THE USE OF VIRTUAL EXPERIMENTS IN SCIENCE TOPICS TEACHING PROCESS FROM THE VIEW OF TEACHERS' FEEDBACK

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Abstract:
The virtual instrumentation can be used in the educational contexts for simulating the real phenomena which are taking place in different systems. Aims and goals in Sciences school subjects focus on competences of scientific information processing, research skills, and also humanistic values. In this sense methodology highly recommended is centred on inquiry based learning, experiential learning, discovery based learning. This paper presents some aspects concerning the impact of virtual experiments implementation in the teaching/learning process on different topics of the Sciences area in Dambovita County (Romania), based on the results collected from 24 Romanian in-service teachers who attended the "*Virtual Instrumentation in Science Education*" training modules, organised in the frame of the three years Socrates Comenius 2.1 European Project *VccSSe - Virtual Community Collaborating Space for Science Education* (http://vccsse.ssai.valahia.ro, project no. 128989-CP-1-2006-1-RO-COMENIUS-C21) co-funded by the European Commission, Education and Training, School Education: Socrates: Comenius [1].

Keywords: virtual instrumentation; virtual experiment; teachers' feedback; assessment tools; Comenius 2.1 Project

1. Introduction

ICT represent an incontestable presence in the educational environment. It provides many possibilities of using for the modernization and the improvement of teaching and learning process, increasing at the same time the quality of education [2]. The education process should be widely assisted by new technologies which allow for the common usage of multimedia, such as the computer, projector, interactive board, etc. It is essential to use

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the computer as a teaching and learning tool for different subjects other than computer science.

Achieving educational goals should be assisted by schools libraries with uploaded sources, in the form of both books and multimedia. Intentional and selective use of the Internet should be its adequate completion. Nowadays the introduction of virtual instrumentation in Geometry, Physics, Chemistry, or Technology teaching becomes one of the usual methods.

The recent researches have emphasized that the using of the simulations is benefit in the teaching process of Science concepts. The educational efficacy of the new approach has been tested, the results emphasizing that using of ICT in teaching process provides pupils an active learning environment that will lead to an easier understanding of the Science concepts. New innovative ways of contents structuring Sciences contents tend to be structured in an inclusive manner, this tendency being obvious in primary school and less present in secondary level.

The paper illustrates some aspects concerning the impact of virtual experiments implementation in the teaching/learning process of different Science areas (Mathematics, Physics, Chemistry) in Dambovita County (Romania). The analysis was made in the frame of the three years Socrates-Comenius 2.1 project "*VccSSe - Virtual Community Collaborating Space for Science Education*" (no. 128989-CP-1-2006-1-RO-Comenius-C21), co-funded by the European Commission, Education and Training, School Education: Socrates: Comenius.

2. Materials and Methods

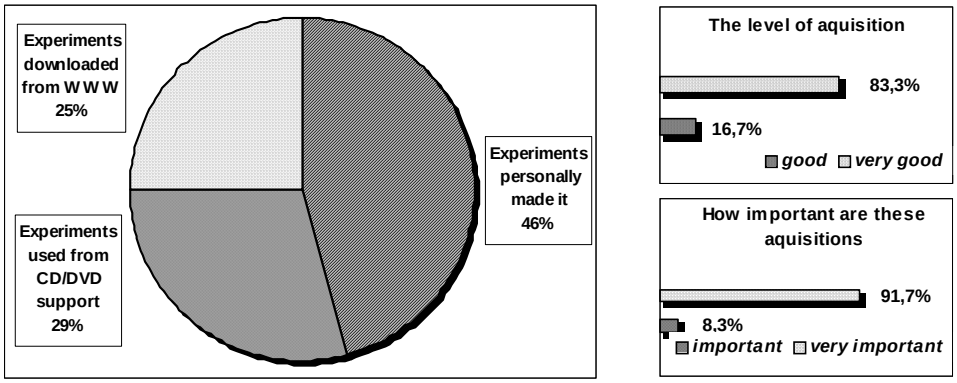
In order to assess the pedagogical use of virtual experiments, those 24 Romanian in-service teachers involved in teaching activities in Dambovita County (Romania) who attended the "*Virtual Instrumentation in Science Education*" training modules expressed their feed-back in three specific web-evaluation questionnaires: the initial one (before the course), the final and the impact ones (after the course). The questionnaires had particularly questions dedicated for evaluating the level of their knowledge acquisition on creating and using virtual experiments in the classroom, achieving the goals and purposes of the *training modules* and rating the presented virtual instrumentation software (*Cabri Geometry II*, *LabView*, *Crocodile Clips* and *GeoGebra*).

During and after the course teachers involved reflected upon the impact the VI (Virtual Instrumentation) tools and application may have and actually had in insuring the effective science contents, by filling in a questionnaire regarding the general attitude towards virtual instruments used in the classroom settings, their opinion regarding the impact VI have on different aspects of Science teaching and learning, the difficulties encountered in using VI in science lessons and the intention of using such tools in the future. At the same time, the teachers were asked to assess as the adaptations they would make in the future situations when using VI tools.

This study is based on the two questionnaires for initial and final evaluation of the involved teachers. Here are just some considerations resulted from the teachers' answers.

3. Results and Discussions

As for most of the teachers using virtual science applications in the classroom wasn't something new (about 63% of them have used before and 87,5% already conducted experiments in the lessons), difficulties were reported in management of the classroom especially in: evaluation of students performance as well as in access to hardware or general management of students. Figure 1 shows the rates of the acquisitions of the examples of VI experiments before and after attended training modules and classroom implementation.



a) b)

Fig. 1 *Rates of the source of the experiments acquisition before (a) and designing virtual experiments using learnt software (b).*

Having in view the achieved goals, the in-service teachers were asked about their knowledge gained on different aspects:

- knowing the basic principles of the implementation of the experiments in the classroom;
- knowing the principles of creating the project of the experiment;
- their knowledge in creating / designing and using virtual experiments made it using learnt software – their feedback was generally appreciated as very good (around 72% of them expressing their knowledge on creating and using of virtual instruments for own teaching area at high level).

Figure 2 and 3 illustrates the rates of their answers.

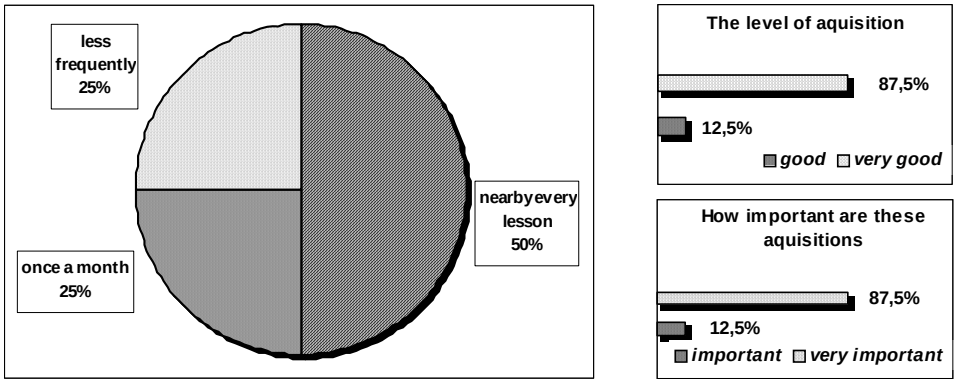


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Fig. 2 *Rates of conducted experiments before (a) and the knowledge of the basic principles concerning the implementation of the experiments in the classroom (b) .*

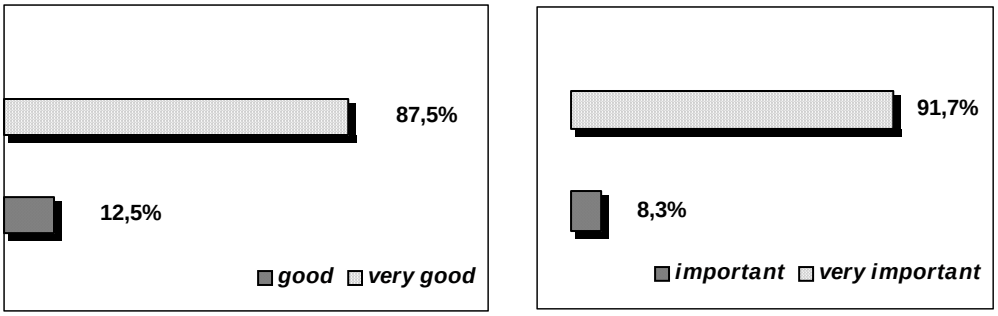

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Fig. 3 *The knowledge rates of the principles of creating the project of the experiment: the level (a) and the importance of the acquisitions (b).*

Concerning the teachers' expectation from the course, the main ideas can be underlined (their percentage in teachers' answers was almost equal):

- using the computer and ITC tools in a better manner in the classroom;
- creating virtual instruments who can be used in the classroom with meeting curriculum requirements;
- acquiring new knowledge and information who can be useful in the teaching process;
- increasing the understanding regarding students' learning and motivation by using virtual instruments: improves students' understanding of Science

contents, developing students' abilities in data interpretation and solving specific experiment tasks, improves students' learning motivation and increasing lessons interactivity and atractivity.

The virtual experiment must be well framed in the lesson context. Thus, a lesson plan has to be designed carefully, good structured and guided to capture and maintain the interest of the student - for this reason, the interactive components in a lesson are acquiring more and more importance [3]. Figure 4 illustrates the main purposes of using experiments in the classroom in the view of involved teachers.

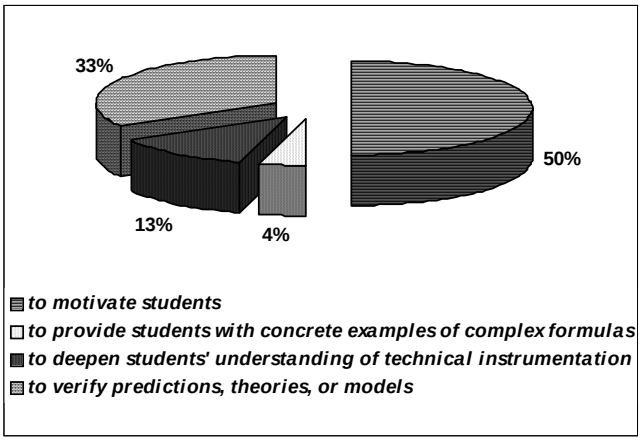

Fig. 4 *Rates of main purposes of using experiments in the classroom*

The teaching process should take into account students' individual learning styles as well as their special education needs having in view that the designed tasks must take in consideration students' experience, knowledge and skills [4]. Most of the teachers (over 80%) have pointed that students usually participate in a group work to an experiment.

As at main benefits after the using of the virtual experiments in the classroom, teachers' answers were rated in relation with the following issues:

- improving students' understanding of Science contents and students' learning motivation;
- supporting correct application of knowledge;
- increasing the Science didactics awareness;
- improving the understanding regarding students' learning and motivation;
- challenging for improving the teaching behaviour.

Figures 5 - 6 present the rates of the teachers' answers. On the base of the illustrated results, it can be remarked that all the analyzed issues gained an important improvement due to the virtual experiments used during the Science lessons.

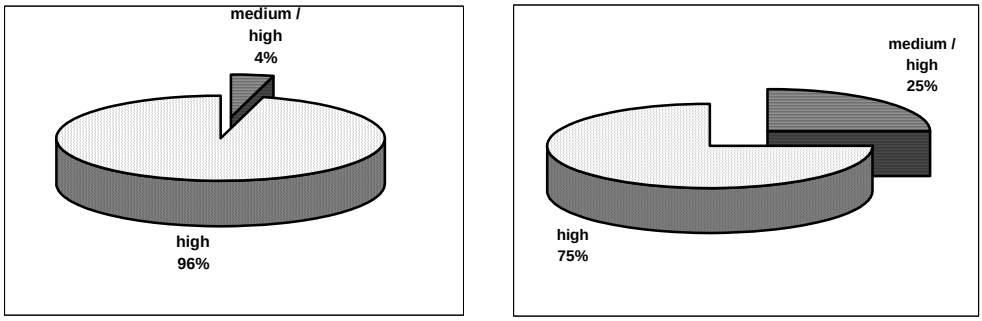

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Fig. 5 *Rates for the benefits achieved from the classroom when using VIs related to: improving students' learning motivation (a) and improving the understanding of Science contents (b).*

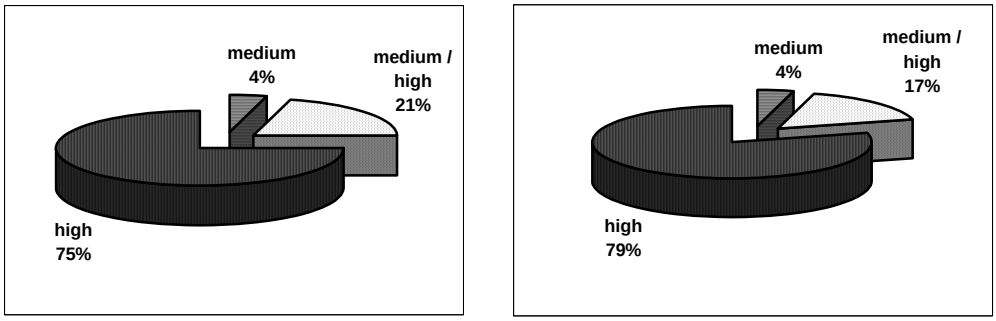

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Fig. 6 *Rates for the benefits achieved from the classroom when using VIs related to: increasing the Science didactics awareness (a) and supporting correct application of knowledge (b).*

Concerning other aspects encountered in the implementation of virtual experiments in different lessons, the teachers' answers emphasized some things that affected the implementation process, like displaying and working with virtual experiments may be time consuming in certain school settings (low number of computers for individual intervention or low computers use abilities).

4. Conclusions

The results presented above have emphasized the impact that the use of virtual instruments can have it on different aspects of Science teaching and learning. The

information and learning tasks are influencing the notion of authentic learning by changing the learning context. Having in view the teachers' answers, the following issues could be pointed out:

- virtual instrumentation applications are regarded as a source of inspiration in teaching actions that should be used as an alternative and complementary to traditional tools, and as a means for improving students' understanding of abstract concepts;
- improving students' motivation for learning in creating and maintaining students' interest for science topics as well in obtaining better results in evaluation;
- increasing the attractivity for the teaching modalities which combine VI with traditional experiments in Science topics.

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