

THE MAGIC CIRCLE OF THE TEXTBOOK – AN OPTION OR AN OBSTACLE FOR TEACHER CHANGE

Leila Pehkonen, University of Helsinki, Finland

***Abstract:** There have been many efforts to change mathematics education and teachers. However this has proved to be very difficult. The starting point for this study was the question: Should we change people? There might be good reasons why things remain stable for longer periods. My aim is to approach the difficult question of teacher change from the perspective of stability and to figure out what constitutes the good and stable elements in school mathematics teaching and learning in the minds of teachers. The remarkable and complex role of textbooks is discussed in this research report.*

Introduction

There is an extensive amount of literature concerning teacher change which presents many aspects of the change process (e.g. Richardson & Placier 2001). During the last decades, new theoretical perspectives of teacher change in the context of mathematics education have been under development (see e.g. Fennema & Nelson 1997) and several empirical studies have been conducted on the change process. Recent findings confirm the previous findings about the complex nature of teacher change. It has become evident that teacher change is a long process that needs time and effort (e.g. Barnett & Friedman 1997; Borko et al. 2000).

The role of textbooks and other curriculum materials in these processes is not well known and there are somewhat contradictory views about the teacher - textbook - relationship. However, studies on the contribution of the textbook to teacher change processes give us reason to investigate this area much more closely (e.g. Sosniak & Stodolsky 1993; Remillard 2000; Collopy 2003). The influence of textbooks on classroom practices and teachers' work is not yet a solved problem.

Many efforts have been made to explain why teachers are not so easily changed (e.g. Guskey 2002). But only a few scholars have been interested in "unchange". Should we not ask why things remain stable and whether there is something valuable in stability? Cuban (1992) suggests that change and stability should not be examined as separate from each other. He points out that schools are deeply embedded in society. Many, but not all, of the impulses for changing schools arise in the larger society. Although schools are dealing with imposed changes, school organisations must preserve their stability – at least to some extent – in order to ensure that what happens today will probably occur tomorrow. Schools are responsible for maintaining order, instructing the young and producing students who have learned.

My aim has been to understand the difficult question of change from the perspective of stability. What constitutes the good and stable elements in school mathematics teaching and learning in the minds of teachers?

Participants and data collection

The data consists of semistructured interviews of nine elementary school teachers - seven female and two male teachers who worked at the same middle-sized urban school in Southern Finland. All of them were competent and qualified elementary school teachers. Other teachers who worked at this school and who did not participate in this study were not qualified teachers. The interviewed teachers had teaching experience ranging from one to seventeen years. Most of them had been only working in this school.

The interviews were conducted at the school in a quiet room. Each interview lasted about sixty minutes. The interviews were tape recorded and later transcribed by the author. I had three broad themes for the interview; otherwise, the discussion was quite open. The themes in the interviews were 1) The teacher's personal conception about the state of mathematics teaching; 2) The good and proper elements of mathematics teaching; 3) The elements in mathematics teaching which should not be changed in the case of any change.

Data analysis

The data was analysed qualitatively to find the stable key elements most important to teachers and to interpret the prerequisites of change. (Pehkonen, L. 2001). I began my analysis with a careful reading and rereading of the transcriptions of every respondent and writing initial remarks on the papers. Then I continued to organise the speech of every respondent under the interview themes.

During the initial analysis it became evident that there are three key elements which were dominating the teachers' talk about mathematics teaching – textbooks, teacher-centred teaching methods, and basic skills and facts. These formed a stable trinity in the minds of teachers. These were seen at the same time as the basis of good mathematics education and as a threat to it. And they were seen as obstacles and threats to development and change. They were also the main elements that teachers did not want to give up in case of any change.

I had not asked anything about textbooks. Anyway, every one of my informants spoke a good deal about them. It seems that textbooks have a remarkable and complex role in the change process. The relationship between teachers and textbooks is interesting. Remillard (1999) has shown that there are many differences in how teachers interact with mathematics textbooks. She argues that teaching is multi-dimensional activity. Each dimension, or arena, as she calls the elements in her model, requires different types of decisions and support, and teachers are likely to use the textbooks differently in each arena. Even teachers who follow textbooks very closely make curriculum-development decisions. Textbooks - not even reform-oriented textbooks - do not operate on their own and naturally produce reforms. This paper concerns the portion of the data that is about textbooks. I decided to separate all the teachers' talk concerning textbooks for separate analysis. The method used to analyse this data was qualitative content analysis..

Findings

Textbooks are important tools for teachers and how they speak about textbooks is plentiful and varied. The talk is considering and reflecting, but contains contradictory elements. The data reveals three qualitatively different ways to speak about the mathematics textbook: justification, criticism and guilt. The talk of justification is composed of ways to speak about the textbook in appreciation and its use in mathematics education and of positive accounts of textbook use. Teachers see the textbooks as a guarantee of a stable quality of teaching. Most of the teachers' talk consists of connected accounts of their textbook use from this perspective. This category includes also the talk about textbooks as a supporter for reforms. Teachers found that textbooks provided help and ideas for new ways to teach. The talk of criticism consists of the teachers' concern that textbooks are burdens and obstacles to their change process; textbooks tie down teachers' freedom to make their own decisions. Teachers felt that textbooks make them passive and mechanise the teaching in classrooms. The last category includes the teachers' talk of their feelings of guilt connected to excessive textbook use and concern about teachers' professional competency. In the following, these aspects are discussed in more detail.

Justification: 1) Textbooks as a guarantee of stable quality

Teachers have a basic belief that Finnish mathematics textbooks are very good. In the teachers' speech, textbooks represent the positive aspect of stability: the maintenance of a uniform quality of mathematics education. The textbooks help teachers to keep their teaching at an appropriate level; i.e. teaching is freer of inadequate and occasional changes. I could find out three different kinds of accounts of why textbooks have such a remarkable role in assuring uniform quality. First, teachers shared many accounts connected to the properties of the textbooks themselves. Teachers found mathematics textbooks to be logical and explicit. They contain the important basic facts and the tasks are connected to everyday life. So it is easy for both teachers and pupils to see the meaningfulness of mathematics. Moreover, textbooks were seen to be motivating; they are colourful and the exercises are varied. The books are easy enough, although there are challenges for most pupils. And one point that is very important to Finnish teachers: Textbooks educate pupils to work hard.

Second, there are accounts that are connected to teachers and to their work. Textbooks were seen as a method for teachers to keep their teaching logical and coherent. Textbooks help teachers in their plans and choices and they assist teachers in keeping the planned schedule. Finnish teachers are overloaded with work demands; they feel tired and they have the feeling that they cannot manage all the tasks that school organisations set for them (Santavirta et al. 2001). Mathematics textbooks help teachers with their work loads, because the books provide ready and sensible structures for lessons and enough exercises for pupils. Even when teachers are in a hurry and unable to prepare their lessons, or when they are busy with other work demands during the lesson, textbooks provide welcome help to teachers.

Textbooks can completely substitute for the teacher, at least now and then. One of the teachers said: " *The math books are so well-made that pupils do not need any help.* "

The third category consists of those statements that are connected to pupils. The pupils' keen interest was seen as an evidence of high quality. Teachers of the youngest children told that children love their mathematics books and almost every teacher stated that pupils like the exercises in the books. As much of schoolwork is nowadays organised in small groups, teachers find that pupils love those peaceful moments when they are allowed to work alone and proceed at their own pace. And last but not least point is that with the help of books, children learn the facts they are expected to learn. That is enough for teachers.

Justification: 2) Textbooks can support change

One way to speak about textbooks was that of reform. Teachers believe that textbooks could help them to change the teaching of mathematics – at least somewhat. The main elements in teaching have remained stable throughout the years because they have proved to be satisfying. The fact is that pupils really seem to achieve what they are expected to achieve quite well, at least measured by official standards and tests. As Sharon says:

"Pupils know at least the facts measured by the tests very well. It is a different matter if you want to test for something else."

But with the help of books and teachers' guides, teachers have adopted some new ideas and methods. Teachers appreciate some activities and problem-solving sessions – now and then, if they do not detract from learning of the basic facts and skills. Books are easy to use and are almost always at hand. That is why teachers believe they have a chance to influence what happens in classrooms. There is research-based evidence that some teachers can change their teaching practices with the help of a textbook and without additional support or feedback, but some others cannot (Colloby 2003). The influence is possible, but not self-evident.

Criticism: Textbooks as a burden and an obstacle for change

"The book is like a burden on your shoulders. It is not my affair that is in the book. I should always think how I will teach the lessons somebody else has planned."

The textbook represents a supply of exercises to most teachers. School mathematics means that these supplies are used, and "teaching mathematics" means that somebody, usually the teacher, explains how these supplies are put into use. The interviewed teachers told that they usually follow the book very obediently. Teachers criticised textbooks, i.e. the supply of exercises, as being far too easy and simple and too congested. They feel uneasy about choosing the tasks or changing the order, even when they think it would be reasonable. Teachers very often make their pupils work out all the exercises in the book, even if the tasks are quite unsuitable – usually

completely too easy - for their pupils. Everything in the book is carefully used and completed. Some teachers are really afraid to make any decisions or omit anything even if it seems reasonable:

“I don’t know how to choose. The book is so good. But last year - I had the same book – we were really in a hurry. I was almost desperate: “How can we manage – we don’t have time.” I did not dare not to omit any tasks.” (Steven)

L: Why it is so difficult?

S: I don’t know. Everyone speaks how important it is to do well in mathematics. I don’t know if one task is more important than another. What if I omit important tasks? I don’t want to take the risk.”

Teachers say that on one hand textbooks tie them down, and on the other hand they make them passive. It is so easy to “obey” the books and not think independently. As Sue, a young teacher, said:

“The book helps so much. You don’t have to think up the exercises yourself. But on the other hand, it ties you down.”

And Sylvia, a very reflective and experienced teacher who is interested in mathematics teaching stated:

“I have noticed that the book makes me passive so easily. The teacher’s guide gives so much support for my work and the textbook, too. They really “tease” me not to think and not to consider how to construct this teaching unit for my pupils.”

Textbooks offer an easy solution to busy days, but this obedience to books can easily mean that mathematics teaching in classrooms becomes very mechanical. Teachers tell that they follow the books without thinking and considering, and the pupils complete almost every exercise. This process is repeated from lesson to lesson. If some pupils are very quick, teachers can easily give them more, similar exercises. The interaction between the teacher and pupils may remain very minimal.

Feelings of guilt and concern for professional competency

Teachers have recognised this state of affairs. Teachers are concerned about the power of textbooks. They feel guilty and they try to explain their course of action.

“It is really a silly thing to be bound to the book, but I am guilty myself. I should get free of it, but that requires so much hard work.” (Sharon)

“When you are tired – you feel guilty, as you know that you should be able to plan for yourself. But you are in a hurry, and you don’t have time and you can’t be bothered.” (Sylvia)

Teachers see the textbook authors as the most competent experts and they are a bit unsure about whether they are as competent as the writers to plan the lessons themselves. They are concerned that they have given up a part of their professionalism to the textbook authors. But the children are learning what they are expected to learn. Is that not enough?

“As if you have given a part of your teacherhood to the book:”
(Sylvia)

“I am a little concerned about my own professional competence - it needs some improvement, I think. Anyway, the children learn the multiplication tables - but I am not sure if it is sufficient.” (Steven)

One fact that all teachers agree on is that over the course of the years the pupils’ attitudes turn against mathematics. Teachers tend to believe that it is due to a textbook-bound teaching of mathematics:

“Their attitudes gradually turn negative. We teachers should motivate pupils more. We could do something else than always make the kids fill in the textbook.” (Simon).

Discussion

Finnish teachers are very well educated. It is hard to get a place in a teacher education program and the education students are usually highly motivated. All teachers – even kindergarten teachers - are educated at universities and all primary school teachers achieve a master’s degree in education. It takes about five years to complete the teacher education program. Finnish teacher education emphasises the academic aspects of education and research-based academic studies dominate the content of teacher education. Finnish teachers are academically well prepared for their task. However, even for these well-educated teachers, it seems hard to face changes in the curriculum and education (see also Pehkonen, E. 1993).

All teachers who participated in this study were good, competent teachers and innovative in many ways. They were enthusiastic about their work and wanted continuously develop it. But mathematics as a school subject seems to have a special character. Teachers do have ideas and views about mathematics education, but they are uncertain of how to cope with different conflicting pressures. Would it be better to meet the goals of academic mathematics educators and researchers or to satisfy the practical goals of achievement tests? They are not sure how much to respect the authority of textbook authors and to what extent to believe in their own professionalism. However, all the teachers reported that they do not have these contradictions in any other school subjects. What is matter with school mathematics?

Teachers are quite satisfied with their current practices, but it seems that teachers are somewhat confused. They do not know how much to rely on their own professional competence. They are happy to teach mathematics with the help of books, but feel inconvenienced if they must plan themselves. There are also some tasks in math

books, but often marked with an asterisk (or by some other sign) to indicate that they are not the most important task. School administrators speak about “modern mathematics teaching” as an important matter, but what they then assess is mostly the “basics”. Teachers are well informed and they do know about new trends.

Teachers have some kind of feeling that teacher educators and researchers do not respect their job. That makes them feel a bit guilty and inconvenient. But it is not a sufficient reason for change. They feel uneasy because they know the trends of modern mathematics teaching, but they are not sure whether these ideas are important or not. This finding is in line with Borko’s and her colleagues’ (2000) findings. Teachers have a kind of contradiction between what they speak and know and how they act.

The math book is like a magic circle – it could be a means for a change, but it seems more like an obstacle. Teachers want the mathematics textbooks to concentrate on the basics, since they believe the basics constitute good and proper mathematics teaching. Teachers want to do their job properly. One of their goals is that their pupils get good marks. And good marks are achieved by hard work and much practise. That is what teachers try to provide, and textbooks help them in this mission. They try to satisfy what parents, administrators, principals and teachers themselves believe is proper math teaching (see Cuban 1992). They have experience-based evidence that their teaching meets the set standards well enough.

Change is always a risk. How can we help teachers to take risks? Well-planned in-service education could help teachers cope with books and provide support and feedback.

References:

- Barnett, C. & Friedman, S. (1997). Mathematics case discussions: Nothing is sacred. In: E. Fennema & B. Nelson (Ed.): *Mathematics teachers in transition*, Lawrence Erlbaum: Mahwah NJ.
- Borko, H., Davinroy, K.H., Bliem, C.L. & Cumbo. K.B. (2000). Exploring and supporting teacher change: Two third-grade teachers’ experiences in a mathematics and literacy staff development project. *The Elementary School Journal* 100 (4), 273-306.
- Colloby, R. (2003).Curriculum materials as a professional tool: How a mathematics textbook affected two teachers’ learning, *The Elementary School Journal* 103 (3), 287-311.
- Cuban, L. (1992). Curriculum stability and change. In: P.W. Jackson (ed.) *Handbook of research on curriculum*, Macmillan: New York.
- Fennema, E. & Nelson, B. (Ed.) (1997). *Mathematics teachers in transition*. Lawrence Erlbaum; Mahwah NJ.

- Guskey, T.R. (2002). Professional development and teacher change, *Teachers and teaching: theory and practice* 8 (3/4), 381 - 391.
- Pehkonen, E. (1993). On Teachers' Criteria to Assess Mathematical Activities. In: I. Hirabayashi, N. Nohda, K. Shigematsu & F. -L. Lin (Eds.) *Proceedings of the seventeenth PME conference* Volume I, 220-227 (Tsukuba, University of Tsukuba).
- Pehkonen, L. (2001). The matter of change - being a respectable teacher. In: H. Silfverberg & J. Joutsenlahti. (Eds.). *Tutkimuksella parempaan opetukseen* (Tampereen yliopisto A 26/ 2001).
- Remillard, J. (1999). Curriculum materials in mathematics education reform: A framework for examining teachers' curriculum development, *Curriculum Inquiry* 29 (3), 315 - 342.
- Richardson, V. & Placier, P. (2001). Teacher change. In: V. Richardson (Ed.). *Handbook of research on teaching* (4th ed.). American Educational Research Association, Washington, DC.
- Santavirta, N, Aittola, E.; Niskanen, P., Pasanen, I., Tuominen, K. & Solovieva, S. (2001). *Nyt riittää* (Enough is enough – Research rapport of work environment, job satisfaction and burnout of Finnish primary, secondary and high school teachers). (Helsingin yliopiston kasvatustieteen laitoksen tutkimuksia 173). (In Finnish)
- Sosniak, L.A. & Stodolsky, S.S. (1993). Teachers and textbooks: Materials use in fourth-grade classrooms, *The Elementary School Journal* 93 (3), 249- 275.