

CONCEPTUALISING THE FACTORS THAT INFLUENCE MATHEMATICS TEACHING OF A GROUP OF NEWLY QUALIFIED TEACHERS IN GREECE

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This work inquires into the hypothesis that the newly qualified teachers who have graduated from Greek Departments of Education need support in teaching mathematics in their classrooms. Here we attempt to explore the needs and concerns that a group of newly qualified teachers has about mathematics teaching. These teachers participate in my research project while teaching mathematics in a Greek primary school. The preliminary analysis of part of the data collected in the context of my research project revealed teachers' beliefs regarding the influence of particular factors in their teaching of mathematics. These factors address issues in the teachers' university preparation and in the absence of programmes for their induction as teachers in the school environment.

INTRODUCTION

Learning to teach mathematics is not merely a matter of undergraduate education and training. It is mainly a longitudinal procedure for the duration of a teacher's professional life. Knowledge and skills concerning mathematics and its teaching that the student-teacher develops during his undergraduate studies influence his further education and particularly his professional life.

How does the newly qualified teacher manage to survive? It is rather difficult to answer to this question and particularly in the case of the majority of Greek primary school teachers who have to teach mathematics in their classrooms, although mathematics was not their favorite subject as student-teachers (Troulis, 1995). How could the teacher adapt his academic experiences in the school, particularly in the case that these experiences are in contrast with the traditional practices of his colleagues (Georgiadou & Potari, 2000)? How could he become "a reflective connectionist who integrates voices, analyses merits of various positions and comes to terms with what he believes in a committed way" (Cooney et al, 1998)?

Newly qualified teachers first teaching mathematics in a real classroom is characterised by reality shock.. A very common practice for them is to adopt the familiar traditional practices that they experienced as pupils and therefore feel safer. Research has shown that there are differences between expert and novice teachers in the sense that experts make wiser use of time, organise lessons better and have a better knowledge of content than novices do (Brown, Cooney & Jones, 1990). In addition experts provide better explanations of why, how and when mathematical concepts are used. This kind of research suggests the idea of mentoring to help newly qualified teachers in mathematics teaching Various implementations of this

idea can be found in the literature. There are differences among mentors' perspectives and practices because mentoring involves such a variety of highly personal interactions conducted under varying circumstances in different schools (Wildman et al,1992, Halai, 1998).

However, in Greek schools do not have designated mentors for preservice or beginning teachers and informal mentoring relationships are not common. Moreover, the apprenticeship model of teacher development, which appears to work to some extent in other countries, is not effective in Greece, as school teaching is very much constrained by traditional approaches to exposition (Potari, 2001).

Hence, before concluding to a particular framework to support the Greek novice teachers who teach mathematics, it is necessary to explore their ideas and beliefs about what mathematics is and its teaching and learning, as well as the teachers' attitudes and teaching practices. This exploration could reveal the real needs, concerns and problems that the novice teachers face in their first steps of teaching and therefore lay the foundations of a supportive scheme which could follow and assist development of novice teachers' teaching of mathematics.

METHODOLOGY

This study refers to data collected in the context of my research project. The research is qualitative and interpretative and it is conducted in two levels: the group level, regarding the group of the six newly qualified teachers-participants in my research project as a whole, and the individual level, regarding each teacher as a case study. The six teachers work in a Greek primary school.

In this study I analyse my notes from the first meeting I had with these teachers, who invited me to meet their needs of teaching mathematics 'effectively' because they considered the teaching methods that they used by then not satisfactory. In this meeting the six teachers discussed concerns and problems that they faced when teaching mathematics in their classrooms.

The meeting lasted one hour and a half and took place in the primary school where the teachers work. The participants were: the six teachers and me, the director of the educational organisation, where the primary school belongs, the principal of the primary and the principal of the secondary schools and a mathematics educator, who works as associate professor in a Greek department of primary education. The educator participated in the group meetings as an observer in the context of the methodological model that I have adapted from Simon (2000) for the needs of my research project.

ANALYSIS

Preliminary examination of the data revealed a series of factors that influence novice teachers' teaching of mathematics as indicated in Table 1. In the following analysis I attempt to explore to some extent the origin of these factors and identify the contexts where these factors were developed. Triangulating the findings from the present

analysis with the analysis of the data that I have collected through other methods, such as observation and video-recording of the teachers' teaching sessions, and interviews and discussions with each teacher-participant might provide the opportunity of scrutinizing the issue in the light of many aspects.

Table 1

<i>Teachers' initial education and training</i>	<i>The practicum</i>	<i>Teaching practices</i>
recipes for success	lack of qualified staff	traditional methods
theory vs. practice	separation of teaching practice from the courses	teaching based on the textbook
scenarios	experiencing traditional school practices	Lack of opportunities for alternative teaching practices

Teachers' initial education and training

Recipes for success

Gina, the teacher of year 3, claimed that while she was a student-teacher the teacher educators did not provide her with step by step instructions that she could use in the classroom and therefore make her teaching more effective.

“There is no ‘know how’. I am in for it. I wish somebody could tell me a way or a practice to help me being more effective when I am teaching and the children do not understand.”

Gina's complains seem to be quite common among beginning teachers. Common views that prevail among Greek student-teachers are that *“it is enough to know the mathematics that is taught in primary school”* and that *“what is needed is to know only how to teach this mathematics”*.

However, many educators who do not adhere to the cut-and-dried nature of mathematics, try to find other ways to meet their student –teachers' demands. For example, Watson (1994) reports that she offers examples and anecdotes to her students who ask directly for advice about teaching techniques. Alternatively she suggests a conversation in which the issue can be worked out than a recipe for success.

Theory versus practice

Teachers think that university studies offer only theoretical and not practical knowledge. Joyce, the teacher of year 1, argued:

“I am looking for books with topics on problem solving. There are two possibilities. Either ‘Patakis’ or ‘theories’.”

Patakis is the name of a company publishing textbooks very similar to those that are provided gratis to the students by the Greek minister of education. Almost all books with extra exercises on the topics that are taught in the primary school are written in the same perspective. Many teachers use these books to give extra exercises or homework to their students. This practice is based on the old pedagogical principle: "Revision is mother of learning". On the other side, books and notes written by mathematics teacher educators are more or less theoretical and do not refer to the actual curriculum. Therefore, there are limitations to the resources available to the teachers like Joyce, who would like to offer more challenging exercises or problems to her students or who would like to try different teaching approaches than the traditional one in her classroom. Cooney (1999) referring to the results of a survey where teachers had difficulties to generate mathematical applications and to identify and analyse different kinds of graphs underlined the need for teacher education to address making connections within the mathematics the teachers would eventually be teaching.

"Scenarios" for the teaching of mathematics

Kate, the teacher of year 2, referred to the scenario that she uses to teach her children how to add a 1-digit number to a 2-digit number. Kate had experienced this scenario as a student-teacher while attending the mathematics teaching methods course in the university. The educator used this and other scenarios in experimental teaching sessions with groups of children of years 1,2 and 3 in order to explore children's strategies of adding a 1-digit number to a 2-digit number. In this way she transformed the scenario from an area of investigation to a routine. Moreover, Kate suggested to her colleagues of years 1 and 3 the same scenario and the same method of adding *"to help teachers and children, to secure the continuity of the curriculum"*.

Chronis, the teacher of year 5, and Peter, the teacher of year 6, claimed that it is difficult to introduce scenarios to teach mathematics in years 5 and 6 because: *"We have to teach many notions, new concepts (pause) fractions, the children are confused. Many notions are introduced in the curriculum of year 5 and this fact makes children meet with great difficulties (pause)."* Both teachers lacked the experience of appreciating the use of scenarios as open-ended situations, where they could explore their students' ideas and concepts of complicated mathematical notions, such as fractions and decimal numbers. *"The use of routines reduces the complexity of the classroom, but it might also work against the aims of developing a rich conceptual understanding of mathematics"* (Bauersfeld, 1980 in Brown, Cooney & Jones, 1990).

The practicum

Five out of six teachers claimed that their teaching practice was not related to the teaching methods course. Prospective teachers' mathematics teaching practice is a compulsory part of all the programmes in the Greek departments of primary

education. The teaching practice is school-based and the student-teachers observe regular teaching, plan their own teaching and teach in a variety of classrooms. However, prospective teachers' teaching practice is driven by existing traditional school practices and by their personal experience as pupils. Moreover, the staff which is responsible for the student-teachers' practice are not qualified. Normally they are teachers seconded to the university departments and they are not trained as mentors.

The educators claim that the separation of student-teachers' teaching practice from the courses is due to a series of constraints, such as the large number of students and the small number of mathematics educators and mathematicians in the education departments. Ebby (2000) suggests the expansion of mathematics teacher educators' perspectives regarding prospective teachers' fieldwork in the sense that prospective teachers learn beyond the conclusion of the semester.

Teaching practices

The teachers admitted that: "*We teach mathematics by using the way that our teachers taught mathematics. The university educators did not recommend this practice*". The teachers argued that traditional practices offer certain ways of learning different mathematical notions. These ways are compatible to the ways in which different mathematical notions are introduced in the pupils' textbooks and in the teachers' manuals. "The child must learn a certain way of solving problems regarding reduction to unit" (Peter). "The children look at the title of the unit 'Problems to be solved by using addition'. Then they are invited to solve problems and they say: 'I will add the numbers' without making sense of what they are doing. They think that 'the most important thing for my teacher is to say the sum' " (Joyce).

The teachers feel trapped by the curriculum demands, by the structure of the pupils' textbooks, by the instructions in the teachers' manuals. They were not given the opportunities neither during their teaching practice nor during their induction period to explore advantages and disadvantages, particularities and limitations of alternative teaching methods. They were not given help in making connections between the world of the university and the world of the classroom, They did not have the opportunity to become creators rather than receivers of knowledge about teaching and take a critical stance towards teaching and schooling.

CONCLUDING REMARKS

The six teachers' concerns about their teaching of mathematics could be attributed to three main factors that generally dominate in newly qualified teachers' professional life: initial education, teaching practice, and induction programmes.

On the one hand, prospective teachers' initial education and training play an important role in providing them with a broad perspective of what mathematics and

its teaching and learning is as well as with the kind of habits of mind that will help them continue to learn from their own teaching.

On the other hand, newly qualified teachers' induction programmes could support them in their attempts to develop knowledge and skills that they acquired during their university studies as well as to relate theory and practice.

I feel that this study is a first step towards the realisation of the newly qualified teachers' problems when teaching mathematics. Teachers' concerns are just the one side of the hill while researcher's interpretations of these concerns seem to be another. It would be appropriate to expand this study by reflecting on other resources of data regarding this particular issue.

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