



Study visit group report

Group No	169
Title of the visit	Development of key competences in mathematics and science
Topic	Learning mathematics and science
City, country	Sofia, Bulgaria
Type of visit	Study visit
Dates of visit	14/03/2011-17/03/2011
Group reporter	Andrew Quinn

I FINDINGS

This section summarises the findings of the group while visiting host institutions, discussing issues with the hosts and within the group. You will be reflecting on what you learnt every day. But to put them together and give an overall picture, you need to devote a special session to prepare the final report on the last day of the visit.

In this section, it is important that you describe not only things you learnt about the host country but also what you learnt about the countries represented by group members.

1. One of the objectives of the study visits programme is to exchange examples of good practice among hosts and participants. Cedefop will select well-described projects/programmes/initiatives and disseminate them to former participants and a wider public, including potential partners for future projects. Therefore it is important that you identify and describe all aspects that, in your view, make these projects/programmes/initiatives successful and worth exploring.

In this study visit we were a party of 10 participants from 9 countries. The range of expertise and area of interest all complemented each other as no person had the same profile. The range of interest was in all aspects of maths and science with professions spanning from teachers to advisors.

In the visits to schools, we were introduced to a ‘specialist school’ in mathematics and science and as part of the visit we met and had presentations from the students. These students explained that they were studying in the school as they had a love of science and showed that by a range of activities, amongst which were: the productions of physics films, a chemistry Olympiad team, the discovery of a new maths solution to a geometric problem and in biology, a young team of very able students who

were enthusiastic about their future in science. Although we appreciated this was a specialist facility, it was very impressive and one in which students has been able to develop with the resources of the school and teaching staff.

Describe each of the good practices you learnt about during the visit (both from the hosts and from one another) indicating the following:

title of the project/programme /initiative	country	name of the institution that implements it (if possible, provide a website)	contact person (if possible) who presented the programme to the group	whom the project/ programme/ initiative addresses	what features of the project/programme/initiative make it an example of good practice
jumpmath	Bulgaria	107 Primary school		9 yr olds	Alternative way of teaching maths
Olympiads	Bulgaria	Ministry of Education		18/19 year olds	
Assessing the outcome of teaching vs teaching for the test	Denmark	Ministry of Education Department of General Upper Secondary Education	Marit SCHOU	17-20 yr olds	The use of computers in maths
Access to Higher education	Scotland, UK	SWAPWest	Andrew Quinn	>21 year olds	Model of adults accessing Higher Education
SINUS. Improving the efficiency of mathematics and science teaching	Germany	Leibniz-Gymnasium- Altdorf	Hermann PUHLMANN	Mathematics and science teachers	Various modules to focus on wrt improving teaching of mathematics and science
Inservice training and Further Education	Norway	Forum for Oppvekst i Sunnhordland (FOS)	Jan Enerstvedt	www.fos-sunnh.no	Encouraging teachers to build up competence
Experimental science teaching	Portugal	Escola Secundária de Amares	Pedro CERQUEIRA	12-18 yr olds	Encourage teachers to teach experimental lessons
Extra math class	Bulgaria	107 Primary school		9-10 year olds	Encouraging pupils to take extra maths classes
Working with gifted students	Bulgaria	National Science and Mathematics High School		17-19 year olds in all subject areas	Allowing the brightest to excel
Partnership Working	England	Exam Central	Ben INSHAW	11-18 yr olds	Encouraging schools to cooperate for the good of all pupils

Informatics and information technology as a special subject in vocational school	Bulgaria	Technological School "Electronic Systems"		14 -19 year old	Prepare students for career
Language schools	Bulgaria	73 Secondary School		6-19 year olds	
Use of IT in teaching	Bulgaria	97 Secondary school		16-18 year olds?	
Maths teaching in lower secondary school	Italy	SCUOLA MEDIA STATALE "P.G. FRASSATI" Turin	Beatrice PEROTTI	11-14 yr olds	Encourage pupils to study maths and science with new ways and use of IT
Extra curriculum maths	France	Lycee Amiral bouvet University of Reunion Island	Fabrice AH-SING	18-22 yr olds	Encouraging students to practice extra curricular activities
Teacher training	Turkey	Celal Bayar Üniversitesi Eğitim Fakültesi İlköğretim Bölümü	Sevil ÖZCAN	>19 yr olds	Making the training of teachers in science and biology more effective
	Bulgaria	Faculty of mathematics and informatics - Sofia University	Kiril Bankov		
Maths outreach to local primary schools	England, UK	St Edmund's school	Mathew Reames	9-11 yr olds	Mathematics masterclass for gifted pupils
Curriculum redesign	Bulgaria	Centre for Control and assessment of the quality in school education	Svetla Petrova	6-19 yr olds	Responding to the research of the PISA survey
Monitoring educational outcome	Bulgaria	Centre for Control and assessment of the quality in school education	Georgi Georgiev	10-19 yr olds	Using empirical methods involving tests for reassurance about the development of the educational system

* You can describe as many good practices as you find necessary. You can add rows to the table.

2. The study visits programme aims to promote and support policy development and cooperation in lifelong learning. That is why it is important to know what you learnt about such policies and their implementation during your visit. You are invited to describe your findings concerning the following:

2.1 APPROACHES TAKEN BY PARTICIPATING COUNTRIES (BOTH HOST AND PARTICIPANTS') REGARDING THE THEME OF THE VISIT. ARE THERE ANY SIMILAR APPROACHES/MEASURES IN PARTICIPATING COUNTRIES? WHAT ASPECTS ARE SIMILAR AND WHY? WHAT ASPECTS ARE DIFFERENT AND WHY?

The approach of the host country, in some aspects, could be said to be very traditional in teaching methods whilst at the same time ensuring a high standard of teaching through their University training programme. Learning was something that pupils had to do, whatever the subject, and were encouraged to do so by flexible programmes, additional classes and staff who appeared to be very motivated by the enthusiasm of their pupils. This was borne out with numerous discussions with pupils.

Pupils were expected to learn by listening to a theoretical approach and through interaction with the teacher.

In a maths class, of 9 year olds, one boy proudly told us how much he enjoyed maths and that he only wanted to be in that class. This was a class of extra maths for pupils.

One example to support traditional learning, is that in maths classes pupils are not always allowed/encouraged to use electronic calculators. The prime reason for this is that the pupils have to develop their thinking capacity and calculators do not encourage that. This is in contrast to all/most other participating countries in which calculators are used freely and are encouraged.

During a visit to the University of Sofia mathematics teacher training department, we heard about the training scheme for maths teachers which mirrored systems used in all the countries present. They were expected to be educated to degree standard, complete a specific teacher training programme and participate in school classes prior to being a qualified teacher. What was interesting and in spite of having visited excellent examples of schools where maths was being taught to a very high level, we were informed that there was a decline in the standard of teaching maths as reported in the TIMS study. Most other countries, although supporting a basic training programme similar to that in Bulgaria, saw quite big differences in the teaching strategies and methods of engaging with the pupils.

In the visits we made to all the schools and training institutions, some partners were impressed by the ability of the pupils we met, to speak English and in the case of a technical and language school, were taught and examined in a foreign language to gain an international qualification. In the visit to the Languages school and the General school we were impressed with the use of 'modern technologies' as a teaching tool and how the pupils found this method of teaching very good. In partners' presentations it appeared that the UK was perhaps out-of-step with its European partners in

foreign language preparation and although not a focus of the study, it was raised in relation to national school curriculums. What was visible to all participants was selection on ability, which although was present in most of the participants' schools, it was not universal but as to its impact, no one knew the full picture.

Bulgaria is concerned about their performance in relation to the PISA study and was pro-active in making changes to the curriculum to redress this problem. They were also conscious of the variation of the performance of pupils in relation to socio-economic factors.

2.2 CHALLENGES FACED BY PARTICIPATING COUNTRIES (INCLUDING HOST) IN THEIR EFFORTS TO IMPLEMENT POLICIES RELATED TO THE THEME OF THE VISIT. WHAT ARE THE CHALLENGES? ARE THEY COMMON CHALLENGES? IF SO, WHY? IF NOT, WHY NOT?

This visit was primarily focused on key competences in science and mathematics but by the nature of the participant's interest and the variety of host institutions that were visited, more general challenges were discussed together with some of our examples of best practice.

Challenges rose during the meetings of the visit:

The low uptake in some or most EU partners countries for higher education students in maths and science. Turkey was seen as a country with a strong history in recruiting science and maths graduates which originates from good support for the subjects at regional and national level.

Teacher training in maths, in some countries was seen as failing and some reforms were required to increase the standard. Amongst the concerns was that teacher training methods were not meeting the needs of pupils and that most maths graduates do not enter the teaching professions, perhaps lured away into industry by higher salaries or that basic maths education was not of a sufficiently high standard to cope with upper secondary (16-19 year olds) education. In Bulgaria, for example, new maths teachers were unaware of curriculum, out with their own level and subject area, so did not appreciate the overall picture.

The raising of basic literacy was also seen as important for the economic success of partner countries and the participation of individuals in civic society. Several models ranging from school to community based resources were discussed as well as the provision of Adult courses. The Grundtvig programme being an excellent example of how basic literacy can be extended to adults.

One universal challenge that was highlighted was the expected need to revise educational structures on the back of general elections. There was no further discussion on this topic but as educators and inspectors, it was felt that a period of stability was required, extending beyond what could be seen as a General Election.

It was also seen, in several countries, that maths learning was perceived as difficult. For this study visit, visits were made to schools where maths was being taught for which the standard was high but may not have been representative of all schools in Bulgaria. The issue of teacher training may have an impact on this together with better salaries for teachers, reduced workload, higher professional status, conditions and more staff to reflect demographic trends of older teachers.

The issue of teaching students with disabilities was raised and it was generally agreed that most, if not all, countries integrated pupils into mainstream classes where appropriate. This was seen as not only beneficial to the learner but also to their peers in relation to learning and good citizenship.

2.3 NAME AND DESCRIBE EFFECTIVE AND INNOVATIVE SOLUTIONS YOU HAVE IDENTIFIED THAT PARTICIPATING COUNTRIES (BOTH HOST AND PARTICIPANTS) APPLY TO ADDRESS THE CHALLENGES MENTIONED IN QUESTION 2.2. PLEASE MENTION SPECIFIC COUNTRY EXAMPLES.

The standard of learners ability in Maths and science was demonstrated at a high level in the classes in Sofia and although may not have been totally representative, they did tackle the problem of standards. It was noticeable that this was achieved in 3 main areas:

- By selecting pupils on ability there was a chance that the students being taught were of the highest standard. This maintains a good supply of excellent students but may also be at odds with other systems where selection is not made and everyone is taught to their own ability in the same school;
- By introducing pupils to schools, dedicated to languages, they would aim to achieve a higher standard, be able to sit international exams and progress onto universities in foreign countries;
- The introduction of IT in regular classroom settings did appear to appeal to all the students. They were able to access the lessons, through their teacher, were directed to on-line resources (e.g. YouTube) and used web search engines to access information. The issue of social networking was raised with the pupils, the majority of which were in favour of involvement as part of their training and it was seen as an opportunity for teacher and trainers investigate this media to interact with pupils at their own level. Turkey, Denmark and Norway have already established this as a teaching tool, together with the integration of personal computers for individual pupils.

Extra curricular activities in maths and science were seen as very positive influences in the promotion of and raising the standard of, maths and science. In schools that were visited we saw where these classes had the effect of developing a high level of pupil knowledge and interest in their subject. Pupils who presented their subjects to the participants of the study visit were supportive of the extra classes and the staff who had assisted them in achieving this high standard.

2.4 ASSESSMENT OF THE TRANSFERABILITY OF POLICIES AND PRACTICES. COULD ANY EXAMPLES OF GOOD PRACTICE PRESENTED IN THIS REPORT BE APPLIED AND TRANSFERRED TO OTHER COUNTRIES? IF SO, WHY? IF NOT, WHY NOT?

We were privileged to see many examples of good practice in the schools we visited and these we have described above. Participants also described good initiatives that were present in their own countries but time did not permit the discussion of these fully. Some however we have highlighted in the table above which details the initiative and the contact person.

Of the initiatives that we have described above, we see no reason why many of these cannot be transferred to other countries, examples of these could be:

Introduction of foreign languages

Extra curricular activities where small group and high level teaching was present. One pupil said 'the fun starts after regular lessons', 'success comes not from regular big classes but in small groups, that is where we get what we need'.

The integration and awareness of Olympiads and other such competitions in all countries, as some are missing out.

Use of IT for teaching

3. Creating networks of experts, building partnerships for future projects is another important objective of the study visit programme.

Please state whether and which ideas for future cooperation have evolved during meetings and discussions.

TO SUM UP

4. What is the most interesting/useful information that the group believes should be communicated to others? To whom, do you think, this information will be of most interest?

Study visits were a very useful way to learn about other countries educational system and appreciate different cultures.

As educational professionals it is particularly appreciated to have the opportunity to discuss and learn from each other.

The visits and speaking with the pupils.

THANK YOU!