Science Teachers Training within the Frame of the State Information Policy in Education - Outcomes and the First Experience

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Abstract

The paper provides a structured overview drawing on the results of the first two years of the large program of State Information Policy (SIP) in Education in the Czech Republic with a special focus on Science Education, primarily Physics Education.

In the first part of the paper the whole system of training in service teachers in using ICT in Physics and Chemistry is described, learning and teaching materials, online courses and the whole online supportive environment Telmae are briefly introduced.

TELMAE Portal, developed at the Laboratory of Distance Education, Charles University in Prague, includes 1/ teachers' online supportive environment, an open publishing environment with four editorial boards, 2/ open edited databases of educational sources and learning object databases, 3/ online journal and 4/ the so called „Gate to online courses". TELMAE has been in use since 2000. It has become the key learning, publishing and also monitoring and controlling tool for science teachers and educators in Science part of SIP in Education program.

In the second part of the article the author focuses on the key factors, advantages and limitations of such a large training program (several tens of thousands of teachers) and on the possible role of virtual learning communities of teachers, tutors and teacher trainers, arising from the creative background of Telmae supportive learning environment.

The possibilities and the potential for a wider (and international) use of experience, results and the developed tools that contribute to teachers' professional development in Europe are discussed at the end of the paper.

1 The State Information Policy in Education Program – Outcomes

The government of the Czech Republic has adopted formal public policies aimed at moving its society from a post-industrial model to an information and knowledge-based society. "*The basic objective of the state information policy is to foster and develop an information society and thereby to create the prerequisites for improving the quality of life of individual citizens….*" [2] The adaptation will come through expanded use of computers and their attendant technologies, such as the Internet and networking, by all governmental sectors; including education.

In short, the initiative is to serve as a modernizing influence for Czech society as well as serving its global interests by bringing the country in line with European Commission initiatives.

State information policy in Education

One of the general aims is the inclusion of ICT in the education system, which is supposed to enable the development of a real Information Society. From this perspective, the Ministry of Education's [1] main strategies are:

1. Provision of schools and libraries with computers connected to the Internet.
2. Presence of an ICT coordinator in each school to help teachers and pupils use the technology as a resource for teaching and learning.
3. A shift in emphasis in teacher training, moving from a methodology concerned with the transmission of information to one concerned with problem-solving; greater emphasis on the use of ICT.
4. Introduction of programs for lifelong learning.
5. Introduction of programs to encourage teachers, researchers and manufacturers to discover efficient ways of using ICT.
6. Analysis and assessment of ICT policy. [4]

In the following we will focus mainly on teacher education, in service training and other ways of professional development with respect to the main objective – to emphasize effective use of ICT in the classroom.

[1] In the Czech Republic the only official body responsible for supervising and promoting the national policy for ICT in education is the Ministry of Education.

2 Teachers Training and ICT – The Reality of 2003/2004

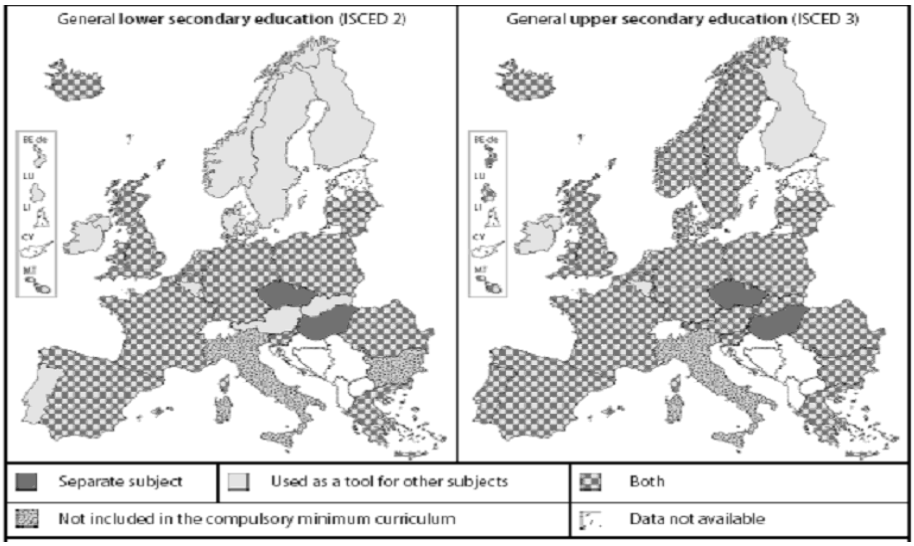

Figure 1. Approaches to ICT defined in the compulsory minimum curriculum. General secondary education (ISCED 2 and 3), 2002/03

At secondary education level, ICT forms part of the compulsory curriculum in practically all-European countries. In most cases, national curricula combine the two approaches to ICT (as a separate subject and its use as a tool for other subjects). In the Czech educational system, on both secondary school levels (upper and lower) the situation is quite exceptional. ICT is incorporated as a subject, only, and not as a tool for introducing other subjects or carrying out interdisciplinary projects.

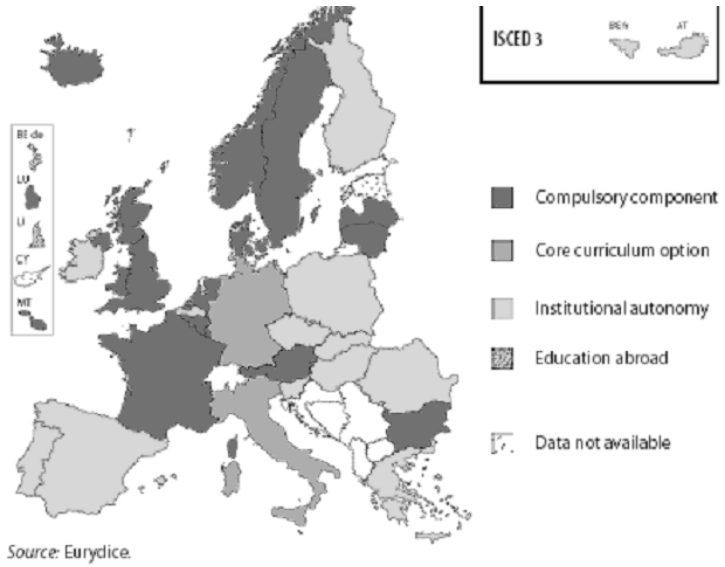

Figure 2. Inclusion of ICT in the initial education of all teachers (except specialist ICT teachers). General lower and upper secondary education (ISCED 2 and 3), 2002/03

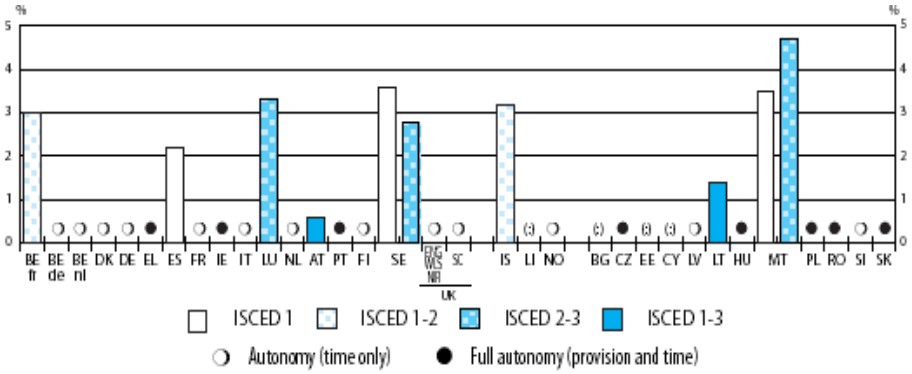

Figure 3. The share of compulsory teaching related to ICT, and the minimum number of hours devoted to such teaching, in the initial education of all teachers (except specialist ICT teachers). Primary and general secondary level (ISCED 1, 2 and 3), 2002/03

The primary objective is to prepare teachers, mainly in-service teachers, to use ICT effectively for their specific subjects. According to the graphs, presented above, future teachers in the Czech Republic might and might not at all be prepared for such a way of teaching (full autonomy of universities, involved in future teachers´ education). Considering the fact, that there is no compulsory system of professional development of in service teachers in the Czech Republic, the only and probably the most efficient solution is to incorporate such system into the State Information Policy in Education National Program.

3 Teacher training within the frame of SIPVZ

3.1 The three-level pyramid concept

The key and for many people probably the most surprising fact is that the SIP VZ National Program is assumed to train more then 200 000 teachers, including those at the pre-primary education level within approximately 3-4 years. That is why the State Information Policy in Education National Program adopted the 3 levels pyramidal model for in-service teacher training.

The basic level has been offered to in service teachers since 2002 with the main focus on obtaining basic ICT skills and knowledge on the level comparable to ECDL (word-processing, calculus, spreadsheets, browsing and effective searching for information, etc.). The intermediate level *("P"-level courses*) is more conceptual, subject oriented and focused mainly on the use of ICT in classrooms. The Intermediate level, again, is offered to all teachers, but only 25 % of them will get funding from the budget of the State Information Policy. The specialized courses *("S"-level courses*) are focused on specific topics and teachers´ needs.

4 The ICT in Physics Module

Science and partially physics represent only a small triangle in the intermediate section *("P"-level courses*) and of course a part of the advanced section *("S"-level courses*). In the area of Science, there are now 2 existing modules, namely ICT in Physic and ICT in Chemistry.

4.1 Main tasks

The Department of Physics Education at the Faculty of Mathematics and Physics, Charles University in Prague became the official guarantor for the ICT in Physics Education Module in 2003. The Department of Physics Education, as the guarantor, has several responsibilities:

1. To manage the training of approx. 10 000 in-service physics teachers in the period of two years (this represents the training of hundreds of tutors, development of reliable supportive environment for disseminating information, for efficient communication, for registration and payment, etc.).
2. To guarantee the quality of the conceptual and content scheme and supportive materials, the reliability of the online learning environment, including the learning objects repositories.
3. To guarantee the quality of the course outcomes (public accessibility and control). Guarantee is responsible for reviewing and publishing of all final projects, what represents the development and providing of a reliable Web based publishing environment, the management of editorial boards and the controlling of the workflow.

4.2 The conceptual and organizational scheme

Organizational, conceptual and content scheme of "P" level courses might be presented by the "ICT in Physic course". The best participants of "P" level course might become instructors. The requirements are very simple:

- to publish 5 additional projects approved by two independent cross reviewers
- active participation at a two-day seminar for instructors (focused mainly on used methodologies)

The successful instructors may organize face-to-face parts and participate (as teachers) in the online part of the course. To ensure the quality of the whole training system, the online part is under the supervision of the course guarantor; the course outcomes are under public control (the participants projects may be accessed by the public).

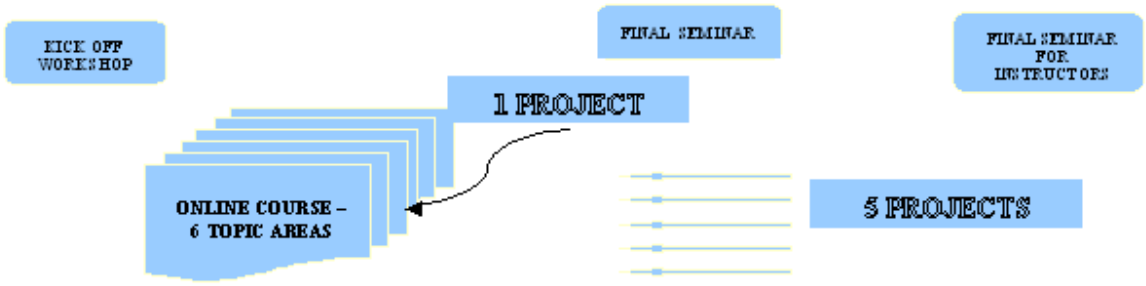

Figure 4. The basic organizational scheme for course P " ICT in Physics participants" (left part) and lectors (right part in addition).

***INITIAL FACE-TO-FACE TRAINING* (kick off workshop)**
Work in the laboratories (Computer aided school experiment, Effective ways to experimental data processing, Modeling in education – examples, recommendations)
ONLINE PART
Work within the online course (6 basic topics, including freeware, general Internet resources for physics, virtual and remote laboratories, remote sensing, etc.)
Work in the supportive environment TELMAE, mainly with lesson plans, published by course authors, tutors, and former students (high reliability and validity of published materials and sources)
Teamwork on the selected topic lesson plan, validation of developed materials by all team members, sharing experience.
FINAL MEETING/SEMINAR
Final project (lesson plan) presentation
Evaluation
PUBLICATION ON THE TELMAE PORTAL
Uploading and description of project files
Editorial process, including cross review
Publishing or refusing

Figure 5. The basic conceptual and content scheme of the " ICT in Physics" course and training

Supportive and publishing environment - TELMAE Portal

Students (teachers) interact with the supportive environment of the TELMAE Portal throughout the whole course of the study (online as well as traditional frontal). Management of the course, communication and feedback are provided by VLE system Learning Space (pilot run also in Moodle and Czech system EDEN). The supportive environment TELMAE includes databases of learning objects, tools for publication, evaluation, editing and communication and, of course, various other services and tools for different users – students, common users, reviewers and instructors.

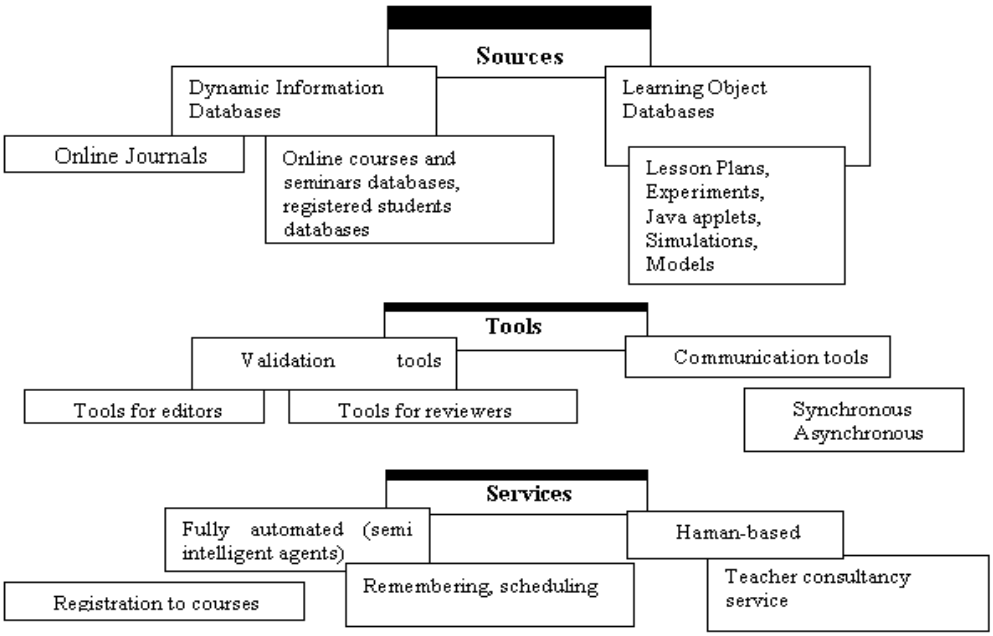

Figure 6. The basic scheme of supportive environment on TELMAE educational portal

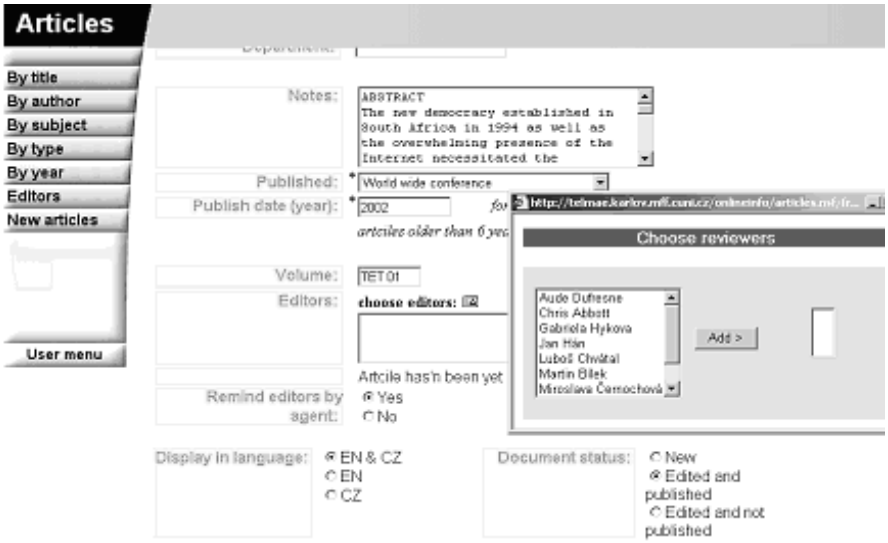

Figure 7. Online Journal TELMAE – database of articles and papers – reviewer's view. Similar type of sorting is available to common users (left navigation column).

The supportive environment of the TELMAE Portal[2]

[2] The number of teachers who are supposed to go through the SIPVZ courses is considerably high. Naturally, it is convenient to use Web based learning as a part of in-service teacher training. However, despite the government's declared liberalization policy, the telecommunications industry remains primarily a state monopoly and e*ffective liberalization has just started.* **Access to web-based learning and resources** for in service teachers is still problematic, supposedly due to their lower income status and the above mentioned technical issues.

serves as a reliable source of information (in Czech language) for students, as well as an environment where it is possible to publish one's own ideas – e.g. a kitchen experiment or a lesson plan.

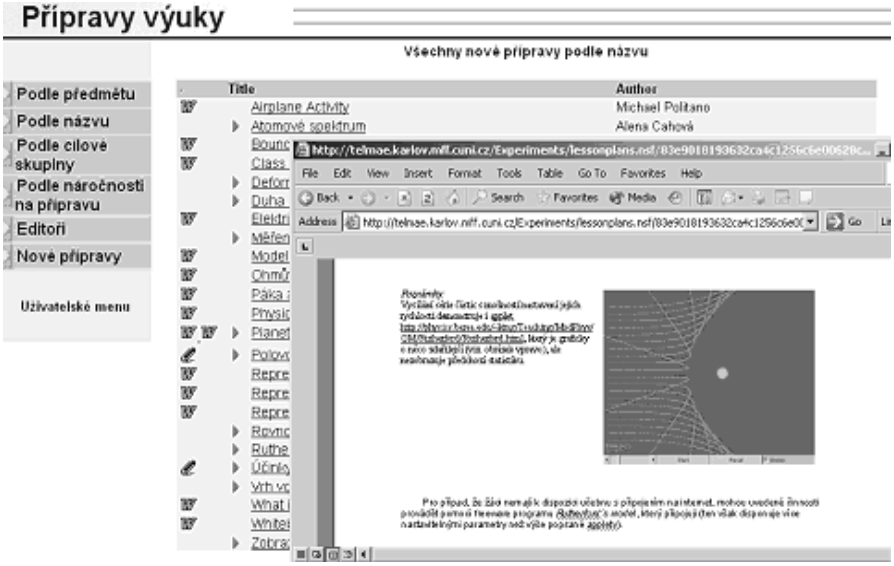

Figure 8. The supportive database of lesson plans. The back window, right strip – basic database tools for ordering, the back window, main area – the list of lesson plans ordered by title, the front window – an example of students work – lesson plan" Rutherford scattering"

Selected outcomes in particular

The first students´ projects have already been published on the TELMAE portal. Each student's work (lesson plan) is reviewed by two independent reviewers, in the same way as all the work done or contributed by common users, contracted authors and "P" level course instructors. In the case of Physics and Chemistry reviewers are selected from Physics and Chemistry experts and specialists on didactics of each subject area or teachers with long-term practice. Not all contributed projects are approved by the reviewers, so far one half of the students´ projects have been published.

Conclusions - Experience

In-service teachers do not seem to have major problems with laboratory work done during seminars or with managing the virtual environment, either the supportive environment or the online course itself. Students´ attitudes differ though, primarily because of psychological barriers and distance from the study (insufficient self-discipline). Often it is also the slow Internet connection that causes problems in the online part of study. Despite these issues, majority of students is able to complete the course successfully. Some of the older students manage to overcome the above mentioned barrier for the first time during the course and since they are well experienced teachers, their results then become examples for other students (see contributed projects on TELMAE). One of the major mistakes observed is students´ "effort" to use ICT in class just for the sake of using it, no matter if it has any contribution to learning. Overall, it is crucial to pay attention to expertise, active constructivist approach to learning and "sensitive" incorporation of ICT to appropriate areas and learning situations.

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