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# The use of mathematics textbooks in the training of elementary school teachers in France

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## 1. Introduction and context

In France, the vast majority of mathematics textbooks come with a teacher's manual. For the purpose of this study, we will consider that the pupil's *textbook* or *schoolbook* and its teacher's *manual* are in fact one single material we will call *textbook*.

In France, teachers can decide for themselves and in each of their classes whether they want to resort to textbooks or not, and which one(s) they wish to use. Publishers produce textbooks aplenty, making their choice by no means easier.

For example, for the CE2 (8-9 year-old pupils)<sup>1</sup> level pupils, at least fifteen different textbooks existed in 2013 for mathematics alone.

If one excepts a few reports issued by the General Inspectorate of the Ministry of Education in 1998, 2010 and 2012<sup>2</sup>, official publications do not usually deal with textbooks and their use in the classroom. While the primary school national standard curricula released in 2008 by the Ministry of Education<sup>3</sup> do state that “using a quality textbook to teach each of the major components of the French language is a guarantee of success”, there is no mention of how mathematics textbooks are to be used.

The competency grid the Ministry of Education released in 2010<sup>4</sup> - which defined the skills primary school teachers-to-be had to master to be granted tenure at the time – clearly stated that the teacher had to be able to “evaluate the quality of teaching resources (traditional or eTextbooks and their teacher's manual, resource materials both traditional and digital, teaching software and so on).” This reference to schoolbooks cannot be found in the new 2013 Ministry of Education competency grid<sup>5</sup>, although one might consider that the “available resources” item it lists under the professional training skill refers to them.

One is right to wonder if, during their periods of observation in the primary school classrooms of the experienced teachers known as *Professeurs des Écoles Maîtres Formateurs*<sup>6</sup>, teachers to be will have the occasion to see for themselves how textbooks are used and how they have been selected by the teachers. This raises questions concerning the teaching practices of PEMFs in mathematics. Do they resort to textbooks to prepare their lessons? Have they made a schoolbook available for each of their pupils? As teacher trainers, have they encouraged beginner teachers to use a textbook? These are the questions that will guide our research in this article and that led us to research the extent of the role textbooks play – when they are used - in the training of PEMFs and that of aspiring teachers

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<sup>1</sup> CE2 (Cours Élémentaire 2e année): the third year of compulsory primary schooling, CE2 corresponds to Grade/Year 3 in English speaking countries.

<sup>2</sup> Inspection Générale de l'Éducation nationale, *Le Manuel scolaire*, Paris, La Documentation Française, 1998 ; Inspection Générale de l'Éducation nationale, Inspection Générale de l'Administration de l'Éducation nationale et de la Recherche, *Le manuel scolaire à l'heure du numérique. Une « nouvelle donne » de la politique des ressources pour l'enseignement*, 2010 ; Inspection Générale de l'Éducation nationale, *Les manuels scolaires : situation et perspectives*, 2012.

<sup>3</sup> Ministère de l'éducation nationale et ministère de l'enseignement supérieur et de la recherche, *Programmes d'enseignement de l'école primaire*, Bulletin Officiel hors-série n° 3 du 19 juin 2008.

<sup>4</sup> Ministère de l'éducation nationale, *Définition des compétences à acquérir par les professeurs, documentalistes et conseillers principaux d'éducation pour l'exercice de leur métier*, Bulletin Officiel n° 29 du 22 juillet 2010.

<sup>5</sup> Ministère de l'éducation nationale, *Référentiel des compétences professionnelles des métiers du professorat et de l'éducation*, Bulletin Officiel n° 30 du 25 juillet 2013.

<sup>6</sup> Primary school teachers and trainers. In this article, we will use the acronym PEMF – standing for Professeurs des Écoles Maîtres Formateurs – when talking about the primary schools teachers who fulfil two different missions: teaching in a classroom and training students planning to embrace the teaching career as well as beginner teachers.

who come to observe their classes.

## 2. Theoretical framework

As research publications in the fields of both science of education and subject didactics clearly show, schoolbooks do appear in scientific literature. Although text books have always been a topic for reflection<sup>7</sup> in the noosphere of the teaching of mathematics, it is only since the first decade of this century that research focusing on how textbooks are used in the classroom has been published.

These publications tend to underline how much textbooks help teachers; Métoudi & Duchauffour<sup>8</sup> go as far as mentioning how comfortable they make teachers, whom they guide through the curricula, help to prepare their lessons, relieve of some material tasks, and assist in implementing more individualized and even differentiated instruction. The authors seem to consider textbooks as an efficient solution to overcome the hurdles linked to lesson preparation and classroom management.

Researchers in didactics of mathematics and authors of mathematics textbooks for primary school classes Briand and Peltier have noted that schoolbooks are not sufficient<sup>9</sup>. The accompanying teacher's manual has a crucial role to play in making the teachers' task easier by helping them analyse situations beforehand. But it must also let teachers do what only they can do: decide how they will use the schoolbooks' contents in the classroom. Both authors consider that textbooks, and more specifically teacher's manuals, can become "a transmission vector in didactics of mathematics"<sup>10</sup>.

Several research papers allude to schoolbooks as "vectors", stressing the idea that they are a medium for knowledge. In most cases, and although its subject varies, this knowledge is aimed at teachers. As an example, we can quote in Niclot<sup>11</sup> cited in Margolinas and Wozniak<sup>12</sup> who showed how geography textbooks could represent "a way to renew the knowledge they [secondary school teachers] taught". Goigoux & Cèbe took as example research papers in the fields of phonology and writing skills teaching to analyse what stopped these researches from having a real impact on teaching practices<sup>13</sup>. They consider that didactic tools can be "transformational vectors in teaching practices when teachers are confronted with their pupils' learning difficulties" (p. 1) under the condition that the knowledge obtained through research is properly converted into "usable - action - knowledge" (p. 2). They support the idea that when they take into account research results and are compatible with usual teaching practices, didactic tools such as textbooks can become "transformational vectors that will change their - teachers' - power to act, and thus influence their professional evolution"<sup>14</sup>.

Other papers lead us to view schoolbooks as "learning vectors" for pupils<sup>15</sup>. Briand and Peltier stress the way teacher's manuals and the pupil's textbooks have to complement each other, as well

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<sup>7</sup> For example, La Commission Inter-IREM-APMEP Manuels Scolaires in the decade 1970 to 80.

<sup>8</sup> M. Métoudi, H. Duchauffour, *Des manuels et des maîtres*, Paris, Belin, 2001.

<sup>9</sup> J. Briand, M.-L. Peltier, *Le manuel scolaire, carrefour de tensions, mais aussi outil privilégié de vulgarisation des recherches en didactique des mathématiques*, Séminaire DIDIREM, 2008.

<sup>10</sup> J. Briand, M.-L. Peltier, *Le manuel scolaire, carrefour de tensions, mais aussi outil privilégié de vulgarisation des recherches en didactique des mathématiques*, Séminaire DIDIREM, 2008, p. 4.

<sup>11</sup> D. Niclot, *Et si les manuels scolaires étaient, par défaut, un outil de professionnalisation des enseignants ?*, In G. Baillat, P. A. Martin, D. Niclot (Eds.), *Vers quelle professionnalité enseignante en France et au Québec ?*, Paris, CNDP, 2003.

<sup>12</sup> C. Margolinas, F. Wozniak, *Usage des manuels dans le travail de l'enseignant : l'enseignement des mathématiques à l'école primaire*, Revue des sciences de l'éducation, Vol. 35, 2, 2009, p. 75.

<sup>13</sup> R. Goigoux, S. Cèbe, *Un autre rapport entre recherche, pratique et formation : les instruments didactiques comme vecteur de transformation des pratiques des enseignants confrontés aux difficultés d'apprentissage des élèves*, In L. Talbot (Ed.), *Les pratiques d'enseignement et la prise en compte de l'hétérogénéité des élèves*, Bruxelles, De Boeck, accepted.

<sup>14</sup> R. Goigoux, L. Ria, M.-C. Toczek-Capelle, *Les parcours de formation des enseignants débutants*, Clermont-Ferrand, Presses Universitaires de Blaise Pascal, 2009. In R. Goigoux, S. Cèbe, *Un autre rapport entre recherche, pratique et formation : les instruments didactiques comme vecteur de transformation des pratiques des enseignants confrontés aux difficultés d'apprentissage des élèves*, In L. Talbot (Ed.), *Les pratiques d'enseignement et la prise en compte de l'hétérogénéité des élèves*, Bruxelles, De Boeck, accepted. , p. 2.

<sup>15</sup> M. Priolet, *Vecteurs d'apprentissage et résolution de problèmes numériques*, Mémoire de D.E.A. en Sciences de l'Éducation, sous la direction de F. Clerc, Université Lumière Lyon 2, 2001.

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as the fact that some pupils enjoy consulting the latter and use it as a reference book<sup>16</sup>.

In the didactics theory of conjoint action<sup>17</sup>, the teacher's and the pupils' work take place in two distinct phases tied to each another: the *in-situ* didactic activity, when the teacher monitors the pupils through the didactic game, and the preparation phase of this activity, when the teacher elaborates the game. If we refer to this theory, we can consider schoolbooks are at the crossroads between the elaboration of the activity and its implementation. Incidentally, Goigoux & Cèbe<sup>18</sup> see activities based on textbooks as being the result of the tension between on the one side the norm they prescribe, and on the other the efforts teachers make to “create anew, build again, individualize once more these artifacts and their ways of use”<sup>19</sup>.

According to Métoudi and Duchauffour<sup>20</sup>, when using textbooks which are “meant for everyone, but in fact suited to no one”<sup>21</sup>, primary school teachers, who have been trained in many subjects, ought to be provided specific training aimed at improving their efficiency in the classroom through the use of textbooks.

Following a study based on discussions with 10 experienced primary school teachers, Margolinas and Wozniak<sup>22</sup> consider mathematics textbooks as a tool for the professional development of teachers. Our study follows on their research on textbooks, focusing on their impact on professional development. But in order to better understand the teaching practices of teachers who use schoolbooks, we have chosen to visit classroom for periods of observation.

### 3. Research question

Although numerous textbooks are published and used in classrooms, it is important to focus on the training primary school teachers get on how to use them. It is all the more relevant for mathematics schoolbooks since the vast majority of new primary school teachers did not major in sciences.

Several studies based on the answers to a primary school teachers survey show that in more than 70 per cent of all Grade/Year 3-5 classes (8-11 year-old pupils), each pupil was provided with a mathematics schoolbook<sup>23</sup>. But we are interested in more than number and, in the same way Margolinas and Wozniak<sup>24</sup> did, we wish to interview teachers about their practices. Still our approach differs from theirs: since we are interested in teachers training, we study the practices of both PEMF, whose mission gives them a key role in the training of primary school teachers to be and those of young teachers. Moreover, we find it important to go beyond teachers' statements whose limits

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<sup>16</sup> J. Briand, M.-L. Peltier, *Le manuel scolaire, carrefour de tensions, mais aussi outil privilégié de vulgarisation des recherches en didactique des mathématiques*, Séminaire DIDIREM, 2008. [http://halshs.archives-ouvertes.fr/docs/00/49/50/58/PDF/manuel\\_scolaire\\_Briand\\_Peltierdef.pdf](http://halshs.archives-ouvertes.fr/docs/00/49/50/58/PDF/manuel_scolaire_Briand_Peltierdef.pdf) (last access: January 14<sup>th</sup>, 2014)

<sup>17</sup> G. Sensevy, *Le sens du savoir. Éléments pour une théorie de l'action conjointe en didactique*, Bruxelles, De Boeck, 2011.

<sup>18</sup> R. Goigoux, S. Cèbe, *Un autre rapport entre recherche, pratique et formation : les instruments didactiques comme vecteur de transformation des pratiques des enseignants confrontés aux difficultés d'apprentissage des élèves*, In L. Talbot (Ed.), *Les pratiques d'enseignement et la prise en compte de l'hétérogénéité des élèves*, Bruxelles, De Boeck, accepted.

<sup>19</sup> P. Rabardel, *Les hommes et les technologies. Approche Cognitive des instruments contemporains*, Paris, Armand Colin, 1995.

<sup>20</sup> M. Métoudi, H. Duchauffour, *Des manuels et des maîtres*, Paris, Belin, 2001.

<sup>21</sup> J. Briand, M.-L. Peltier, *Le manuel scolaire, carrefour de tensions, mais aussi outil privilégié de vulgarisation des recherches en didactique des mathématiques*, Séminaire DIDIREM, 2008, p. 2.

<sup>22</sup> C. Margolinas, F. Wozniak, *Usage des manuels dans le travail de l'enseignant : l'enseignement des mathématiques à l'école primaire*, Revue des sciences de l'éducation, Vol. 35, 2, 2009.

<sup>23</sup> M. Priolet, *Résolution de problèmes arithmétiques et registres sémiotiques*, Mémoire de Maîtrise en Sciences de l'Éducation, sous la direction de J. C. Régner. Université Lumière Lyon 2, 2000 ; Inspection Générale de l'Éducation nationale, *L'enseignement des mathématiques au cycle 3 de l'école primaire*, 2006.

<sup>24</sup> C. Margolinas, F. Wozniak, *Usage des manuels dans le travail de l'enseignant : l'enseignement des mathématiques à l'école primaire*, Revue des sciences de l'éducation, Vol. 35, 2, 2009, pp. 59-82.

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Margolinas and Wozniak<sup>25</sup> have stated, and to add the observation of practices in the classroom to teachers' interviews. This is done in order to understand and study together with experienced teachers the role of mathematics textbooks in day to day teaching practices as well as in the training process of primary school teachers to be and experienced teachers. To phrase it another way, for PEMFs, how important are textbooks in teaching/learning situations? What advice do they give teachers-to-be who came in their class to train? How do young teachers use schoolbooks? Does it contribute to their professional development?

### 4. Methodology

#### Data gathering

At first, Priolet led a quantitative study in 2000<sup>26</sup>, based on a questionnaire 81 teachers from 2 different school districts filled. It highlighted the important role mathematics schoolbooks play in teaching practices in primary school, but did not reveal anything more about their specific uses – if any – in the classroom. In order to further our research and include training practices, we implemented two different methodological procedures.

The first one involved 9 PEMFs from 3 different schools teaching in different grades/years, and took place in two separate steps. For the first phase of our study, we led 9 guided interviews we will refer to as first interviews. They aimed at understanding the use of mathematical textbooks. The interview schedules, centred around questions about the use of textbooks in the process of teaching, as well as their contribution in the professional development of teaching, dealt, in particular, with the following elements: deciding factors in the choice of textbooks; mode of use; contribution to professional practice; contribution to professionalization; personal relationship to mathematics and pathways in mathematics teacher training.

The second phase only involved 4 of the PEMFs. It took place at two different times. We began with the observation of these 4 teachers' practices in class, which we recorded on video. Then, during a simple self-confrontation interview<sup>27</sup>, each PEMF viewed the recording and discussed it with a researcher in order to add information to the practices observed, such as how they came to be or how they could evolve.

The second procedure involved a young primary school teacher. It was led in parallel with the first one, and consisted in observing a mathematics lesson in the CP (6-7 year-old pupils)<sup>28</sup> class of a teacher in training<sup>29</sup> and the following interview that took place between the young teacher and an experienced PEMF. The procedure ended on another guided interview, this time between the beginner teacher and the researcher. Both phases were recorded: the lesson was videotaped, and the interviews were recorded audio only.

#### Data analysis

All five videotaped lessons and the 15 recorded interviews were transcribed in their entirety.

As a whole, they were subjected to a thematic analysis focusing on the skills primary school teachers are expected to master<sup>30</sup>:

P 1. Master subject-specific knowledge as well as didactics.

P 3. Create, implement and present teaching and learning situations, taking into account pupil diversity.

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<sup>25</sup> C. Margolinas, F. Wozniak, *Usage des manuels dans le travail de l'enseignant : l'enseignement des mathématiques à l'école primaire*, Revue des sciences de l'éducation, Vol. 35, 2, 2009.

<sup>26</sup> M. Priolet, *Résolution de problèmes arithmétiques et registres sémiotiques*, Mémoire de Maîtrise en Sciences de l'Éducation, sous la direction de J. C. Régner. Université Lumière Lyon 2, 2000.

<sup>27</sup> Y. Clot, *Clinique du travail et action sur soi*, In J.-M. Baudoin, J. Friedrich (Eds.), *Théories de l'action et éducation*, Bruxelles, De Boeck, 2001.

<sup>28</sup> CP (Cours Préparatoire) is the first year of compulsory schooling in France and corresponds to Grade/Year 1.

<sup>29</sup> Teachers in training are teaching for the first year.

<sup>30</sup> Ministère de l'éducation nationale, *Référentiel des compétences professionnelles des métiers du professorat et de l'éducation*, Bulletin Officiel n° 30 du 25 juillet 2013.

### 5. Main results

Here are the different profiles we established following the analysis of the guided interviews we led. We will try to understand how using a textbook can help primary school teachers acquire skills, be they beginner or experienced.

#### *Profiles according to textbook use as declared by teachers*

Among the 9 PEMFs we interviewed, 6 - 5 of them work in the same school - declared that in class, each of their pupils were given a mathematics schoolbook. Out of the 3 remaining PEMFs, one said that his pupils did not have any textbook because he did not want them to, whereas the other two declared that the schoolbook their pupils were given - which had been chosen by a predecessor - were only used as a source of exercises. Figure 1 sums up these data.

Concerning the use of the teacher's manual, 4 different profiles were established after the interviews (fig. 1).

	School 1				School 2				Sc. 3
PEMF	A	B	C	D	E	F	G	H	I
Pupil's textbooks	YES Same textbooks from CP to CM2				YES	YES			NO
Description of use	Profile 2	Profile 3	Profile 1	Profile 2	Profile 2	Profile 1	Profile 3	Profile 3	Profile 4

#### Pupil's textbooks

**YES** : presence

**NO** : absence

**Empty box** : Occasionnal use (G et H)

#### Description of use

**Profile 1** : Complete fidelity to the teacher's book and to the authors' intention

**Profile 2** : Fidelity to the teacher's book but with adaptations

**Profile 3** : Development of the teaching of mathematics based on the use of several teachers' books

**Profile 4** : Development of the teaching of mathematics based on personal experience.

*Figure 1: Pupil textbooks in the classroom and the different manual users profiles*

Among the 9 PEMFs, 2 said they followed the entire teacher manual (profile 1) and the authors' advice to a t, 3 mentioned they also used it but that they adapted it (profile 2), while 3 declared they resorted to several different teacher's manuals to create their lesson plans on problem solving (profile 3). The remaining PEMF (teacher I) said he could do without a teacher's manual (profile 4) thanks to his experience in didactics of mathematics. Since we are studying textbook use, we will focus on profiles 1 to 3.

As for the beginner teacher, he declared he used the schoolbook and its teacher's manual, which had been selected the year before. PEMFs G and H were in the same situation. The beginner teacher mentioned he "also relies on teachers sites on the Internet". Each pupil was given the associated teaching materials.

#### *Textbooks and the mastery of subject knowledge and their didactics*

The first PEMF interviews showed that sometimes, using a textbook comes down to personal

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choices, which can be linked to their skills in mathematics. For example, PEMF E<sup>31</sup> declared he personally experiences “huge difficulties in mathematics” and that this shortcoming even poses a problem in his everyday life. Hence his full trust in textbooks, the necessary tools that give him access to mathematical knowledge. PEMF F, who teaches in CE1 (7-8 year old-pupils), was able to deal with geometry in the mathematics syllabus thanks to textbooks. What the PEMFs underline is the didactic role of schoolbooks. In France, primary school teaching requires dealing with so many different subjects that one cannot possibly expect experts in pedagogy who teach and train others in every subject matter of the syllabus to perfectly master all of them. In order to compensate for his lack of knowledge in didactics of mathematics, PEMF C referred to the manuals’ forewords, which according to him often indicate what teaching theories the book is based on. PEMF F – whom we have already quoted – also mentioned a foreword that gave him the opportunity to learn more about the child’s conception of numbers. As for PEMF G, he explained that it is through a textbook that he got acquainted with Vergnaud’s theory<sup>32</sup>. This is very similar to what his colleagues said concerning the link between schoolbooks and research.

The beginner teacher said that at the beginning of the school year, he read the foreword to the teacher’s manual. But he also stated that he did not refer to it again in spite of the gaps in his mathematics knowledge he insisted he had during a counselling interview with a PEMF which was not part of our study sample.

01.25/PE-DEB/ [...] So, it’s true that right now I follow the textbook exactly how it is, how it is presented. [...] But this notion here, problem solving, still isn’t clear with this type of exercises.  
01.38/PEMF<sup>33</sup>/ Is it the type of exercises you can find in the schoolbook that bothers you when it comes to problem solving in general?

01.45/PE-DEB/ No, it’s because I have very little knowledge concerning problem solving, and it’s what hinders my fully analysing this type of lessons and exercises.

During the guided interview that followed, the beginner teacher declared it was more important for him to describe how each lesson went and write it down in his logbook<sup>34</sup>. This beginner teacher was under a lot of stress and looking for immediate solutions rather than long-term research to build on his general training in didactics of mathematics. His priority was to deal with urgent situations.

As a conclusion, mathematics textbooks seem to better fulfil their role as “vectors of transmission for research in didactics of mathematics” - as Briand and Peltier described - for PEMFs than for beginner teacher, because beginner teachers are faced with the conundrum of having to simultaneously train and implement teaching/learning situations<sup>35</sup>. But as Métoudi and Duchauffour<sup>36</sup> suggest, does it mean textbooks can contribute to this implementation?

*Using textbooks to build, implement and facilitate teaching and learning situations, taking into account pupil diversity*

### *Using textbooks to create a syllabus*

During the interview, teachers who do use textbooks mentioned they are the source they most frequently turn to when writing their yearly lesson plans. Although considered as an expert in pedagogy because he is a teacher-trainer, PEMF C went as far as saying that the help they provide, he “would not know how to elaborate a yearly lesson plan in mathematics”.

Textbooks have a reassuring effect: “I am not afraid I won’t be able to finish the syllabus

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<sup>31</sup> We replaced the teachers’ names with the acronym PEMF X. X stands for a given teacher’s designation in figure 1.

<sup>32</sup> Here, the PEMF is referring to the theory of conceptual fields; G. Vergnaud, *La théorie des champs conceptuels*, Recherches en Didactique des Mathématiques, Vol. 10, 2-3, 1990, pp. 133-170.

<sup>33</sup> Extract from an interview between a beginner teacher and a teacher trainer who was not part of the group selected for this study.

<sup>34</sup> In France, the *cahier-journal* is both a logbook where teachers write down what goes on in the classroom day-to-day, and the place they keep the lessons they have planned for the class.

<sup>35</sup> J. Briand, M.-L. Peltier, *Le manuel scolaire, carrefour de tensions, mais aussi outil privilégié de vulgarisation des recherches en didactique des mathématiques*, Séminaire DIDIREM, 2008, p. 4.

<sup>36</sup> M. Métoudi, H. Duchauffour, *Des manuels et des maîtres*, Paris, Belin, 2001.

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anymore”, said PEMF D. This reminds us of the comfortable aspect Métoudi & Duhauffour<sup>37</sup> brought up.

Thus all 9 PEMFs we worked with, whether they used textbooks or not, said they would recommend them to teachers-to-be and beginner teachers; they stressed the fact the authors of teacher’s manuals offer suggestions for yearly lesson plans. What textbooks bring could be summed up by two words PEMF F used: “framework” and “structure”. Three amongst them insisted explicitly upon the necessity of resorting to the teacher’s guide.

### *Textbooks and implementing teaching / learning situations*

Out of the nine PEMFs we interviewed, eight resorted to at least one teacher’s manual to plan teaching / learning situations. They insisted on how useful these manuals were. For example, PEMF A declared he “know(s) the manual by heart”. Nevertheless, classroom observation and self-confrontation interviews show that even the PEMFs claiming to follow a manual’s recommended approach “step by step” in fact modified it, like the two following examples will show.

The classroom observation that took place during a CM2 class (10-11 year-old pupils) focusing on problem solving and more specifically on percentage calculation shows PEMF D changed the author’s wording of a mathematical problem.

appareil	ancien prix	prix solde
lecteur DVD	100 €	
lecteur enregistreur DVD	300 €	
téléviseur 48 cm	350 €	
lecteur MP3	110 €	
meuble télévision	225 €	
télécommande	20 €	

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Figure 2: Wording of the mathematical problem as seen in textbook *Cap Maths CM2*<sup>38</sup>, p. 104, and wording as modified by PEMF D for the class

PEMF-D explained he had thought out the modification:

03:07/ PEMF D/ “For the exercise, I kept the numbers because I thought this way I wouldn’t have to think of numbers that would work in this exercise... On the other hand, I changed the context to make it correspond to their life at school and lure them because we were still at the beginning. Afterwards, for the following lessons, I sometimes kept the exercises in the textbook exactly the way they were written. But that time, I chose to change the context to get them going, and because at the time the situation was perfect for it...”

Looking at how this lesson plan on percentages was prepared, we saw that PEMF D changed problem wording only once, and that there was no further modification of the manual author’s wording afterwards. He added that his aim was to help pupils build their own concept of percentages and that he did not wish to confine his problem wording to classroom situations.

Apparently, it is PEMF D’s expertise as a teacher that allowed him to deviate from the original wording, not because he wanted to show how free he was from the manual, but because he wanted to “get pupils involved”<sup>39</sup>. Moreover, this adjustment in wording was done taking into account the entire lesson plan and the aim of the class.

These adjustments seem as normal to us as they are to Goigoux & Cèbe (2011), because they illustrate the ingenuity of the operator, which is an essential element of intelligent work<sup>40</sup>. Let us add that expertise in teaching plays a crucial role in regulating these adjustments.

We witnessed another example of this skill when we observed the classroom of PEMF C while he

<sup>37</sup> M. Métoudi, H. Duhauffour, *Des manuels et des maîtres*, Paris, Belin, 2001.

<sup>38</sup> R. Charnay, G. Combiér, M.-P. Dussuc, D. Madier, *Cap Maths CM2 – Manuel de l’élève*, Paris, Hatier, 2010.


<sup>39</sup> C. Hélou, F. Lantheaume, *Les difficultés au travail des enseignants : exception ou part constitutive du métier*, Recherche et Formation, 57, 2008, p.67)

<sup>40</sup> M. de Montmollin, *The future of ergonomics : hodge podge or new foundation*, Le Travail Humain, Vol. 55, 2, 1992, pp. 171-181; J.-L. Minguay, *Concevoir aussi dans le sillage de l’utilisateur*, International Journal of Design and Innovation Research, 10, 1997, pp. 59-78.



was implementing a situation aiming at presenting pupils with problem solving in the field of proportionality.

1 Géomette met bout à bout des bandes vertes, toutes de même longueur.  
En mettant bout à bout 4 bandes vertes, elle obtient une longueur de 8 cm.



Quelle longueur obtiendra-t-elle en mettant bout à bout :

a. 8 bandes vertes ?                      c. 40 bandes vertes ?  
b. 12 bandes vertes ?                    d. 48 bandes vertes ?

Figure 3: Wording of the problem in the pupil's schoolbook Cap Maths CM1<sup>41</sup>, p. 83

While the author who created the teaching situation did not allow any measuring, PEMF C spontaneously agreed to let two pupils use a graduated ruler; “I focus on pupils with difficulties and I constantly adjust what I do to suit their needs”. Next, PEMF C made sure the results these 2 pupils obtained through measurement were compared to those the rest of the class got through calculation. Clearly, these pupils with difficulties will achieve success but doesn't this detour through measuring risk obscuring the objective of the lesson?

Beginner teacher also changed the manuals' lesson plans; “First I base my work on the manual first. Then, when I need to, I add information or I remove what I think is unnecessary.” We observed one of his lessons called “Problems: the hidden multiples of ten” aiming at “learning to regroup some terms in an addition in order to find potential tens” which was created in order to develop a skill called “learning calculation processes”. After the class, during an interview, beginner teacher explained why he made the adjustments he did:

“R<sup>42</sup>: Was it mentioned they [the pupils] were allowed to use their number chart?

PE-DEB: No, no, no. In fact, that day, I gave them the chart because I wanted them to use it if the need arose, but it was only to make this tool available to them should they need to use it, and not specifically for that lesson.

R: So what did they do with it?

PE-DEB: Well, they used it, and it interfered, the fact that they had it at the beginning of the class.

R: What was the aim of the lesson?

PE-DEB: The aim was to group numbers to create tens. They counted instead of grouping. So I missed the aim simply because I gave them material they didn't need at the time.

R: Did you understand what was happening then?

PE-DEB: No, I didn't. Not at all. It's true that if you give it some thought, it's obvious that with this tool in hand, the only thing they would want to do is use it.”

At the beginning of the lesson, the beginner teacher gave each pupil a number chart she had protected with adhesive cover film the day before. This material was neither required by the teacher's manual nor indicated in the “material” section of the teacher's logbook. As soon as they got the chart, pupils stopped looking for processes to do the addition mentally, and rushed to use the number chart thus turning away from the intentions of the authors of the textbook. Arditi has already stressed the difficulties in using the teaching processes described in the teacher's manual for those teachers, “who do not have the skills to perform the activities as they are described in the teacher's manual.”<sup>43</sup>. Her attention caught between managing the timing of the lesson, keeping pupils involved and taking into account those with the most difficulties, the beginner teacher did not see the chart was used in a way that defeated the purpose of the lesson as it had been planned by the manual's authors, and could not

<sup>41</sup> R. Charnay, G. Combiér, M.-P. Dussuc, D. Madier, *Cap Maths CM1 – Manuel de l'élève*, Paris, Hatier, 2010.

<sup>42</sup> R. stands for the researcher.

<sup>43</sup> S. Arditi, *Variabilité des pratiques effectives des professeurs des écoles utilisant un même manuel écrit par des didacticiens*, Thèse en Didactique des Mathématiques, sous la direction de D. Butlen et A. Robert. Université Paris VII, Denis Diderot, 2011, p. 346.

## 6. Conclusion

The study described in this article is based on direct observation of the teaching practices of teacher trainers (*Professeurs des Écoles Maîtres Formateurs*). While they confirm experienced teachers do resort to textbooks, (Margolinas, Wozniak, 2009), these observations, and the self confrontation interviews that followed concerning the use of textbooks - whether it is “to the t” or not - show adjustments are made to the recommendations the authors of teacher’s manuals issue.

In this article, a few examples show the variety of adjustments in relation to pupils involvement or to the difficulties some of them experience. These adjustments do not go against the global teaching / learning aims of the lesson plan. Their success is for the greatest part rooted in the expertise of the teachers who know how to “handle the class”<sup>44</sup>, by being in control of the way the class is organized and functions as a group and thus creating a general atmosphere conducive of learning and pupil socialisation. Once this is established, teachers can focus on the didactics part of their job; beginner teachers, on the other hand, find themselves – willingly or not – out of step with the recommendations provided by the authors of the teacher’s manual they usually follow, and run the risk of being unable to “stay the course” during the class.

Analysing how PEMFs use textbooks has shown this artefact contributes to the improvement of the skills of these experienced teachers; schoolbooks bring them new subject and didactics contents, thereby expanding their mathematical culture; through the lesson plans they provide, manuals take part in the framework and the structure of teaching; they make teaching and learning situations easier to implement and thus contribute to the expansion of their repertoire of teaching and learning situations.

Insofar as textbooks contribute to the professional development of experienced teachers, one can hypothesize they play a useful role in the training of beginner teachers.

When a beginner teacher says

I have been trained for a year, so I did go into classrooms during that year. So it was the first time I came into contact with textbooks, although I did not have the necessary perspective at the time to know how to use them.

We are at the core of the topic: the training to learn how to use textbooks. The statement of this beginner teacher, who states the shortcomings of his training., shows how important and how necessary it is to give teachers in training and beginner teachers the opportunity to reflect on their professional practices by describing and analysing the adjustments they make to the recommendations written by the authors of teacher’s manuals, as well as the reactions of their pupils, the work they produced, and the global aims of the teaching / learning lesson plan.

This is why we firmly believe that within the context of class management, a specific training to textbook use is necessary and that it must take place both during the observation phases when beginner teachers come to observe PEMF classes and in the courses of higher teacher education schools. Only then can textbooks, which contribute to the professional advancement of experienced teachers, play the same role for beginner primary school teachers.

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<sup>44</sup> R. Goigoux, L. Ria, M.-C. Toczec-Capelle, *Les parcours de formation des enseignants débutants*, Clermont-Ferrand, Presses Universitaires de Blaise Pascal, 2009.