SOLVING GEOMETRICAL LOCUS PROBLEMS USING DYNAMIC INTERACTIVE GEOMETRY APPLICATIONS

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1. Introduction

A geometrical locus is mathematically defined as the set of all points or lines that satisfy or are determined by specific conditions. Even this definition seems to be a clear one, geometrical problems which proposed the searching of a locus have proved to be not as simple for be solved by pupils. Practically, most of pupils have difficulties when demonstrating a geometrical locus. To tackle these kinds of problems when teaching, it can be started to link to the fact that all the geometrical locus problems are included in the family of problems with equivalent conditions. More than that, the geometrical locus problems look like the problem of finding a reciprocal true. In this sense, the pupils have to know clearly the theorem structure, the way of its formulation and the fact that a reciprocal proposition becomes a reciprocal theorem if this is demonstrated true. In essence, the geometrical problems where the locus is known are problems in which a multitude of plan points is defined in two ways, for the pupils remaining the task to demonstrate that these two multitudes are equal. That's why, from the methodological point of view, the teacher's responsibility has to be focused on pupils knowledge concerning the definition of two equal multitudes and the theorem equivalent with that definition.

As the practice proved that the geometrical locus problems are difficult to be understood and solved by pupils, the traditional didactic method which involved the using of the blackboard and chalk became over fulfilled. New didactical strategies and methods have to be take in consideration promoting the solving the problems and, ICT has to be integrated as a main component. One of the best opportunity for presenting ICT as a specific element of a didactical strategy appeared together with the approval of the VccSSe Project.

2. The VccSSe Project

The three years Socrates Convenio 2.1 European Project “VccSSe - Virtual Community Collaborating Space for Science Education” (http://vccsse.ssai.valahia.ro) has started in October 2006 and proposed - as declared objective - on targeting to adopt, develop and disseminate teaching modules, teaching methodologies and pedagogical strategies based on the use of Virtual Instruments, with the view to their implementation in the classroom, through ICT tools. The main objective of the project has been achieving involving pedagogical and specific particularities of different countries involved in the partnership. The project is coordinated by Valahia University of Târgovişte, Romania, the partnership being composed by 9 educational institutions from Romania, Spain, Poland, Finland and Greece.

One of the most important outcomes of the project was to create and develop specific materials for training on using Virtual Instrumentation in Science Education [2]. The training materials were dedicated to in-service teachers from primary and secondary schools involved in Sciences subjects in the partners' countries. Finally, the training materials presented four selected Virtual Instrumentation environments (LabView, Crocodile Clips, Cabri Geometry and Geometer's Sketchpad) and the teachers - training also - had the possibility to choose one of the software environments for using ICT main functions and creating at least one learning object that has to include a V application. The Cabri Geometry II Plus was selected under the Module (Module Object-Oriented Dynamic Learning Environment) e-learning platform [1], [3]. VccSSe training modules tutors and participants experienced the Module's course features and expressed their opinions in specific discussions.

3. Cabri Geometry II Plus Software

Cabri Geometry II Plus allows the dynamically exploration of Euclidian, transformational and coordinate geometry. It makes the Mathematics concepts easier to learn thanks to its kinaesthetic learning approach. The geometric figures, equations or graph functions are easy to be created on the Cabri-screen, practically becoming manipulable objects. In this way, the software gives to pupils the tools and motivation to dig deeper and actively explore and also to be creative and to experience the interactive and constructive methods and those based on the procedural thinking. Cabri II Plus is developed to solve infinity of geometrical constructions on the screen, with the same characteristics but with different shapes. Each geometrical shape with Cabri Geometry II Plus represents in fact a class of geometrical constructions with common geometrical properties. The variety of the offered instruments gives to the users the possibility to select the most proper one in order to structure a strategy for solving a problem and build a strategy for obtaining the results in many ways. At the same time, Cabri offers a set of instruments necessary for the development of new visual and conceptual elements of the geometrical logics.

Students can create and verify their hypothesis, create alternatives for the geometrical construction or can submit the images into document processors and send them on the Internet via Cabri Java [8], [9].

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4. Examples of Solving Geometrical Locus Problems with Cabri Geometry II

The Training Modules developed in the frame of the VccSSe Project allowed the participants to choose the topic and prepare the related learning objects. Based on the specific curricula for primary and secondary schools, the Mathematics teachers chose various topics, the geometrical locus problems becoming a provocative challenge. In this respect, the teachers felt that when using Cabri, one of the most interesting applications for pupils are dedicated as a specific element of a didactical strategy appeared together with the approval of the VccSSe Project.

As the practice proved that the geometrical locus problems are difficult to be understood and solved by pupils, the traditional didactic method which involved the using of the blackboard and chalk became over fulfilled. New didactical strategies and methods have to be take in consideration promoting the solving the problems and, ICT has to be integrated as a main component. One of the best opportunity for presenting ICT as a specific element of a didactical strategy appeared together with the approval of the VccSSe Project.

5. Conclusion

The presented experiments together with others realized by the participants in the frame of the mentioned Training Modules were uploaded in the VccSSe-Products Matrix - an on-line database which includes learning objects / e-learning resources developed for Sciences education. The Matrix is open for public access and downloading for the educational community with the view to the use of the virtual experiments for educational purposes. The e-learning technologies can follow the same philosophy of working through an e-learning platform and presenting good practices or other results as examples (like the case of VccSSe).

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References