CONSIDERATIONS ON PUPILS' FEEDBACK CONCERNING THE USE OF VIRTUAL EXPERIMENTS IN SCIENCE TEACHING

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1. Introduction

ICT represent an inestimable presence in the educational environment. It provides many possibilities of usage for the modernization and the improvement of teaching and learning process, increasing at the same time the quality of education (Fig. 1). But there is always a question concerning the effective and pedagogical usage of ICT in the classroom. The educational efficacy of the new approach has been tested, the results emphasizing that using of ICT in teaching process provides pupils an active leaning environment that will lead to an easier understanding of the Science concepts. The recent researches have emphasized that the usage of the simulations is benefit in the teaching process of Science concepts. Due to those optimistic results, the usage of virtual instrumentation in Science teaching has grown considerably in the last decades. Different software applications were developed for designing virtual experiments that simulate the real phenomena which are taking place in different systems. These experiments can be a proper solution for teaching the pupils how to design their own learning experiences for a better and deeper understanding of the theoretical concepts.

The paper illustrates some aspects concerning the impact of virtual experiments implementation in the teaching-learning process on different areas of the Sciences area in Romania. The study was made in the frame of the three years Socrates-Comenius 2.1 project “VccSise - Virtual Community Collaborating Space for Science Education” (No. L5999-CP-IE-2006-1-RO-Comenius-C21), co-funded by the European Commission, Education and Training School Education; Socrates, Comenius.

2. Description of procedure

As virtual instrumentation represents a real revolution in the field of instrumentation and its power in creating simulation-based learning environments is well-known, the project is addressed - on the one hand - to in-service teachers training on using virtual instruments in the teaching process of different Science areas (Mathematics, Physics, Chemistry and Physics) and - on the other hand - to the pupils - as end-users - who benefit by the implementation of the virtual instruments in the classrooms. One of the targets of the VccSise team was to study the pupils’ feedback concerning the use of virtual instruments in Science teaching.

During the project-life, a collection of assessment tools have been produced by the Evaluation Group of the project partnership. Two questionnaires for initial and final evaluation of the teachers who participated to the Training Modules “Virtual Instrumentation in Science education” are the core of the project. A questionnaire for the teachers and a different questionnaire concerning the impact of the virtual experiments in the classroom, addressed to teachers and pupils. The Pupils’ Feedback Questionnaire contained five questions and was applied to pupils who participated to the project. At the end of the implementation process the form has been filled in by 958 pupils from Dambovita County, enrolled in all education levels, from primary to upper secondary schools, after using of different virtual experiments in teaching Mathematics, Physics, Chemistry, Nature Sciences and Technology.

The study was realized on the base of the analysis of the pupils’ answers collected from the “Pupils Feedback Questionnaire” designed by the Evaluation Group of the partnership and delivered by every pupil after the implementation process. The analysis was performed on a sample of 958 pupils (8-18 years old) as previously mentioned. The pupils’ distribution by the level of education is illustrated in Table 1. The virtual experiments designed by the teachers at the end of the training modules were implemented in different areas, like Mathematics, Physics, Chemistry and Technology.

3. Results and Discussion

After the implementation of their virtual experiments in the classroom, the involved teachers considered the practices they had developed to be largely successful in terms of enhancing pupils’ learning. The increasing of pupils’ motivation, the deeper understanding of the theoretical concepts and the easier clarification of a model or a hypothesis by them have been identified after the usage of virtual experiments in teaching of different Science areas. This aspect is in concordance with other recent papers concerning the critical impact of the teachers beliefs about the benefits of using ICT in the classroom.

Concerning the answers of pupils from primary school to the Pupils’ Feedback Questionnaire, it has to be underlined that all the pupils that filled in the questionnaires participated to the implementation of different virtual instruments designed with Cabry Geometry II Plus or GeoGebra software in Mathematics lessons. In some of the lessons, the virtual instruments are visible only in certain steps of the lesson, and in others, the whole lesson can be lead by using these instruments. The lessons have been animated by using the virtual experiments during the teaching process. They have the advantage of changing by simulation, animation and logics different dimensions of the studied aspects, supporting the learning process, in accordance with different types of learning.

Fig. 1 Pupils’ distribution by level of education

On the lower secondary level, 260 pupils filled in the feedback questionnaire, 121 of them participating in the 8th grade, 87 to Chemistry lessons, 12 to Physics lessons and 40 to Technology lessons, 76 of them filling in the feedback questionnaires for Mathematics lessons, 101 for Chemistry lessons and 20 for Physics lessons. Concerning the positive aspects of the lesson where the virtual experiments were used, the pupils’ comparative answers, by different level of education of participating pupils are emphasized in the diagram presented in Figure 2.

Fig. 2 Pupils’ distribution on teaching areas

Analysing the collected data from different level of education, it can be stressed that even the age of the respondents was quite different, the answers were similar, proving the advantages of using the virtual instrumentation in teaching different subjects. It is a fact that 41.5% of pupils considered the use and implementation of the VI in the teaching/learning process very useful and found it suitable for a better and easier understanding of different subjects. 34.0% of them emphasized the importance of using virtual experiments in Physics, Chemistry, and other 21.3% considered the virtual instruments like positive aspects related to the usage of computer in the classroom, but the most important thing was that only 3% of pupils didn’t emphasize any positive aspect of the VI implementation during the teaching process.

4. Conclusion

The results presented above have emphasized that the use of virtual instruments can change the social dynamics of the classroom. The information and learning tasks are influencing the notion of authentic learning by changing the learning context. Analyzing the pupils’ answers, the following aspects could be pointed out: a) the easier and deeper understanding of the content due to the usage of VI tools; b) the pupils’ desire to extend the use of VI tools in teaching process to other disciplines; c) the increasing of the quality of the learning process; d) the raising of the attractiveness for the teaching modalities which combine VI with traditional didactic activities.

The teacher remains the one who is deciding the manner and the moment when and which the VI tools are suitable to be used in the teaching process in order to assure the fulfilling of all the objectives established in the beginning of the lesson. In addition, even the pupils are really delighted by the usage of virtual experiments instead of the real ones, the teacher does not forget that virtual experiments cannot replace entirely the real experiments developed in specific laboratories, that are focused not only for understanding the theoretical concepts but also to develop specific skills and abilities by using different utensils and laboratory equipment.

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