Abstract

The actual changes recorded in the society involved a clear redesign of the teachers’ work. Nowadays teachers’ professional competencies have to be acquired during training processes planned under various national or international projects oriented on school teacher training. Furthermore, a very easy way for measuring the efficiency of an actual teacher training programme implies the questioning of the target group before and after the training activities, followed by a rigorous comparative analysis with the view to establish the teacher’s progress (on the one hand) and to assess whether the training programme was in line with the initial expectations (on the other hand). This paper presents a series of figures resulted from the answers given in the assessment forms filled in by the teachers who attended the training modules “Virtual Instrumentation in Science Education” organized in the frame of Socrates-Comenius 2.1. European project “VccSSe - Virtual Community Collaborating Space for Science Education”. In this direction, specific sets of assessment tools were created during the project phases with the view to evaluate the quality of the training process. In this sense, in order to assess the formative impact of the training materials, an experimental design was associated with the training process which included an initial and a final survey based on questionnaires.

Keywords: assessment tools, virtual experiment, teachers’ feedback, Comenius 2.1 Project;

1. Introduction

During last years, in-service teachers training became an important aspect that national education systems in Europe included as a priority and strategic activity. Generally, the training targeted on teacher’s professional development, considered as a lifelong learning activity (Delannoy, 2000). Educational programmes try to answer to teachers’ needs as their career advances, the trainers being required to raise the quality of instruction and to adapt the contents to the actual technological development. Related to the evaluation of such teacher training programmes, one of the first steps of measuring of their efficiency can be obtained directly, in a simple way, by questioning the target groups before and after the training activities and make comparative analysis to establish the progress and how the training programme reached the beneficiary expectations.
In general, this is the main procedure met in the European transnational educational projects where teacher training programmes represent the core activity.

According to European programmatic documents, the educational programmes must offer a real contribution to teacher education and training, according to the Lisbon strategy (Education and Training 2010), in the following areas: (a) the continuum of the teaching profession, from initial teacher education to induction and continuing professional development; (b) development of partnership approaches between teacher training institutions and the wider world which emphasize experience-based learning (links between school and the worlds of research, business, and society at large); (c) approaches designed to encourage teachers to develop new pedagogical methods to increase pupil motivation.

Most of the selected projects in Europe - under the former Socrates (and actual Lifelong Learning Programme) - envisaged the directions mentioned above.

2. Method

In the respect to the priorities and specific activities mentioned in the Socrates Comenius programme - (a) teacher and trainer education; (b) information and communication technology (ICT) in education and training; (c) increasing participation in Mathematics and Science, the partnership of the Comenius 2.1 Project “VccSSe - Virtual Community Collaborating Space for Science Education” explored, analyzed and found a common interest for new ways to provide in-service teacher training in the area of Sciences. This led to a solution that tried to increase the participation in Mathematics and Science studies, represented by the promoting of virtual experiments as new method and educational resource for Science in-service teachers (Gorghiu, 2009).

The project - which involved nine institutions from five countries (Romania, Spain, Poland, Finland and Greece) - had in view to adapt, develop, test, implement and disseminate training modules, teaching methodologies and pedagogical strategies based on the use of Virtual Instruments in the classroom, through ICT tools. In order to achieve the assumed objective, the partnership created and developed materials which constituted the basis for the training modules “Virtual Instrumentation in Science Education”, with a total duration of 40 hours. In the end, the participants designed virtual experiments (as learning objects) for different educational levels (Gorghiu et al., 2010).

Specific sets of assessment tools were created during the project phases with the view to evaluate the quality of the training process. In this sense, in order to assess the formative impact of the training materials, an experimental design was associated with the training process which included an initial and a final survey based on questionnaires. The Assessment tools were produced by the project evaluation team who designed and refined the forms addressed to teachers and pupils in order to assure their internal consistency and clarity. The questionnaires included specific, but diverse number of topics differentiated according to the moment of their delivery and target group particularities. Each questionnaire included different types of answer appreciation scales which allowed relevant data processing. In this sense, the forms were composed mainly from multiple choice items, and with few exceptions, open questions were avoided due to the language barrier raised during the analysis process. The forms were translated in the partnership national languages and they were delivered at the initial and final stage of the training programme, using an electronic format that teachers could access directly from the project Moodle course management system or project website.

The first group of Assessment tools was introduced in the Training Stage and consisted on two different on-line forms - Teachers’ Initial Evaluation and Teachers’ Final Evaluation. The questionnaires focused on teachers’ understanding and attitude towards the use and efficacy of ICT, on the possibility to extend the implementation of virtual experiments in Science education, as well as on their appreciations related to the training programme and aspects that made it effective. A particular topic included in the Teachers’ Initial Evaluation form was related to the teachers’ training needs, as they were declared in strong relation to the field of new technologies and educational software. While this questionnaire included general questions that had in view the mentioned subjects, the Teachers’ Final Evaluation form included more specific items referring to the use of virtual instrumentation in Science education and its educational value.
The **Implementation Stage** was focused on the practical testing of the educational products (*Learning Objects*) created by the trained teachers. In this respect, the evaluation had as main aspect the impact of the teachers’ products in the classrooms, the **Teachers’ Impact Questionnaire** emphasizing on the teachers’ opinions related to virtual experiments based-lessons. In addition, the **Pupils’ Feedback Questionnaire** was addressed to pupils with the view to collect their impressions concerning the use of the virtual experiments in Science lessons, near their educational and motivational gains.

The electronic format (for the questionnaires addressed to trained teachers) allowed the project team to create a **database** for registering the answers, having in this way a large amount of data at disposal. As example, figure 1 illustrates the on-line form of **Teachers’ Impact Questionnaire**.

The relevance of the collected data was assured by the large number of the respondents, by different age groups of pupils, education levels and nationality. Till the end of the project, a total number of 363 teachers were questioned and more than 2800 pupils expressed their feedback.

Beside the evaluation activities made by teachers and pupils, in order to evaluate the project activities, the partnership was asked to fill in a yearly **Evaluation Questionnaire**. The questionnaires proposed some items related to the assessment of the training process. Based on those questionnaires, consequently, **Evaluation Reports** were provided by the project team.

### 3. Results and Discussions

Using virtual experiments in Science Education became an important method, taking into account their power on creating simulation-based learning environments. In this respect, the VccSSe project answered to an actual trend and provided training modules that promoted new teaching methodologies and pedagogical strategies based on the use of virtual experiments for Science Education. Practically, the project represented an opportunity for exploring the educational use of virtual experiments in the classrooms, in different Science learning contexts.

The training programme (based on the **Training Modules** “Virtual Instrumentation in Science Education”, together with the related **training materials**) was dedicated to in-service teachers from the whole palette of educational levels (primary, lower secondary and upper secondary levels), basically from technical and scientific areas, with a background in Mathematics, Physics, Chemistry, and Technology. Also, a minimum background and experience in the educational use of ICT represented a good criterion to enrol teachers in the training process. But the participation to the training was not limited to teachers belonging to the same school in the cases where many members of a school (or department) decided to be enrolled. Anyway, the training process was able to meet the demand of all interested members from the participating institutions.

Specific discussions can be made around some questions introduced in the **Evaluation Questionnaire** of the project second year. As example, to the question: *how easy or difficult did you find identifying the teachers that participated to the training program?*, the project partners answered they did not have problems with persuading teachers to be involved in such course due to the fact they were fully informed about the course either via e-mails, local media or by visiting schools, discussions on local staff coordinating teachers’ level; also teachers shared the information among them. At the same time, to the question: *how easy or difficult did you find motivating teachers for accomplishing the tasks during the training period?*, the project partners answers are different, ranging from “primary school teachers were highly motivated, especially while using specific software”, “it was not hard, most of them were very interested”, through “it was easier when teachers understand better the role of ICT to support their own work in meaningful ways”, to “the task was very difficult to accomplish due to some lack of computing experience” or “rather difficult, but the reasons lie behind the Project and do not depend on the quality of the Project activities” or “teachers have no motivation to improve their teaching practices; in our school there is no adequate infrastructure; our teachers like to and access all the training materials included in the web-page of VccSSe but they did not prefer to perform some demanded activities...”.

Finally, from a total number of 363 teachers (who were enrolled in the training process), 206 teachers produced 218 **learning objects**. All the **learning objects** were uploaded in the **Database for Virtual Experiments (Teachers’ Products Matrix)**, an important section of project webpage (http://www.vccsse.ssai.valahia.ro/main/matrix).
The channels used for supporting the teachers’ activities and the preparation of learning objects were appreciated as welcome and very efficient. Training resources were designed and offered to teachers as an important base for finalizing the training process at a whole. In addition, face-to-face meetings and appointments for registering the teachers’ progress were held. It is also important to mention that the modern communication modalities (through the facilities proposed by the e-learning platform) gave an impulse to a part of teachers to be motivated in the construction process of their own virtual experiments, as well as for improving their knowledge at a high level.
At the same time, some problems arisen from the teachers work were registered. To have, an image of the most frequent faults there can be mentioned: (a) incompleteness of some lesson plans / scenarios (especially in the description of the evaluation and experiences resulting from using the proposed software applications); (b) technical problems related to the use of some software applications.

However, the designed learning objects have many strong points: (a) content adequacy; (b) methodology attractiveness; (c) compatibility with the school curriculum.

Generally, the training process was assessed by the participants as very good, considering also the fruitful cooperation between tutors and participants. In fact, the most important aspect emphasized by the teachers was the best feedback received by them on the whole period of the training process.

In particular, having in view the content of the training, the teachers appreciated that the virtual experiments and related tools provided a new motivation for designing innovative, active and student centered Science lessons.

4. Conclusions

Undoubtedly, evaluating a training process is not an easy task, but it can be made in a proper manner just questioning the target groups before and after the training activities, and then producing a comparative analysis for establishing if the training programme reached the initial expectations. That procedure was implemented also in the VccSSe project, for collecting the feedback from the participants to the training modules “Virtual Instrumentation in Science Education”. Specific assessment tools were produced by the project evaluation team who designed and refined the forms addressed to teachers with the view to assure a suitable internal consistency and clarity. Special questionnaires were provided in strongly relation with the achievement of the training modules goals, benefits expected from the use of virtual experiments in the classrooms, proceeding of classes and proposed software.

Generally, the feedback was a very positive one, underlining on the efficiency of virtual experiments implementation in Science lessons, as a common pedagogical method. In addition, the training programme (as a whole) was received as a well organized one, having a good balance between theory and proposed practical activities, even a big part was led as distance learning activities, using the Moodle platform.

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