The Role of Professional Development Networks in Reforming Mathematics Education in Egypt

Conference or Workshop Item

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Abstract
Mathematics is considered to be one of the key areas for growth and development in Egyptian schools (Monk et al., 1999). Therefore, reforming mathematics education has been given priority by the Egyptian Ministry of Education. Accordingly, a particular emphasis has been given to the professional development of mathematics teachers. This paper is a case study of the role of the Egyptian National Network for Distance Training (NNDT) in development of mathematics teachers' knowledge and in reforming teachers' practice in schools. This paper concludes with some suggestions for the effective use of the network in teachers' professional development.

Introduction

Since 1991, Egypt has been pursuing a reform policy that aims to improve many aspects of its education system (Swain et al., 2003). The Egyptian Ministry of Education reform efforts include, for example, curricula development, reviewing assessment and examination systems and using information and communication technology. The Egyptian Ministry of education places mathematics education at the top of its reform agenda. As part of the reform policy, the mathematics curriculum for basic education has been revised to encourage the students to solve problems and develop higher thinking skills such as critical and creative thinking (The Ministry of Education, 2003). In line with this reform, a particular emphasis is now given to developing mathematics teachers in order to transform their role from the traditional one (dispenser of knowledge) to take on multiple roles such as guide and facilitator of students' learning. Therefore, professional development is considered to be an important mean to achieve these goals.

Professional Networks in education can be used to promote the dissemination of good practice and enhance the professional development of teachers (Sliwka, 2003). The Ministry of Education in Egypt has established the National Network for Distance Training (NNDT), which has become the backbone of teachers' continuous professional development. A large number of training courses for mathematics teachers have taken place via the network in order to improve their practice in schools. These courses aim to address the problems that face teachers in teaching mathematics, inform teachers about any changes and/or developments in the mathematics curriculum and introduce mathematics teachers to new methods of teaching and technologies.

The research described in this paper is a case study of mathematics teacher continuous professional development in Egypt. It aims to investigate the views of mathematics teachers, inspectors and training experts about their professional development using a distance leaning network. This paper highlights the different issues that face mathematics teachers during their training using the network. For instance, it addresses the impact of the training on the development of the mathematics teachers' knowledge and its role in changing their practice inside classrooms. This paper also examines the role of the Egyptian network in the building of communities of practice among mathematics teachers.

The Egyptian National Network for Distance Training

In 1997, the Ministry of Education in Egypt initiated a distance network for training in order to overcome the obstacles that face conventional approaches for teacher professional development. These obstacles include, for example, the lack of financial resources and time limitations (Bredeson, 2002). In addition, there are large numbers of teachers who require training but are located in distant and disadvantaged areas of Egypt. This network aims mainly to train large numbers of serving teachers across the country on any changes and/or developments in the Egyptian national curricula. It also aims to introduce teachers to new technologies and different teaching methods. This network consists of 57 centres and each governorate in Egypt has its own centre. In addition, there is a main centre which is located in the Ministry of Education. The role of this main centre is to develop the training programme and support the operation of the whole network. All the centres in the network are connected using Interactive Videoconference (IVC) technology which is used to provide the distance training for teachers. The total capacity for the network centres is around 8000 trainees at the same time and the average network operation capacity is 2664 hours per year (Training Department, 2004). This illustrates the large number of training programmes which are organised every year through the network. For example, the number of the training programmes during the period (October 1999 - December 2002) totalled 1003. Furthermore, the total number taking part was 1097038 trainees. This number includes a wide range of professionals who are working in education in Egypt such as

teachers in all subjects and in different stages, school inspectors and school managers. The network aims to provide equal accessibility to the training experts between advantaged and disadvantaged districts across Egypt. However, the main pedagogy that is used for distance training via videoconference is the formal 'lecture' approach i.e. the trainees usually act as passive receivers while the trainer acts as a dispenser of information. For the training, the experts usually organise a series of lectures for three to seven days which are related to the training programme. These lecture series usually conclude by taking questions from the trainee teachers.

The Technological Development Centre prepares a plan for conducting the training via the National Network every six months and the centre coordinates a number of external partners in order to prepare this plan. These external partners include, for example, the Centre for Curricula Development and Instructional Materials; the National Centre for Educational Research and Development; higher education institutions and subject consultants. These partners contribute to the plan by presenting proposals for the training courses which include the training objectives, the target group, the number of videoconference sessions etc. Accordingly, the planning of the training courses is considered to be "top-to-down", because it does not take into consideration the actual needs of the teachers. When the Ministry of Education reviews the training proposals, the Technological Development Centre identifies a 'Host' centre which leads the training according to the prepared plan. An expert is usually based at this host centre where he/she remotely conducts the training. Each local centre can be best described as a large classroom which accommodates about 50 -200 trainees for each training session.

Research Methodology

This study is of the professional development of mathematics teachers drawn from a number of prep-schools (11-14 years), which is the second stage of basic education in Egypt. It also included a number of school inspectors, training experts and educational technology specialists. A mix of research methods was used in this research: in-depth interviews, observations and questionnaires. The interviews and questionnaires were conducted with school mathematics teachers who had been trained via the network. The questionnaires included 50 teachers (36 male and 14 female). Their ages ranged between 20 to 50 years old and they have different teaching experiences which vary from 2 to 22 years. The analysis of the questionnaires and interviews data did not show any significant difference between the male and female teachers' views about the training. The observation was of a distance training course for mathematics teachers in prep-schools via the National Network in one of the local centres in Egypt. In this local videoconference centre, 21 mathematics teachers participated in the course and they completed questionnaires regarding the training. In addition, a number of mathematics teachers (10 teachers) were interviewed. Furthermore, some interviews were conducted with school inspectors (10 inspectors) regarding the impact of the training on teachers' practice.

Discussion of Outcomes

The impact of the training on developing teachers' mathematical knowledge

Teachers can be viewed as participants who belong to a community of practice. Because teachers have a joint enterprise, they function as a community, and they develop a shared repertoire and resources such as tools, documents, routines, vocabulary, symbols and artefacts, that embody the accumulated knowledge of the community (Allee, 2000). Lave and Wenger (1995) describe the community of practice as a set of relationships between persons, activity, and their world, over time and in relation with other tangential and overlapping communities of practice.

Teachers' knowledge can be classified into two main categories: formal and practical knowledge (Tuan et al., 2000). While formal (theoretical) knowledge is considered to be a product of the studies on effective teaching, practical (professional) knowledge is seen to be functional, personal, situated, local, relational, and tacit knowledge. Therefore, practical knowledge is mainly gained through the teachers' daily practice of their profession. In Egypt, there are three main categorises of teachers' knowledge (educational knowledge, subject knowledge, and cultural and social knowledge often termed 'basic knowledge'). These three types of knowledge are mainly gained through study (formal) and through practice (practical). Subsequently, 'effective' professional development should aim to develop *both* formal and practical knowledge of teachers in order to affect their practice inside classroom. As illustrated in figure (1), the training via the network influenced the different types of teachers' knowledge. For example, 15 out of 50 teachers find that the training has influenced their educational knowledge such as the evaluation of students' learning of mathematics and teaching methods. For example, one of the teachers, Mariam, said:

"I learn new teaching methods of mathematics from the training via the national network".

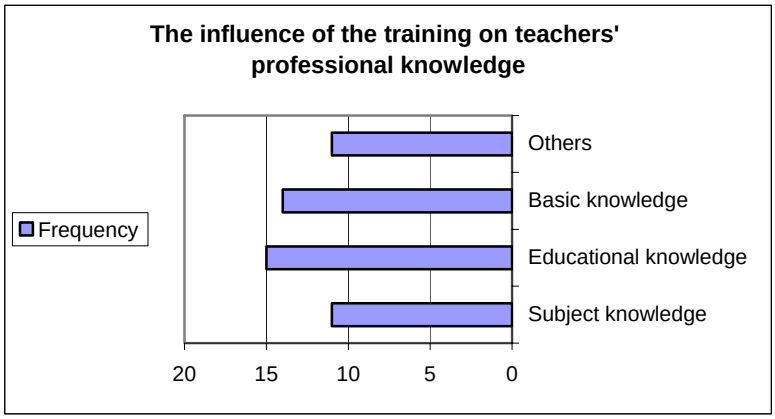

Figure (1) shows the influence of the training on teachers' professional knowledge.
In addition, 11 teachers believed that the training influenced their subject knowledge i.e. their mathematical knowledge. The main benefits from their point of view are related to the mathematical concepts and knowledge that they gained from training. One of the mathematics teachers, Adham, identifies the way he has benefited from the training by saying:

"I benefit from the training courses in developing my mathematical knowledge and in relation to the curriculum…I gained new mathematical knowledge"

Moreover, 14 teachers indicated that the training has affected their basic knowledge. This basic knowledge include, for example, developing teachers' ICT skills which are seen to be necessary for the effective use of ICT in teaching mathematics. In contrast, 11 teachers selected 'Others' option and mentioned that the training courses did not influence their professional knowledge. As illustrated in table (1), a large number of teachers (8 out of 11 teachers), who mentioned that the training affected their mathematical knowledge, revealed that their subject knowledge has improved. While only one teacher pointed out that his/her subject knowledge has changed and two teachers found that their subject knowledge is still the same after training. Similarly, 7 teachers out of 14 teachers expressed the view that training via the network has improved their basic knowledge and only two teachers declared that their basic knowledge has changed. In contrast, only 5 teachers out of 15 teachers, who indicated that the training has influenced their educational knowledge, believed that their educational knowledge has improved and/or changed. While the majority of them (10 teachers) declared that their knowledge is still the same after having training via the network.

Table (1). After the training my professional knowledge has

Response	**Subject Knowledge**	**Educational Knowledge**	**Basic Knowledge**	**Others**
Improved	8	4	7	1
Changed (To become different)	1	1	2	-
Still the same	2	10	4	10
Did not mention	-	-	1	-
Total	**11**	**15**	**14**	**11**

Based on the above indicators, the training via the National Network for Distance Training (NNDT) has to some extent an influence on mathematics teachers' professional knowledge (subject, educational and basic knowledge). However, the main impact of the training is seen to be mainly on improving and/or changing teachers' subject and basic knowledge. For example, teachers were asked if the training is related to the real problems that they face inside classrooms. One of the teachers, Nagi, answered by saying:

"There are some cases that teachers do not follow the appropriate scientific approach to solve a mathematical problem, for example, during solving some mathematical equations. Through the training via the national network, we learn how to overcome this problem."

On the other hand, according to the teachers' views, the training via the network did not have a significant impact on improving and/or changing teachers' educational knowledge. For example, one of the teachers said: "*I hardly benefit from the educational training courses because I feel it is*

isolated from the reality in classrooms" This is seen to be as a result of the way in which the network was used. For example, the training usually is conducted through a short series of lectures using the videoconference network, yet continuous professional development is more than just a series of training workshops, meetings, and in-service days. It is a process of learning how to put knowledge into practice through engagement in appropriate practice within a community of like- minded practitioners (Schlager and Fusco, 2003).

The role of the training in reforming teachers' practice inside classrooms

According to Warfield et al. (2005), mathematics education should enable students to think creatively and flexibly about mathematical concepts and solve mathematical problems with understanding. Therefore, students need to be able to think about mathematical ideas without having the ideas pre-explained to them and to solve mathematical problems without first being shown a method by teachers. Accordingly, the mathematics curriculum should be prepared and developed in order to support students' autonomy. In addition, teachers' knowledge needs to be developed in order to enable teachers to learn new roles and teaching strategies that can lead to improving student achievement (Bliss and Bliss, 2003), so all professional development efforts should lead to the reform of teachers' practice inside classrooms.

According to this study, 48% of teachers mentioned that they use the gained knowledge from training courses with the students inside classrooms. Additionally, 48% of mathematics teachers pointed out that they changed their practice in the classroom after having the training via the network (see figure 2). For instance, one of the school mathematics inspectors, Mokhtar, mentioned that:

> *"I find that some teachers change their practice inside classroom after having training via the network such as the use of collaborative learning"*

In contrast, 50% of teachers were either not sure, disagree or strongly disagree that they changed their practice inside classrooms.

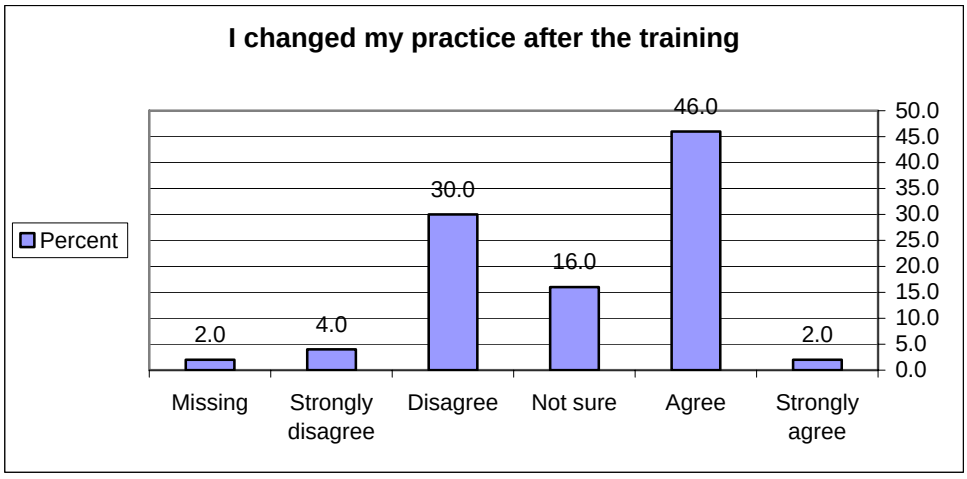

Figure (2) shows teachers responses regarding changing their practice in the classroom after the training via network.

Moreover, around 56% of mathematics teachers mentioned that they found difficulty in applying new aspects and approaches that they gained from training in their classrooms. Adham, a math teacher, highlighted this issue by saying:

> *"There are some aspects which I gained from training and I can apply inside classroom, while there are other aspects that are very difficult to apply."*

The difficulty in applying new aspects inside classrooms is seen to be for a number of reasons. These can be summarised in the following:

- During the training, teachers mainly act as passive receivers of information. Accordingly, they do not work as a part of community and they do not examine their practice in order to develop it.
- Teachers view the training to be isolated for the reality on the classrooms. For example, some teachers mentioned that most of the training did not address the problems that they face inside classrooms.
- There is a lack of continuity in the training. For instance, 47% teachers highlight that they need a follow-up training.

The duration of the course is seen by the majority of teachers (66%) to be too short. -
These reasons in turn do not lead to shifting the paradigm of teaching mathematics in classrooms from a teacher-centred approach to a student-centred approach.

Conclusion

Teachers are seen to play a key role in reforming mathematics education in Egypt. Therefore, professional development is an important means to develop teachers practice and in turn improve student learning. Teachers' professional development in Egypt needs to be viewed as a career-long process (Schlager and Fusco, 2003), rather than short-term courses. Moreover, professional development programmes need to be based on the actual needs of mathematics teachers in order to address the problems that they encounter during their daily practice inside classrooms. Furthermore, teachers should be given the opportunity to work as member of a community during CPD programmes instead of acting as passive receivers. This could enable teachers to examine and evaluate their own practice, on the one hand, and to enable them to identify "successful" practice, on the other. Accordingly, teachers will become able to develop their practice in order to encourage students' creative thinking in mathematics and develop students' problem solving skills. The results from this study also reveal that mathematics teachers find some difficulty in applying new knowledge and skills that they gain from the training inside classrooms. Hence, teachers need adequate guidance and continuous support from trainers and school inspectors in order to encourage them to shift their practice.

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