



CEDEFOP

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of Vocational Training



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Study visit group report

Group No 106

Title of the visit New approaches to competence-based teaching and learning in science

Topic Learning mathematics and science

City, country Dillingen, Germany

Type of visit Study visit

Dates of visit 10-14/10/2011

Group reporter Heidi Foxford

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.

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
Fibonacci Project	Numerous countries across Europe including Germany	French Academy of sciences, Institut national de recherche pedagogique "Ecole normale superieure" Paris www.fibonacci-project.eu	Harald Haidl	The project is aimed at science and mathematics teachers in Europe	The Fibonacci project highlights the importance of Inquiry-based science and Mathematics Education (IBSME) for developing an integrated strategy for scientific literacy and awareness from primary to secondary school, raising interest in science and mathematics and reinforcing scientific careers. It is a collaborative project which develops the sharing of good practice and links within the EU.
The development of competence based teaching and learning in Germany	Germany	Ministry of Education, Germany	Dr Wolfgang Ellegast	Organisation of the German education system	German states have been and are harmonizing their education systems by holding conferences between the 16 states to agree on common education standards and procedures. There has been an agreement to move towards competence based teaching in all 16 states.
The Rocard Report	EU	The European	Harald Haidl	Those involved with	Renewal of science education requires

2007		Commission http://ec.europa.eu/research/science-societ2/	Michel Rocard	science education	promotion of initiatives that increase children interest and attainment in science. With some adaptation these initiatives could be implemented effectively across European countries. Initiatives such as the French project 'pollen' and the German project 'SINUS-transfer'.
Sinus Bavaria	Germany	Bavarian State Ministry of Education and Cultural Affairs www.sinus-transfer.eu	Harald Haidl	Science teachers	Develops inquiry based learning
The function of educational standards	Germany	Jochen Meyer meyer@camerloher-gymnasium.de	Jochen Meyer	IQB Science educators	Description of government requirements, performance measurements, development of teaching and learning, better individual support, harmonisation of science curricula. Introduction of 'diagnosis' in Germany to determine what the students know. Movement towards competence based teaching and learning so learning is focused on achieving .outcomes
Science Teacher Education in Germany	Germany	David Di Fuccia difuccia@uni-kassel.de	Dr David Di Fuccia	Kassel University	Introduction of Bachelor and master for teachers (bologna effect). Invention of standards for teachers. Training teachers in competence based learning and PCK (pedagogical content knowledge) e.g. use of diagnosis/assessment and peer assessment.
Jugend Forscht	Germany	Sven Baszio www.jugend-forscht.de	Dr Sven Baszio, Steffen strobe, Stefan Gagel	Intel	The Jugend Forscht competition is Europes largest and most successful science festival. This practice provides students

					with the opportunity to design their own STEM projects. It often leads students into careers in STEM subjects and develops independent learning.
Science on Stage Europe - Winning Hearts and Minds	Headoffice in Germany, but across 27 European countries.	Science on Stage - Europe	Elena Luhrs www.science-on-stage.eu	Approximately 350 science teachers from 27 european countries	The project runs a science on stage festival every 2 years. Teachers from across Europe can apply to attend. The festival provides a forum for teachers to exchange teaching ideas for science. This enables teachers to inspire and re-enthuse pupils.
Industry apprenticeships	Germany	Industrial			School students can do apprenticeships in the chemical industry. This is popular and leads students into careers linked to the chemical industry.
Teacher training Realschule Hirschaid	Germany	Realschule Hirschaid. Bavaria	Ursula Bonner Gregor Gunzenheimer	Trainee teachers and secondary school children.	Pedagogy seen at the realschule was based on competence based learning and very active approaches. In each lesson pupils are presented with a problem they must solve. Teaching methods promote independent learning, collaboration and 'soft skills'. Practical work including microscale chemistry is commonplace.
'Tiere live' Biodiversity education project	Germany	Bavarian Academy for Nature conservation and Landscape Management (ANL) and the Academy for Teacher Training and Personal Management (ALP)	Tanja Berthold, ALP t.berthold@alp.dilligen.de Peter Sturm, ANL Peter.sturm@anl.bayern.de http://dozenten.alp.dilligen.de/tiere-live	Students interest and respect for nature and the environment	Tiere Live handbook includes concrete descriptions and materials for 64 tested activities for 12 organisms (e.g. beavers, butterflies, snails and earthworms. There are also chapters giving advice on the permanent keeping of animals in schools. Teacher training courses associated with the project are available. The project will be offering a workshop in March 2012
Aprian-Gynasisum	Ingolstadt, Bavaria	Apian-Gymnasium Ingolstadt	Markus Zeller		Tour of vivarium. small living animals in school, 3 rooms containing, terrarium

Teaching with Living Animals					and aquaria. They use them as examples in education, showing behaviour, feeding etc. as well as teaching students respect for animals and how to care for them.
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** 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?

All the countries involved are taking steps towards ensuring effective implementation of competence based learning. All countries were in agreement that competence based learning is a more effective and interesting approach to learning science. Competence based learning provide students with the skills needed to be active citizens in society and be able to apply their knowledge in different situations.

All the countries involved had different educational systems which are routed in the past and have evolved over time. The countries are all at different stages in the journey to effectively embedding competence based teaching in science. This is due to varying approaches to teaching and learning that have existed in the past. It is also limited by resistance to change in some countries and issues with educational policies imposed by governments.

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?

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In order for competence based teaching to be effectively embedded in schools we need to re-educate and train all our science teachers so they have the knowledge and skills to teach using this approach. Teacher training is an issue in many countries due to financial and time restraints and resistance to change in some institutions.

Implementation of European standards and common standards within states of a country is also an issue. Ideally, we need to work towards having common standards within and between countries. For example Germany has 16 different states. All sixteen have their own educational system therefore harmonisation was required. Spain has the same challenges with seventeen provinces. This issue was not a common challenge across the majority of the countries on the visit since most had a single education system followed by the entire country.

Jugend Forscht was an example of good practice but requires excellent links with industry, wide media coverage to ensure uptake and sponsorship for funding. Other European countries would have difficulty with the PR and drumming up adequate sponsorship.

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.

An ideal, but somewhat radical solution would be to have a common science curriculum across countries of the European Union. Countries that have different curriculums and qualifications in each of its states need to work towards harmonisation by agreement on what constitutes the best curriculum. We should also work towards developing and promoting common exams and qualifications such as the ‘igcse’ and the ‘international Baccalaureate’. This common approach could also be applied to teaching qualifications and pathways. A shared understanding of what is effective in terms of pedagogy and an international teaching qualification would support improved standards across science education and the quality of science teaching across the EU.

Teachers need to work collaboratively to improve competence based teaching. Events such as Science on Stage promote international exchange of ideas and good practice in science. Projects such as the Fibonacci project, POLLEN and SINUS (operate over particular European countries) are also effective at promoting the exchange of resources and ideas.

Counties could drive to develop more effective links with industry. This could be done in a number of ways. Having science education as part of an industrial placement works well in Bavaria as seen in the Industry Park Gersthofen. Competition such as Jugend Forscht also forges links with industry.

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?

The Jugend Forscht competition could be applied to other countries on a smaller scale. The main challenges with an event such as Jugend Forscht are likely to be with finding industrial partners, sponsorship and effective advertising to ensure uptake by students.

Tiere Live is a good example of a project that could, with some modification (according to curriculum and local environment) be implemented in other countries.

Moreover, other countries could benefit from developing effective links with industry as seen in Germany. This informs and inspires students. Dialogue between industry, schools and departments of education can have very positive effects for schools. This could be done in all countries although it would require active cooperation from local industry and a change in culture in many countries that currently do not have such links. Countries such as Iceland would also find this difficult due a lack of industries.

Teacher training already exists in various forms in many countries but could be extended across Europe. Promoting active approaches to learning as seen in Hirschaid Realschule could also be transferred to other countries.

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.

The Science on stage festival could be an opportunity to fund partnerships between EU countries to share good practice. Teachers can apply to participate in the festival. All participants have exchanged emails and would like to stay in contact. Participants from some participating countries such as Iceland, England, France and Czech Republic would like to form an informal network and possibly organise a visit to Iceland.

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?

It is interesting to see how teachers from other countries strive to work together to improve science education for our young people. Most teachers agreed that the 'Tiere Live' project (using animals to teaching through competence based learning) was very useful, particularly the handbook.

The active teaching methods observed in the Realschule were regarded as being an example of excellent pedagogy and which could be shared with others. In particular, the use of micro-scale chemistry was considered to be something that participants would like to share with science staff in their own counties.

Jugend Forscht and its power to enthuse and inspire students to pursue science and technology related careers were also seen to be very useful.

Finally all participants agreed that having a clear vision for the progression of our students from primary level through to university level is vital.

THANK YOU!