

To change or not to change

How primary school teachers speak about stability and change

LEILA PEHKONEN

Changing mathematics education and teachers has proved to be difficult. In this case study the matter has been turned upside down. The purpose is to approach the question of change from the perspective of stability. In this paper I will discuss how primary school teachers speak about stability, and – in this connection – about changes in mathematics teaching. The data consists of semi-structured interviews of nine primary school teachers and is analyzed qualitatively. The findings suggest complex relationships between the need for continuity and the desire for changes.

In the last decades, studies on teacher change (e.g., Richardson & Placier, 2001) have presented many aspects of the change process. Studies on teacher change in the context of mathematics education reform have also varied from theoretically driven studies to studies showing practical implications (Fennema & Nelson, 1997). Mathematics educators have been developing new ideas of what kind of teaching should take place in classrooms. These visions have been significantly different from traditional practices. One of the main interests has been to find the conditions required for change.

Richardson and Placier (2001) distinguish two different positions in the literature on teacher change, i.e., individual and organizational perspectives. The first involves examining cognitive, affective, and behavioral change processes in individuals or in small groups. The organizational position links structural, cultural, and political aspects of the school organization to change processes. In the recent past, a good deal of research on teacher change in the field of mathematics education has

Leila Pehkonen

University of Helsinki

been individually oriented. Many researchers have focused their attention on teachers' conceptions and beliefs about the learning and teaching of mathematics (Thomson, 1992; Cooney & Shealy, 1997). Some researchers have adopted more organizational, e.g., sociological or sociocultural orientations on teacher change (see Fennema & Nelson, 1997).

Many recent, individually oriented empirical studies (e.g. Senger, 1999; Borko et al., 2000; Drake & Sherin, 2006) have revealed the complex nature of teacher change. Senger (1999) examined elementary mathematics teachers' beliefs about change and the metacognitive aspects of the change process in a year-long study. She found that the integration of a new belief is a complex process over time. According to Senger, the change process requires both mental imaging and experimentation on practical and verbal levels. New beliefs are not always fully integrated, and practices can be inconsistent with verbal discourse. These findings are in line with Borko and her colleagues' (2000) results. They studied the process of change experienced by two teachers during their participation in a reform project. They noticed that change is a dialectical process where both beliefs and practices must change in order to achieve significant and lasting change. The role of curriculum materials in change processes has been examined too, but we do not have very definite ideas about their influence (e.g. Sosniak & Stodolsky, 1993; Colloby, 2003).

Teacher education has been seen as one solution to the problem of teacher change (e.g. Cooney & Shealy, 1997). It has been suggested that teachers should be educated to be critical and to be able to use the idea of different epistemologies or ways of knowing in their own work (Lyons, 1990).

Educating critical teachers has been the mission for Finnish teacher education for many decades (Niemi & Jakkusihvonen, 2006). The level of teacher education is very high in Finland. All primary school teachers are university educated. This has been the case since 1971, and they receive a master's degree in education. Primary school teachers are responsible for the first six years (grades from first to sixth, from the ages of 7 to 12) of education, including mathematics. Teacher education programs are – and have always been – very popular. Primary school teacher programs are among the most popular university programs – and only 10–15 percent of the applicants are accepted to the five-year program. Finnish teacher education emphasizes the academic aspects of education, and research-based academic studies dominate the content of teacher education. In addition, the students become familiar with teachers' everyday work during the several practice periods including in the studies. Finnish teachers are both academically and practically well prepared for their task. The recent achievements of Finnish pupils in PISA can be seen

at least to some extent to be due to the high level of academic teacher education (see more about Finnish teacher education in Jakku-Sihvonen & Niemi, 2006). However, even for these well-educated teachers, it seems to be hard to face changes in the curriculum and education (Pehkonen, 1993).

Fortunately, it is not easy to change people. My own interest in this topic *was aroused* out of a genuine concern. Is it a right and justified aim to change people? Perhaps there truly are good reasons why change processes are so difficult. Resistance to imposed change efforts could be interpreted as a shield against irrational change and manipulation.

The purpose of this study is to understand the difficult question of change from the perspective of stability. My interest is not in considering how teachers act in their classrooms or what their real teaching practices are. In this paper, my focus is on how primary school teachers speak about stability, and in this connection about changes in mathematics teaching.

Conceptual framing: Change and continuity

We educators tend to think that planned change is progressive and desirable, whereas stability should be avoided. However, many psychologists and social psychologists have pointed out that in the life and development of human beings, patterns of continuity are important and can be seen as markers of successful adaptation to transitions and changes in later life (e.g. Frazier et al., 2000; Cassidy & Trew, 2001; McAdams et al., 2006). Researchers have made similar findings about the coexistence of and positive links between change and continuity in many other fields, too (e.g. Bleich, 2006; De Vos, 2000). According to these findings, change and stability are not separate from each other, so it seems reasonable that they should be examined together.

The conceptual connection between change and stability can be linked with the help of the concept of continuity. At the practical level continuity can be described from at least three different perspectives. When things (development, situations) remain stable from one moment to another, there is no change. Changes can be emergent when elements are not present at moment one, but present at moment two. Changes are fading when elements are present at moment one, but absent at moment two (Frazier et al., 2000). However, we must make a difference between actual changes and how people speak about changes. Sometimes changes are desired and people aim to reach these goals, and they hope to succeed. Sometimes continuity is preferred and changes are not desired. So, when people speak about change and continuity, the perspective of hope or

desire is inevitably present. In any case, even if we can distinguish changes or desire changes, some amount of continuity is always present.

Cuban (1992) uses an organizational perspective to explain the determinants of stability in school contexts. This means that he tries to look inward for explanations about what happens at schools. Students, teachers, principals, school and classroom structures, and the weight of the past in the former curriculum are the internal factors that work towards maintaining stability. Students, teachers, and principals, for very different reasons, strengthen the existing curricula.

Methodology

Participants and data collection

As my main concern is to understand teachers' views on stability and change in primary school mathematics education rather than theoretical inference or generalizations, I have approached the issue with the help of case study methodology (Hammersley & Gomm, 2000). Besides the question about the purpose of the research, the case study usually refers to a relatively small number of participants and naturally occurring cases. This is a case study of nine teachers in one school.

The school was a very typical, middle-sized suburban primary school in southern Finland, in a district with a high socio-economic status. The school was very ordinary and typical in many respects. It was an ordinary (public) school without any selective requirements for pupils, there were no special programs, and the size of the school was around the average. In southern Finland the average school size is a little less than 300 pupils. The other resources were about the same as in any school in southern Finland. Fourteen primary school teachers, a couple of small-group teachers, and the principal worked in the school with about 300 pupils. I had become acquainted with the school and the teachers as I had been consulting the principal and one small-group teacher in gifted education for several years and had visited the school quite often. Although I have stressed the typicality of the school, in one respect the school was different from many others. In spite of my own fifteen years' experience as a primary school teacher, many years as a supervisor of student teachers, and several visits to various schools during my university years, I had never heard so many professional, reflective discussions in the teachers' room than in this school. I learned to know the teachers of this school as experts in teaching and education, and to appreciate them. In this study I wanted to give voice to these academically educated practitioners as representatives of Finnish primary school teachers.

However, typical of many Finnish primary schools, there were a number of teachers with no proper teacher education working temporarily with a one-year contract. At the time of the study, five unqualified class teachers were working in the school. These teachers are not included in my data. The participants in this case study are only the nine qualified teachers who had completed the primary teacher education program at the university. So, I proceeded from the selection of the school to the selection of participating teachers. The cases in my study are the interviewed teachers, but the school provides the context. The data consists of semi-structured interviews of nine primary school teachers: seven female and two male teachers (see table 1). If I had to locate my approach in terms of Richardson and Placier (2001), I would define it as more individual than organizational.

Table 1. *The participants*

Name	Grade	Teaching experience as competent primary school teacher
Sue	first-grade teacher	1 year
Sylvia ¹	fifth-grade teacher	2 years
Sheila	second-grade teacher	4 years
Steven	third-grade teacher	6 years
Sharon	fourth-grade teacher	7 years
Susan	first-grade teacher	10 years
Simon ²	fourth-grade teacher	10 years
Sally	first-grade teacher	15 years
Sarah	second-grade teacher	17 years

Notes. 1 Previous education and working experience in the field of natural sciences. 2 Specialized in mathematics education.

As I knew, at least to some extent, the participants beforehand, the setting was very fruitful for reflective interviews. The interviewed teachers had teaching experience ranging from one year to seventeen years. Sue was a young teacher (25 years old), but the ages of the other participating teachers were between 30 and 55 years. Most of them had only worked at this school. One of the teachers (Simon) was specialized in mathematics education as a part of his Master's degree. This means that besides the obligatory mathematics and mathematics education courses (in teacher

education), he had taken mathematics as a minor and had completed a special course in mathematics education, as well.

My aim was to understand the teachers, not to evaluate, change, or 'cure' them. The atmosphere of the interviews was very relaxed, and the teachers felt safe enough to speak confidentially. There was no need for the teachers to demonstrate how innovative or ready for changes they were, since I did not ask anything about their needs or demands for change. They could tell how it really is. The interviewed teachers were very reflective and eager to contribute. They told stories about good math teaching and their own practices.

The interviews were conducted at the school in a quiet room. The themes in the interviews were, (1) the teacher's personal conception of the state of mathematics teaching in Finland, (2) the good and proper elements of mathematics teaching, and (3) the elements of mathematics teaching which should not be changed if changes were to be made. Each interview lasted about sixty minutes. The interviews were tape-recorded and later transcribed by the author.

Data analysis

The data was analyzed qualitatively, and I applied several qualitative techniques in this process. I began my analysis with careful reading and rereading of the transcriptions of every respondent, and writing initial remarks on the papers. Then I continued to organize the speech of every respondent into interview themes. I reviewed my data and sketched diagrams and pictures. First, I was able to identify three key elements which dominated the teachers' talk about mathematics teaching – textbooks, teacher-centered teaching methods, and basic skills and facts. These seemed to form a stable trinity. They were seen at the same time as the basis of good mathematics education and as a threat to it. Further, 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 or reform. In addition to these, I separated the recurring talk about textbooks for a separate analysis (Pehkonen, 2004).

The more I reviewed my papers, drafts, and sketches, the more it became evident that the teachers were telling me stories and giving accounts. Although the stories were varied and had individual features, they seemed to have similar elements and a similar plot. I could identify similar core sentences and messages in the teachers' talk, e.g., "I was educated well at the university", "I know all the math books and I use the best of them," and "I want to teach properly and help my pupils individually." Around these core sentences I organized all the related talk.

A new, reconstructed, but very clear story developed from the themes of the original interviews (Kvale, 1996).

This is why I will first present the structure for my findings in the form of a short created narrative. This created narrative has the structure of beginning, middle and end, and it serves as an opening for the findings, which are then explored in more detail. The interpretation of the findings was later negotiated with the involved teachers, and they were eager to accept it.

The findings of case studies are usually not meant to be generalized in any conventional way (see e.g. Gomm, Hammersley & Foster, 2000; Schofield, 2000; Stake, 2000). However, there is usually no need to avoid the whole matter of general conclusions. In case studies, it is possible to make interpretations and conclusions that are relevant outside of the studied cases, too. The data in this case study was collected in a school which was typical and ordinary in many respects. The participating teachers (cases) were selected with the aim of taking into account the heterogeneity of primary school teachers; they varied in terms of experience, grade level, sex, age, and interest in mathematics education. The number of teachers specialized in mathematics education adds an extra feature to the typicality of the school. It is common in schools of this size that one (or none) of the teachers is specialized in mathematics education. The teachers were not randomly selected, but they were *all* qualified teachers in the school. So it is likely that the school and the group of participating teachers are a nice and acceptable, although not random, 'sample' of those at Finnish primary schools. Studying the typical is one way to increase potential generalizability, as well as selecting cases so that the heterogeneity of the target population is taken into consideration (Schofield, 2000; Gomm et al., 2000). The conclusions drawn from the data in this study offer at least one possibility of interpreting issues related to change and stability.

Findings

The plot of the reconstructed narrative could be told as the following.

The level of mathematics teaching is high in our country. Teachers, including myself, are well educated and do a proper job. Personally, I take my job as a math teacher very seriously. I know the trends of modern mathematics education. I want to teach well and see my pupils as individuals. All mathematics books are good, and I am using the best possible one. I have carefully selected it. My pupils and I myself – we like the book very much.

Nevertheless, I feel guilt. Perhaps I am not as good as I want to be, and the pupils do not always like mathematics. I do not object to changes, but there are too many risks. Who knows what would happen if I spend time on something unimportant. On something that is not assessed by tests. I must be sure that the children are learning.

I want to be a good and respected teacher, and I want my pupils to get good marks. It is not my job to entertain the children; I am educating them. I know what the results are of my current teaching – they are good enough. It will do.

The beginning of the story

I am an expert

The interviewed teachers took their roles as math teachers very seriously. They wanted to teach well and take care of each pupil's mathematical development individually. They also wanted to express their own expertise. This talk of expertise covers four themes. First, they shared that they are well educated. They said it directly:

I must say, I was well educated (in math teaching) at the Department of Teacher Education. I really got a lot. (Sharon)

Moreover, they said it indirectly by speaking about the curriculum, various textbooks, teaching methods, and learning materials. They spoke about their meaning and usefulness. The teachers expressed that they know what they want to achieve.

We (Finnish teachers) teach very well and vary what we should teach according to the curriculum. If the child has a competent teacher, there should be no problems. (Sheila)

They explained that, besides the official curriculum, they have their own individual goals and views about good math teaching:

My goal is to make mathematics a challenging and meaningful subject for my pupils. (Sylvia)

I think pupils must realize that you cannot understand everything at once. You must work for it. (Sally)

Second, although individual teachers had somewhat different ideas about how to achieve the set goals, they all shared the same desire to be able to

teach their pupils individually and to make sure that every pupil learns the basic skills. That seemed to be the mission of each of the teachers:

I have the basic attitude that I take every child as an individual.
(Susan)

As a class teacher I know my kids – everyone. It is possible to teach individually. (Simon)

Third, the teachers emphasized that they are autonomous. They are able to make their own decisions and do not follow 'official' schedules. These adaptations and exceptions from the schedules set by books or the school's own curriculum are usually small. But they are huge for teachers who usually follow math books very obediently:

Sometimes I take more time, if we have a new concept to learn. As a teacher I must put some things before others. (Sheila)

Fourth, the teachers expressed their knowledge about 'new trends' in math teaching. They spoke about them and contemplated their usefulness and meaning in Finnish classrooms. They spoke about gifted and talented pupils, mathematical thinking and problem solving, international achievement tests and comparisons, and so on. They seemed to share some common values of the good of the child and about mathematical development.

"I use the best possible math book"

In Finland, it is the teachers' right and responsibility to choose the textbooks and other materials for their pupils. According to the participants, the mathematics books have a very important role in their classrooms. Textbooks are mentioned continuously in teachers' speech (Pehkonen, 2004). In Finland most textbook writers are ordinary teachers who are interested in mathematics education and currently working at schools. There are several parallel textbooks from different publishers (at this time there are five or six textbooks) at the primary level. All possible textbooks were in use among the participants. Although there are some minor differences from one book to another, on a general level the textbooks and teachers' support materials are very similar. All the mathematics textbooks are rather more traditional than reformative, but reformative elements are included in all the textbooks. The books provide a good supply of basic exercises as well as more complicated tasks meant for all pupils. There are also collections of challenging tasks for those pupils who are more advanced and/or interested in mathematics.

Mathematics textbooks also provide various materials for problem solving and statistics, and ideas for group work and projects.

The interviewed teachers could not imagine teaching without textbooks. I asked Sally, a female teacher with fifteen years of experience, what she would take with her if she were forced onto an uninhabited island with her pupils and allowed to choose only one thing with which to teach her pupils mathematics. She spoke easily about various manipulatives and ended up choosing the abacus. In the end I asked – to make sure – about the math book that she had seen as so important earlier in the interview. Sally laughed long and gaily and answered:

But of course I will need the math book. It is self-evident. I couldn't imagine, you supposed that I could get along without a math book. It is the basic starting point.

The teachers found Finnish mathematics textbooks to be very good – regardless of the book they use themselves. They explained that they use the best possible textbooks, but that all the books are good and continuously developing:

We have a very good math book. The children love it. (Sarah)

All math books are good and nice. I could use any of them. (Sharon)

The teachers were convinced that their pupils learn the basic facts and skills well and that this is due to the good textbooks. The book presents the curriculum for most of the teachers: if the child can cope with her/his math book, (s)he has achieved the learning goals. The books are full of tasks, and that was enough for the teachers:

The children do well in mathematics and they learn the basics. They can complete the tasks in the math book, so they are learning. Everyone learns the multiplication tables and so on. (Steven)

The fact is that the pupils really seem to achieve quite well what they are expected to achieve, at least when 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.

The problem seems to be that all the official tests primarily measure the basics. There may be one or two different tasks on some national tests, but if the pupil knows the basic facts, (s)he can achieve a good score. So the basics were very important to the teachers – they will do. The teachers

thought that it is unreasonable to spend time on something else. If your pupils do well on tests, you are a good and respected teacher – you do not need to be the most competent expert.

In any case, the teachers were somewhat concerned about the power of the books. They found the books to be very good, but the teachers noticed that they have given up a part of their professional competence to the textbook authors. The teachers usually follow the book very obediently, as the interviewed teachers revealed. They do not choose the tasks or change the order. Their curriculum enactment seems to differ from what Ball and Cohen (1996) believe in their presentation, but minor adaptations are possible.

Almost everything in the book is carefully used and completed. Some of the teachers were 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. 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 to omit any tasks. (Steven)

L: Why it is so difficult?

S: I don't know. Everyone says 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.

The teachers explained their loyalty to the textbooks with their heavy workload. Teaching groups are very heterogeneous, and teachers are busy. The ready 'prethought' books make the busy days easier to manage. They provide a welcome help to teachers. The books "are so well-made, that pupils do not need any help", as Steven and other teachers put it.

The middle of the story

"I feel guilt; perhaps I am not as good as I want to be"

From the teacher perspective, school mathematics ought to be 'all right.' Teachers are able to be satisfied. However, all the interviewed teachers expressed feelings of guilt and mild concern about their own professional competency. They think they are too teacher-centered and bound to the math books:

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

The teachers saw the textbook authors as the most competent experts, and they were a bit unsure of whether they are themselves as competent to plan the lessons:

I have noticed that the books make me a little passive. As if you gave a part of your teacherhood to the book. (Sylvia)

They knew the trends of modern mathematics education, but they were not sure how to meet them and whether they are worth trying and struggling for. They also have had bad experiences of in-service education:

They try to change you in three hours or so. And then you come back and feel like you are a bad teacher and that you have not learned anything anyway. (Sarah)

All of the teachers were concerned about the more able students. They felt that they cannot challenge those pupils and that the slow learners also suffer in mathematics classrooms.

Simon: I feel that I am not able to challenge those more talented pupils.

L: Why not?

S: Maybe it is due to my own laziness. Life is so busy in the classroom. I have seen that it is better to follow the math book and that all the pupils do the same tasks.

Although the interviewed teachers thought that the state of mathematics teaching is good in Finland, and they were convinced that their pupils have learned what they ought to learn, they felt insufficient:

I often feel that I am not good enough. There is so much talk about the state of mathematics and then I think that my teaching – for sure – it is not what I want it to be. Anyway, the children learn – so the situation is a bit difficult. (Sharon)

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 that is sufficient. (Steven)

In the end

The teachers wanted to be good and respectable people. They wanted to do their job properly and not to make fools of themselves. One of their educational goals was to educate children who are hardworking. The

teachers had developed routines for controlling noise and idleness in their classrooms. The math book provided enough tasks for everyone in their classrooms to be busy. The teachers felt guilt over the books, but they were afraid of the risks:

Perhaps we could do something rather than to follow the book. But I don't accept that I should entertain my pupils. Yes, yes – it is good, if the pupils feel good, but I am really irritated about entertaining them. (Simon)

One of the risks is 'teaching as entertainment', and the teachers did not want to change mathematics teaching into entertainment. It was difficult for the teachers to decide whether something is entertainment – and so is somewhat of a waste of time – besides the basics and the word problems. They had experienced that teaching without books or without teacher-centered methods is not a good and proper job:

I remember – in my pre-service education we had to give lessons without books. It was about entertaining. (Sharon)

When I asked what it means to be teacher-centered, a typical answer was:

It means that I teach the whole group and put some examples on the blackboard. Then everyone begins to do the exercises individually. And I help the pupils individually. (Simon)

When everyone is busy and silent in the classroom, the teacher has some time to take care of the slow learners. The teachers thought that if they changed their teaching style so that more time is given to problem solving or mathematical thinking, there would be a risk that slow learners would be neglected and that they would not have time for everyone. The teachers were afraid that if they changed their mathematics teaching, it would detract from the other subjects. They would not have any time to plan their lessons properly. Moreover, it is too big a risk. Why should they take such a risk when the pupils are learning well enough with the old methods? They did not see any reason for it.

The math book is enough for a normal child. It also has so many challenges. (Steven)

I cannot teach without the math book. I don't have so much time that I can plan and arrange everything. I cannot live everything through mathematics. Why should it be more important than something else? (Sharon)

The teachers spoke very much about time, busyness and human resources. Teachers are busy, teaching groups are very heterogeneous, and every child must be cared for. The teachers were happy, because the math book helps with their workload and tight schedules:

It helps so much. You don't have to think up the tasks yourself. (Sue) and

If you are going to plan something by yourself, it means you must devote your evenings to it. So you think: "I can do it as usual". (Sally)

Even when the teachers saw that some changes would be welcome, they may give up on them:

But when you are so tired. You may see that the change is reasonable and you may be able to do it, but you don't have time and you are tired. So you think: "OK – the math is quite nicely arranged – I will follow the book". (Sylvia)

Sylvia, a very reflective teacher who is interested in math teaching, commented on the books:

The books give such terrific support that they really 'tease' me not to think and not to consider how to construct this teaching unit for my pupils. And it is me who knows my pupils. I should know what prior knowledge and skills they have. I should be responsible.

The situation is somewhat complicated: the teachers were happy to teach mathematics with the help of the books, but felt stressed if they had to plan for themselves and inconvenienced if they did not do their own planning. Moreover, it seems that the teachers did not know how much to rely on their own professional competence in mathematics teaching. However, it must be said that textbook use in Finnish classrooms does not mean that pupils are filling the books all the time. All Finnish primary teachers are well prepared to teach mathematics, and they really do teach. The teachers here felt uneasy because they know the trends of modern mathematics teaching, but they are unsure of the values and goals behind them and how to meet these goals. So, they are not sure whether these ideas are important or not. Official tests and standards do not give much support in this respect. The teachers wanted the math books to concentrate on the basics, since they mainly believed that the basics constitute good and proper mathematics teaching.

Discussion on change and stability

The findings of this study suggest that the need for continuity and the desire for changes are firmly linked with each other. The teachers were not willing to admit that they object to changes; any changes should be meaningful and reasonable to them. Mostly, the teachers believed in their ability to teach well. They wanted to do their job properly, be respected, and not to make fools of themselves. If teachers are ready for every change that comes from the outside, they are no longer sure whether and how their pupils are learning. The data gives clear support that the pupils' learning is the most important issue for the interviewed teachers.

In the light of this case study, the question of change and stability can be approached from several perspectives. There are changes that the interviewed teachers do not desire, and changes that they do desire. There is also the desire for continuity. So the questions of change and stability are linked to desire and hope. Teachers set goals and aims for their work, they try to move into directions that they find to be reasonable and desirable, and they hope for success in these efforts.

When the participating teachers spoke about mathematics teaching, they made it very clear that they are educators. They did not want to become entertainers, and they hoped to be able avoid that. This can be seen as some kind of 'moral dilemma' (see Lyons, 1990) for the interviewed teachers. They felt that teacher educators and in-service educators sometimes try to change them into showmen – at least to some extent. The teachers had had experience that teaching without books easily turns into entertainment. This kind of change in mathematics teaching was unwelcome to them.

Among the desired changes were organizational arrangements that are independent of the teachers' own resources. The teachers hoped for smaller groups, more time, and more human resources in order to teach more individually and to take care of every child, even the most talented. Teachers are well-educated professionals who are aware of children's needs, and they know what they should do. So the interviewed teachers seemed frustrated, as they had to admit that often they are not able to teach in a way they find reasonable. They felt that they do not have the time and resources to plan their teaching or enough time for each child during the lessons. However, they wanted to do their job properly.

Some issues related to change were really problematic for the interviewed teachers. Some change in teaching practices would be welcome to them. The teachers felt a bit guilty of being tied up in the textbooks and of making a teacher-centered instruction. And they were a little uncertain about how much time they should spend on topics other than basic

mathematics. In principle, they have the possibility to have an effect on changes. However, the interviewed teachers believed that they cannot manage change and at the same time keep up the high standard of the children's learning.

The teachers hoped that their pupils manage well. So, they were happy and satisfied that the children learn mathematics well with somewhat old and traditional methods. Thus, continuity is desirable. The question of change in mathematics teaching seems to encounter a very difficult problem. The findings of this study suggest that the problem culminates in the dilemma that the elements that are desired to remain stable are at the same time the objects of desired changes. The same elements that are valued as good and worth remaining unchanged are also seen as burdens and objects for needed and desired change.

The teachers wanted to do their job properly and be respected. One of their goals is that their pupils get good marks, which – as the teachers described – are achieved by hard work and much practice. That is what teachers try to provide. They try to satisfy what parents, administrators, and teachers themselves believe is proper math teaching (see Cuban, 1992). The teachers in the study had experience-based evidence that their teaching meets the set standards very well, or at least well enough. But they did not have any evidence of what happens if they spend their time on something else.

One possibility is to interpret these findings through concepts of beliefs (e.g. Thompson, 1992). The teachers seemed to have at least two kinds of beliefs about mathematics teaching. They had a deep belief in proper math teaching. This belief in the basics with the help of the book is widely supported in their immediate surroundings. It is the belief of parents and other teachers, and it is a deep belief maintained by the mathematics books. This belief in the basics is also deeply rooted in society. Many various experts – university professors, industrial managers – support the idea of properly learned basic mathematics. Teachers continuously hear this feedback.

But there is also another kind of belief: the teachers were a bit confused about 'fuzzy information'. Teacher educators and researchers speak about different goals – problem solving, conceptual understanding, and so on. There are also some tasks in math books which are often marked with an asterisk (or with some other sign) to indicate that they are not the most important tasks. School administrators speak about modern mathematics teaching as an important matter, but what they then assess is mostly the basics. So teachers are well informed and do have ideas about new trends. They have some kind of belief that teacher educators and

researchers do not respect their job. That makes them feel a bit guilty and inconvenienced. However, it is not a sufficient reason for change.

However, if we are interpreting these findings only through beliefs, we may lose something about the complexity of the phenomena. Interpreting through beliefs means to load all the 'change business' on teachers' shoulders. This leads us easily to the danger of seeing teachers as victims of their beliefs. And then researchers and in-service educators can march in and rescue teachers, providing advice, new 'better' beliefs, feedback and support (Borko et al., 2000; Senger 1999).

Another possibility is to interpret the findings through autonomous activity. Teachers are working under many kind of pressures, and they have to make compromises in order to manage well in complex situations and under heavy working loads. The issue is not only of beliefs. It can be a matter of values and intentional choices:

I cannot live everything through mathematics. Why should it be more important than something else? (Sharon)

In addition, the issue can be a matter of self-respect and psychological well-being. Teachers have a life outside of school, too. Drake and Sharin (2006) noticed in their study of two teachers that family (and school) events very often prevented one teacher – Beth – from spending as much time for planning as she felt necessary. So she sometimes shifted back to more traditional teaching. The participants in this case-study offered similar explanations:

There are situations when everything seems to be too much. 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)

Could this help us to understand why changes are so difficult and slow to achieve? Or why it is sometimes possible to help teachers to change? Teachers have good reasons to work in certain ways. If we want them to change, we should be able to offer something clearly better. Teachers are autonomous professionals. They need to feel that their job is seen as valuable and they want to be respected. How can we provide this?

References

- Ball, D. & Cohen, D. (1996). Reform by the book: what is – or might be – the role of curriculum materials in teacher learning and instructional reform. *Educational Researcher*, 25(9), 6–8, 14.
- Bleich, E. (2006). Institutional continuity and change. *Policy Studies*, 27(3), 219–234.
- 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.
- Cassidy, C. & Trew, K. (2001). Assessing identity change: a longitudinal study of the transition from school to college. *Group Processes & Intergroup Relations*, 4(1), 49–60
- 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.
- Cooney, T. & Shealy, B. (1997). On understanding the structure of teacher's beliefs and their relationship to change. In E. Fennema & B. Nelson (Eds.), *Mathematics teachers in transition* (pp. 87–109). Mahwah, NJ: Lawrence Erlbaum.
- Cuban, L. (1992). Curriculum stability and change. In P. W. Jackson (Ed.), *Handbook of research on curriculum* (pp. 216–247). New York: Macmillan.
- De Vos, E. (2000). *Biocultural and experiential bases of cultural continuity and change*. Lengerich: Pabst Science Publishers.
- Drake, C. & Sherin, M. G. (2006). Participating change: curriculum adaptation and teacher narrative in the context of mathematics education reform. *Curriculum Inquiry*, 36(2), 153–187.
- Fennema, E. & Nelson, B. (Ed.) (1997). *Mathematics teachers in transition*. Mahwah NJ: Lawrence Erlbaum.
- Frazier, L., Hooker, K., Johnson, P. & Klaus, C. (2000). Continuity and change in possible selves in later life: a 5-year longitudinal study. *Applied Social Psychology*, 22(3), 237–243.
- Gomm, R., Hammersley, M. & Foster, P. (2000). Case study and generalization. In M. Hammersley & R. Gomm (Eds.), *Case study method* (pp. 98–115). London: Sage.
- Hammersley, M. & Gomm, R. (2000). Introduction. In M. Hammersley & R. Gomm (Eds.), *Case study method* (pp. 1–16). London: Sage.
- Jakku-Sihvonen, R. & Niemi, H. (Eds.) (2006). *Research-based teacher education in Finland. Reflections by Finnish teacher educators*. Turku: Finnish Educational Research Association.
- Kvale, S. (1996). *InterViews: an introduction to qualitative research interviewing*. Thousand Oaks, CA: Sage Publications.

- Lyons, N. (1990). Dilemmas on knowing: ethical and epistemological dimensions of teacher's work and development. *Harvard Educational Review*, 60, 159–180.
- McAdams, D. P., Bauer, J. J., Sakaeda, A. R., Anyidoho, N. A., Machado, M., et al. (2006). Continuity and change in the life story: a longitudinal study of autobiographical memories in emerging adulthood. *Journal of Personality* 75(5), 1371–1400.
- Niemi, H. & Jaku-Sihvonen, R. (2006). Research-based teacher education. In R. Jaku-Sihvonen & H. Niemi (Eds.), *Research-based teacher education in Finland. Reflections by Finnish teacher educators* (pp. 31–50). Turku: Finnish Educational Research Association.
- 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* (Vol. 1, pp. 220–227). University of Tsukuba.
- Pehkonen, L. (2004). The magic circle of the textbook – an option or an obstacle for teacher change. In M. Johnsen Høines & A. B. Fuglestad (Eds.), *Proceedings of the 28th Conference of the International Group for the Psychology of Mathematics Education* (Vol. 3, pp. 513–520). Bergen University College.
- Richardson, V. & Placier, P. (2001) Teacher change. In V. Richardson (Ed.), *Handbook of research on teaching* (4th ed.) (pp. 905–947). Washington, DC: American Educational Research Association.
- Senger, E. (1999). Reflective reform in mathematics: The recursive nature of teacher change. *Educational Studies in Mathematics*, 37(3), 199–221.
- Schofield, J. W. (2000) Increasing the generalizability of qualitative research. In M. Hammersley & R. Gomm (Eds.) *Case study method* (pp. 69–97). London: Sage.
- Sosniak, L. A. & Stodolsky, S. S. (1993). Teachers and textbooks: materials use in four fourth-grade classrooms. *The Elementary School Journal* 93(3), 249–275.
- Stake, R. E. (2000 / 1978). The case study method in social inquiry. In M. Hammersley & R. Gomm (Eds.), *Case study method* (pp. 19–26). London: Sage.
- Thompson, A. G. (1992). Teachers' beliefs and conceptions: a synthesis of the research. In D. A. Grouws (Ed.), *Handbook of research on mathematics learning and teaching* (pp. 127–146). New York: Macmillan.

Leila Pehkonen

Leila Pehkonen is university lecturer in Education at the University of Helsinki. Her research interests include mathematics education, education for gifted students, and teaching and learning in higher education.

Leila Pehkonen
PhD, university lecturer
Department of Education
University of Helsinki

Sammandrag

Att ändra matematikundervisning och matematiklärare har visat sig vara svårt. I den här fallstudien har saken vändts upp och ner. Syftet är att närma sig frågan om förändring utgående från stabilitetens perspektiv. Detta arbete handlar om hur klasslärare talar om stabilitet och – i detta sammanhang – om förändringar i matematikundervisningen. Data består av halv-strukturerade intervjuer med nio klasslärare och har analyserats kvalitativt. Resultaten tyder på komplexa samband mellan behovet av stabilitet och viljan till förändringar.