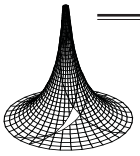

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The mathematics teacher trainee as an assistant teacher

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Abstract. The experiment described in the article aims to answer two needs at once: that of assistant teachers in schools, and that of a more practical training of mathematics teachers. The answer suggested is a model of school experience where mathematics teacher trainees work as assistant teachers in schools. An attempt to realize this model is described, and it is evaluated positively.

Key words and phrases: teacher education, assistant teacher.

ZDM Subject Classification: B50, D40.

1. Introduction

As a secondary mathematics teacher in Hungary, I have always envied colleagues I saw abroad, who had another adult to help them in the classroom: a paid teaching assistant, a volunteer parent, or an older student. On the other hand, I had a strong belief that students in initial teacher training courses should have more and earlier teaching experience than the present teacher practice. Reading an article about pre-service teachers tutoring one-on-one in a school [1], I had the idea that I should use pre-service teachers as assistants in my classroom. Reading into the literature on the topic, I found that the idea is not a new one, in fact, the strengthening of school-university partnerships is a major current trend internationally. This encouraged me to launch a small project: as a start, I tried to have the most benefits from the least extra work for partners, hoping that success will lead to bigger changes in the future.

2. Bilateral motivation

As I mentioned above, the motivation for the project is two-fold, one is the need for assistant teachers in schools, the other is to introduce more teaching experience into initial teacher training courses.

Assistants

As the composition of students is becoming increasingly mixed, there is a greater and greater need for differentiation worldwide [2], and Hungary is no exception [3]. However, the teacher can individualize teaching much more effectively if s/he is not the only adult in the classroom [4]. There are many different examples of assistants, such as:

Teaching assistants

Teaching assistants (TAs) are "adults who are paid to work in the school classrooms [...], usually directly with pupils" [5, p. 1]. Only the education systems of a few countries are able to afford them, the profession is most common in the UK, the USA, Canada and the Netherlands [5]. DfES, the governing education body for England sets the following main tasks for TAs, which include the following subtasks (the list of subtasks is not full) [6]:

- Support for the pupil
  - support pupils according to their individual needs
  - provide feedback for them
  - help in implementing Individual Educational/Behaviour Plans
- Support for the teacher
  - help planning the lesson
  - manage behaviour
  - observe and report pupil performance
  - administer and mark tests
  - take part in school-parent communication
  - provide administrative support
- Support for the curriculum
  - deliver learning activities and adjust them to pupils' needs
  - help and supervise pupils working with resources such as ICT

- Support for the school
  - assist with supervision of pupils at out of lesson times
  - accompany pupils to out of school activities

A part of these tasks help save time for the teacher (administrative support or supervision), but most of them aim at supporting individual pupils' needs. Besides giving them individual attention during whole-class activities, TAs are often asked to work independently with small groups or individuals as a means to implement inclusive learning and differentiation [7]. DfES also prepared subject-specific plans on TA-help, and for Mathematics these include the importance of questioning, and helping pupils who are stuck [8].

Volunteers

In many countries, there are volunteers who help the work of teachers. Volunteers belong to the following groups [9]:

- *Parents and grandparents* often volunteer to make themselves useful by improving the quality of their children's school. This results in a closer relationship and better communication between teachers, students and parents, which is so fruitful that some believe that "every parent should be connected to their children's education through volunteering" [10].
- *Volunteers working for school credits:* At some universities, pre-service teachers get course credits for volunteering at a school. Students applying for initial teacher training courses also get credits for previous voluntary teaching. At some secondary schools, students need to volunteer in a field related to their interests, so those interested in a teaching career do this at a school [9] & [11].
- *Churches and community groups.*

A volunteer's main role is to support the teacher in providing individualized attention to students [12]. Their possible tasks include [9]:

- One-on-one tutoring
- Small-group instruction
- Grading papers
- Hallway monitoring
- Office tasks
- Special education assistance

Schoolmates

Some schools organize peer-tutoring, or set up tutoring pairs between two classes of different ages. The tutoring student gains by deepening his/her understanding by explaining it, while the tutored one obviously gains from the help received [13].

School-based experience for pre-service teachers

Eurydice, an organisation which aims at improving education in Europe has recently published a detailed description of initial teacher training in European countries [14]. The report starts with a historical view since the 1970s, then it gives account of present conditions. One major of its major points is that training has been constantly changing in a more practical direction, and this is still an important need in the present. More practical means two major trends, one is increasing the ratio of professional (teaching related) courses in the curriculum as opposed to general (subject related) courses, the other is the greater emphasis on teaching experience. This paper focuses on the latter need.

In her guide to teaching practice, Nacino-Brown states that its two main aims are (1) to smooth the transition from the role of student to that of teacher and (2) to learn the ideas, skills and attitudes necessary to become a competent teacher [15]. To the second aim the author adds a thought of Flanders:

> *To be understood, concepts in education must be verified by personal field experiences; in turn field experiences must be efficiently conceptualised to gain insights.*

Lately, teacher training experts have started to emphasize, that this interaction between theory and practice is only possible if theoretical training and school practice happen simultaneously or alternately. To illustrate the importance of this simultaneity and even the need for school experience even before theoretical courses, Ulpitis makes an insightful comparison between learning to teach and learning to skate [16]:

> *Learning to skate is like learning to teach – or at least the way I think learning to teach ought to be. Once I had decided to learn to skate, I could hardly wait to get to the rink, put on my new "Canadian Tire special" skates, and try it out. If someone had offered to teach me the theory of skating, I would have listened impatiently with one ear or – more likely asked them to stop. All I wanted to do was to find someone to guide me and to get on the ice. [...] During our first lesson together, I was*

concerned only with standing up and reaching my goal of letting go of the boards and my skating teacher by the end of the session. But by the second or third time, I was ready to hear about some of the theory behind skating. In other words, I had formed questions, based on my beginning experiences: "Why do I need to bend my knees?" "How can I skate faster?" "How do I stop without banging into the boards?" As my experience deepened, the kinds of support I sought changed as well; in my development as a skater, I took charge of my own learning and was proud of the progress over the course of the winter months.

These views call for a teacher training curriculum where school experience has a much more important role than before. As this model has an influence not only on teacher training, but on the lives of schools, as well, it is a symmetrical relationship between schools and universities, referred to as school-university partnership.

3. School–University partnerships

The view that school experience should have a greater role in initial teacher training has initiated an endeavour to establish and strengthen **partnerships between teacher training institutions and schools**. This movement started in the 1980s and 1990s simultaneously in the UK [17] and in the USA [18], and many countries followed. The term partnership is used to indicate advantages for both teacher trainers and schools. Benefits of teacher trainees for schools include [19]:

- their work contributes to a better pupil-teacher ratio in and outside classrooms, hence students get more individualized attention
- their presence stimulates a higher performance from other teachers
- they bring in new ideas on teaching methodology due to recent theoretical studies, their willingness to experiment, and their more careful planning
- they give a fresh impetus of extracurricular life
- they provide a pool of potential new teachers for the school

Besides, schools have long-term benefits, such as the development of adequate theories about teaching and regulations (e.g. school curricula) due to researchers' better view on real teaching, or the fact that newly trained teachers will be more competent because of a more effective training programme [18].

Encouraged by the success of partnerships, the Department for Education in England went even further and introduced **school-based initial teacher education**. This means that students not simply spend more time in schools, but the task of initial teacher education is completely handed over to schools from universities. The introduction of school-based teacher training had a rather negative reception both in teacher training institutions and in schools. The former ones were naturally worried about the possibility of closing down, while schools were concerned that the extra load of having to train teachers would have a negative effect on the quality of teaching [17]. Since then, university-based and school-based teacher training have been co-existing and have become interrelated, obviously heading for a balance.

There is lot of evidence that in cases other than England institutions managed to establish balanced and fruitful partnerships with each other (e.g. [18], [20], and [21]). Presently, the term "school-based" is no longer associated with teacher training run by schools alone, but it came to mean the part of teacher training programmes that take place in schools. Many countries are still moving towards stronger partnerships between teacher training institutions and schools. An example for a project with this aim is EUDIST, which is a collaboration between several European countries [22].

In Hungary, the present initial training of secondary teachers is far from having a real school-based component. It consists of four years of theoretical work at the university, with a school experience in the third year and a short teaching practice in the fifth year. Experts claim that there is a need for a more practical training [23], but initiatives to strengthen university-school partnerships are very rare. The pilot project described in the next section aims to be such an experiment.

4. The teacher trainee as an assistant teacher

The idea of teacher trainees working as assistant teachers answers both of the above needs at once. It is an idea that can be realized on different levels, so it can serve as a transition towards a stronger co-operation between schools and universities. Let me present two levels, the ideal realization, and the level on which it can be easily introduced at present.

The ideal model

In the ideal model, teacher trainees would have a school practicum in every second semester, starting from the first or year of their training. In the school component of the course, trainees would work as assistant teachers, they could visit different teachers, different subjects, and some extra-curricular activities, too. The programme would include some lesson observations, and an increasing amount of individual teaching practice, as well. They would have pre- and post-lesson discussions with schools teachers. In the university component of the course the trainees would have a seminar where they would get theoretical training and a connected focus of observation from the professor, and they would also have post-lesson discussions with the professor and peers. Evaluation would be based on the evaluation of the school teacher and on a report written by the trainee.

The system would serve three main ends for the trainees:

- opportunity to connect theoretical knowledge to practical experience
- early diagnosis of whether the teaching profession is appropriate for them
- a smooth transition from the student role to the teacher role

Schools would benefit in the following ways:

- Trainees' help would improve the quality of teaching
- Teachers' working load would decrease (due to trainees' doing checking, administrative work, and extra-curricular tasks)
- Teachers' professional development is also enhanced by reflecting on their teaching methods through discussions with trainees

Although for the for glance this seems to give extra work for both universities and schools, universities could transform their existing teaching methodology classes to fit the program, and schools teachers' extra work would be less than the time trainees save for them.

Implementation in the present

The aim of the present project is to set up circumstances as close as possible to the model described above, within the boundaries of the present training system, in order to test the model and to find a simple way of introducing it. I started from the mandatory school experience of third year mathematics teacher trainees, and cooperated with the professor responsible for the course to set up the experiment. The course consists of two introductory lectures at the university, observation of two school lessons a week for ten weeks, and optionally three lessons taught by the

trainee at the end of the semester. Evaluation is based on the written evaluation of the school teacher and a report written by the trainee. In the transformed model the main change is that the trainee assists in the lessons instead of observing them, there is more emphasis on pre- and post-lesson discussions, and the trainee has regular consultations with the professor.

The project has been running for two years, with one trainee each year. At the end of each year I make an action plan which contains small modifications based on the evaluation of the project. As the aim was to help teaching and teacher training at the same time, evaluation must be made from these two angles. The first viewpoint is that of the teacher and students, the second is that of the trainee and the professor. Hence data gathering consisted of my lessons observations, students' written and oral feedback, regular interviews with the trainee, and discussions with the professor.

Year 1

The trainee was a student with an extraordinary motivation towards teaching and methodology. She volunteered for the experiment out of curiosity, but the school experience was also important to her because she wanted to do observations for her thesis.

As a *teacher*, I found the trainee being of great help. Her greatest role was to help students while they were working on problems, which meant students got twice as many teacher attention as usual. Her other task was to help students with individual problems in the homework, which meant that I could reduce the time spent with discussing it with the group as a whole. In fact, the latter task was her own idea, which shows that she also worked as an observer, which gave me professional help. Besides general suggestions as above, she made comments on individual students, too.

The majority of students (76%) found the trainee of great help, and the most common reason they gave was the presence of two teachers:

- Teachers can help more people that way.
- We can get an answer to our questions faster.
- She can explain well what I don't understand, and this helps a lot in advancing in the material, and in understanding exercises.
- Miss doesn't have to run everywhere.

Some students, although satisfied, had problems with following explanations for various reasons:

- She doesn't really know what we've learnt, and so it is really difficult for her to explain problems, because she asks about everything if we have learnt it.
- Everyone teaches in a different way, and this is not always good.

A few students (12%) had a negative opinion, as they were not satisfied with the kind of help she gave:

- I think she should be more patient and kinder.

The rest (12%) were neutral about the question.

The *trainee* found the experiment useful, in the first place because of the teaching experience, and in the second place because she could make observations connected to her thesis topic. She said she did not miss observing the lessons passively, as she should have done originally, because she could observe students more closely this way. She appreciated written feedback students gave her at the end of the semester, and my oral and written evaluations. In fact, she was so enthusiastic that she took part in twice as many lessons as required, and convinced a mathematics teacher in another school to let her do the same kind of work there, too.

The *professor* found the trainee's (and hence the experiment's) connection to the university insufficient. He claimed that the introductory lectures were too general to really help the trainee, and otherwise she did not consult him as much as I thought. I decided that next year I would monitor this process more strictly.

Year 2

This year's trainee was also motivated in teaching, but without the extreme interest of that of the previous year. He became participant in the project in a more or less accidental way, which also meant that I could test it in "average" circumstances.

As a *teacher*, I found the trainee of great help again, mostly because I felt that my students received more help during problem solving. The benefits from the better monitoring of activity and behaviour are shown in a student's written comment, "Last lesson he didn't let me do my German homework :)". He also gave me useful feedback by praising and questioning some of my teaching methods and making observations about individual students in post-lesson discussions and in his university report.

Again, the majority (71%) of students found the trainee's help useful:

- I am happy that he is here. He is good at explaining things.
- I am happy that he comes in to help us.

The rest of the students (29%) were neutral:

- I can't see much use, but he doesn't bother me.

The *trainee*, as his predecessor, believed that this active form of teaching experiment was more useful then mere observation.

However, the component of the project where the trainee was supposed to regularly meet the *professor* was dissatisfying again. Although I regularly asked the trainee to do this, he failed for quite understandable reasons: being ill, having an assignment to finish, etc. I conclude that a trainee would need exceptional motivation to do work that is not part of his curriculum, and thus for average trainees (even if they are interested in teaching and want to do a good job, as the present one) this is not a realistic requirement. Hence the professor and I agreed that in present circumstances we would not expect trainees to do voluntary extra work at university, but we would rather try to include this component in the curriculum. The first step would be running an optional discussion course (with university credit) linked to the school experiment.

5. Conclusion

The experiment of a mathematics teacher trainee working as an assistant teacher instead of making lesson observations during a school experience turned out to be useful both from the aspect of teaching, and from that of the professional development of the trainee. This suggests that a similar programme should be made mandatory for trainees. The experiment also showed that even while this long-term aim is not realized, individual teachers and trainees can easily follow the model.

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