Sophie's scenarios. Mathilde provides a teaching sequence we analysed in three parts: an introductory session, three sessions dedicated to the area of square and rectangle and a session of introduction of the area of other polygons. This correspond with what is proposed in the textbook.



**Figure 1 Mathilde's scenarios**

The analysis of the series of activities proposed in Sophie's classroom show a split teaching sequence where activity from the official textbook are often mixed with improvised tasks on the blackboard.

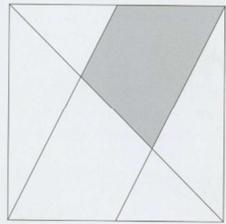


**Figure 2 Sophie's scénarios**

We represented a structure in four parts: an introductory activity, a series of activities on the area of square and rectangle, an introduction in the measure of areas of the other regular polygons and a session of revision.

Although Sophie and Mathilde based their teaching sequence on the same common project, we see well how both scenarios evolved. While the starting point is almost identical, the gap is widening in the course of the sessions. It is nevertheless interesting to note that in the interviews, Mathilde and Sophie did not seem conscious of these differences.

The analyze of the first session, during while Sophie and Mathilde proposed the same activity, "Fraction of a field", allowed to see more in details the difference.

<p>8. Fraction of a field</p> <p>Father Joseph has a square field. He splits it using three ropes passing through the vertices or the midpoints of the sides. One of his sons, Francis, will inherit the grey part of the field.</p> <p>What fraction of the field will he receive?</p>	<p>8. Fraction de terrain</p> <p>Le père Joseph a un terrain carré. Il le partage par trois cordes tendues passant par des sommets ou des milieux de côtés.</p> <p>Un de ses fils, François, héritera de la partie grise du terrain.</p> <p>Quelle fraction du terrain recevra-t-il?</p> 
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The table below synthesizes the succession of the phases during the carrying out of the activity in Sophie's and Mathilde's class.

Sophie	Mathilde
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<i>Phases</i>	<i>Durée en minutes</i>	<i>Phases</i>	<i>Durée en minutes</i>
Instruction	7	Instruction	3
Pupils work on the activity	6	Pupils work on the activity	10
Pooling	3	Pooling	7
Pupils work on the activity	3	Aide mémoire	19
Pooling	8	Pupils work on the activity	39
Parallel task on white board (interruption)	5		
pooling (reprise)	8		
Aide mémoire	4		
Parallel task on the white board (interruption)	8		

Here we see very clearly that, although the same activity was proposed to the pupils, its management in class is totally different between the two teachers.

In the class of Mathilde the number of phases is limited. The instruction is very short. During the pooling, the interactions testify of a discussion between the teacher and the pupils who have an active participation in advancing the discussion. Correction are made individually.

In the class of Sophie we observe at first a longer instruction time. Sophie testifies of a will to make sure that the pupils understand well « what they have to do ». The progression of the project is managed collectively. Sophie makes regular pooling in the course of which, she directs the pupils on a strategy of resolution which is going to become common. However, the task is also diverted on secondary tasks which are in connection with knowledge bound to calculate the area of parallelograms or triangles which are central objectives for her.

Sophie's more personal project enters thus in tension with the progress of the main activity which becomes a material medium to introduce new knowledge in a lecture style of teaching on whiteboard.

We can thus observe a big variability in the practices of these two teachers. What is really questioning is that these differences do not seem to worry them and in spite of their various ways of functioning, the teachers find an interest to prepare together the teaching sequences.

The space provided in this paper only allows to give a limited insight into our research result but some analysis made permit to identify tensions bound to the use of MER.

The first cause of tension results from the “shape” of this resources. Indeed, the quantity of the activity proposed is too important and a novice teacher can't know them all and make a real choice. As said in the introduction, there is no supplied sequence and not much piece of information given about each activity. This leads the teachers to follow what make other colleagues, even if sometimes they didn't share the same objective and teaching strategy.

Furthermore, as we show in the first part, the specific status of this resource will act as a strong constraint on the teacher who will use it to be in “conformity”, even if they don't follow the socio-constructivist approach and will finally distract from the goal the activities.

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