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# Teachers' Continuous Professional Development on Actual Educational ICT Issues, in the Frame of the ProWeb Project

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## Abstract

*The teachers' continuous professional development represents an imperative condition in nowadays education of the contemporary society - the information society based on knowledge. In this context, we assist to a multiplicity of roles that must be performed by teachers, focusing on the formative component of the educational process.*

*In this respect, looking to the future, the students need not only to acquire the knowledge, but rather the meta-cognitive skills, in order to enable and structure an own style of learning, which value the personality, the development of interdisciplinary connections and the knowledge transfer, in the context of solving problems faced mostly in their everyday life.*

*In the presented study, we intend to investigate the views of the teachers involved as trainees in the project "ProWeb - A Network for Teachers' Continuous Professional Development in order to Use Multimedia, Virtual Instrumentation and Web 2.0 in the Curricular Area of Mathematics and Natural Sciences" (POSDRU/157/1.3/S/141587) - developed in the frame of the Sectoral Operational Program for Human Resources Development 2007-2013 -, related to the effectiveness of the design and realization of a training approach based on using ICT.*

*The research methodology consisted on performing of a 12 items structured interview on a sample of 60 teachers, concerning their perception and evaluation on their own digital skills and positive effects, that could be generated by the implementation of ICT instruments, in the context of Mathematics and Science lessons.*

*The obtained results - after processing the teachers' answers - come to confirm our expectations. Thus, we find that teachers realized the importance of their professional*

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*training, focusing on training and digital skills development, but also on recognizing that ICT is beneficial for multiple values in the educational process.*

### **Keywords**

*Continuous professional development, digital competences, ICT instruments, Mathematics and Natural Sciences, ProWeb project.*

## **Introduction**

In the context of the contemporary society, and in accordance with the National Strategy for Digital Agenda - Romania 2014-2020, the development of the digital literacy is a national priority. More than that, “the education goes through radical changes, aiming to reorganize the existing infrastructure, for future learning environments. ICTs represent a resource for many schools, but a more effective way is to develop the necessary equipment and infrastructure which can ensure that students are engaged and motivated in learning, exploiting also their potential.” (www.mcsi.ro)

Furthermore, the introduction of ICTs in the educational system is one of the strategic steps assumed by the country in the last 20-25 years. This fact implied the assimilation and exploitation of ICTs in the educational practices, especially in activities such as: developing the computer literacy, introducing specific disciplines in the mandatory curriculum or even in the optional ones (mainly on using computers and ICT in different areas, eLearning etc.), promoting training methods and computer-assisted instruction programs, creating and using of educational software for various disciplines, using virtual instrumentation across different disciplines, designing computer techniques in the creation of database for educational management etc. As such, ICT “may facilitate communication management, but also the management of information through all mediums, starting from involving PCs to using Internet and/or smart technologies. The benefits come into the improving of the efficiency and effectiveness of education at all the levels, both in formal and informal / non-formal settings.” (www.mcsi.ro)

It is important to mention that the digital literacy is one of the eight key competences structured by the European Commission, as a key competence for lifelong learning (2006). According to its programmatic documents, in this sense, the educational policies must involve the use of multimedia technologies, in order to retrieve, store, create, present and

exchange the information. This involves the massive use of technology in the actual information society, but also the development of ICT basic skills, cognitive skills (logical thinking), critical abilities to effectively manage large volumes of information, communication skills.

ICT skills can be developed through specific activities, involving the huge support of new technologies, and in lessons undertaken in the frame of various disciplines. In this respect, UNESCO recommends a number of activity categories (2004), such as (Suport curs formator, [www.qedu.ro](http://www.qedu.ro)):

(a) using of generic software packages: text editing applications, graphical programmes, applications for making presentations etc.;

(b) using of educational software for interactive learning, simulations and interfaces for illustrating scientific contents;

(c) using of tools for on-line communication and information exchange (e-mail, forums, messaging, audio- and video-conferencing);

(d) using the Internet as a resource for information and research.

From the teachers' perspective, the use of digital technologies is a professional competency included in the specific standards for the teaching career. In this context, it is important for teachers to acquire information related to: knowledge concerning ICT specific concepts, digital instruments that can be used in education, benefits that entails the use of new technologies in different training contexts, necessary skills that must be developed to students, abilities of using the applications in teaching, learning and assessment, ways of implementing of digital technologies in modern education settings adapted to the actual information society.

## **Methodology**

In the frame of the POSDRU project entitled: "ProWeb - A Network for Teachers' Continuous Professional Development in order to Use Multimedia, Virtual Instrumentation and Web 2.0 in the Curricular Area of Mathematics and Natural Sciences", it was interesting to investigate the views of the participated teachers in a related continuous professional development programme, which envisaged the development of their ICT skills. The research objectives aimed to measure the perception of teachers related to their digital skills and the importance of harnessing ICT in the learning process.

The research methodology involved a questionnaire-based survey, teachers being asked to answer to 12 items, three of those being structured on a rated *Likert-scale*, defined as: *to a great extent, in a great measure, to a*

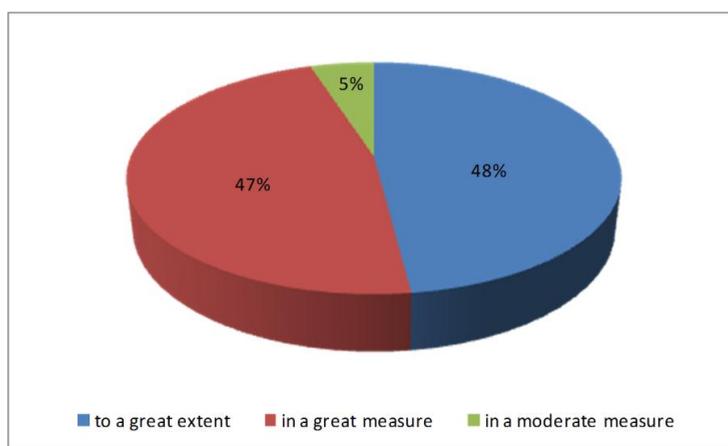
*moderate extent, in a small measure, to a small extent.* At the same time, some items proposed an appreciation on a 1 to 10 scale - 1 means *strongly disagree*, and 10 means *totally agree*.

The resulted data were processed using statistical and mathematical methods, and were correlated with qualitative issues.

The envisaged research targeted on the following dimensions: using of ICT / Web 2.0 in Mathematics and Science teaching, analyzing the teacher-student relation (especially by stimulating the students' attention, interest and motivation), transmission and acquisition of knowledge, developing of digital literacy, sharing ideas and educational practices with colleagues from other areas / countries, addressing specific curriculum subjects of Mathematics and Natural Sciences.

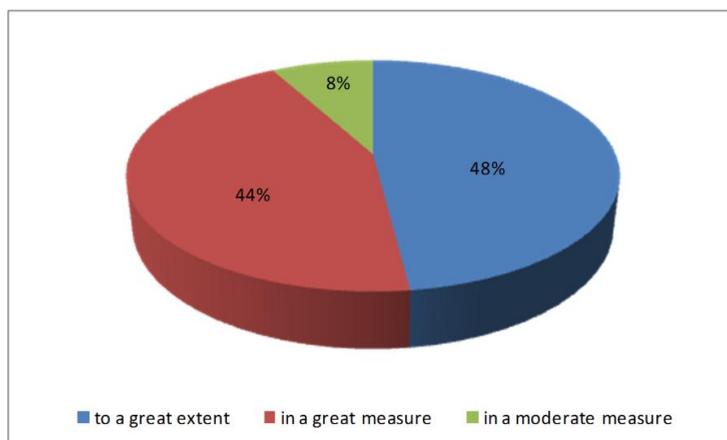
### Results and discussions

The first item covered the teachers' opinions concerning the need to use ICT (in particular, multimedia / hypermedia) in education, in the context of curriculum subjects of Mathematics and Natural Sciences (figure 1). The answers demonstrate that teachers are aware of technological developments useful for social life in general, and in education in particular. The impact of ICT is well perceived, and their feedback demonstrates the openness for the use of multimedia technologies and hypermedia applications in educational settings.



**Fig. 1.** Teachers' opinions concerning the need to use ICT (multimedia / hypermedia) in education

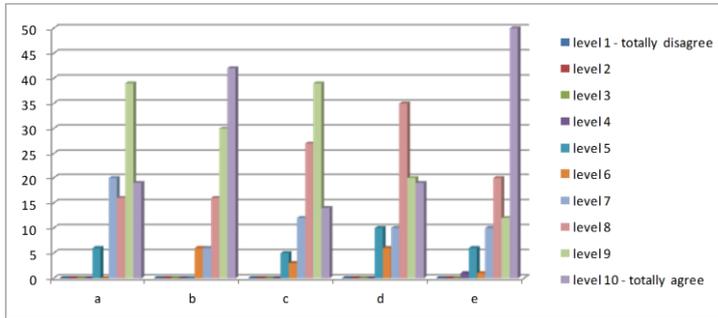
The next item is concentrated on teachers' focus on using web 2.0 applications, virtual experiments and educational software, in the curriculum subjects of Mathematics and Natural Sciences (figure 2).



**Fig. 2.** Teachers' interest on using web 2.0 applications, virtual experiments and educational software

The following two items aim to capture (on a scale of 1 to 10), the teachers' opinions related to their own digital skills / competences. The questionnaire was based on five pillars, assessing the teachers' knowledge stating (figure 3):

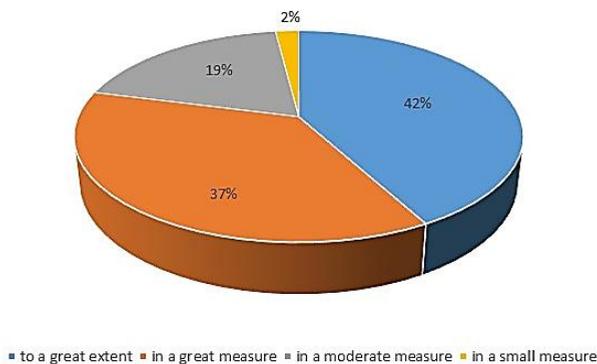
- a. designing a teaching scenario based on harnessing ICTs in the classroom;
- b. implementing specific ICT elements in the teaching activities;
- c. elaborating specific elements that may be subsequently implemented by ICT in the teaching activities;
- d. developing a training approach based on multimedia, virtual experiments, educational software and web 2.0 applications;
- e. mediating - through ICTs - educational exchanges of ideas and practices, with colleagues from other regions / countries.



**Fig. 3.** Teachers' opinions related to their own digital skills / competences and effectiveness of making interventions based on harnessing ICT in the teaching process

Referring to their digital literacy, the teachers positioned their responses especially in the second half of the assessment scale - between the levels 5 and 10. Those responses demonstrate, on the one hand, an important need for continuous training, and on the other hand, the effectiveness of the training programs proposed in the frame of ProWeb project: (a) Modern approaches on teaching Mathematics and Natural Sciences, and (b) E-education in the curricular area of Mathematics and Natural Sciences.

The teachers' perceptions related to the effectiveness of an intervention based on the exploitation of ICT (figure 4), during the classes of Mathematics and Sciences (Physics, Chemistry, Biology) demonstrates - once again -, the important value and the formative effects imposed by the digital tools, but also their role on increasing the student's motivation and interest for the scientific areas.



**Fig. 4.** Teachers' perceptions related to the effectiveness of an approach based on involving ICT in teaching

The last eight items of the questionnaire tried to perceive the teachers' opinions - on a scale from 1 (*strongly disagree*) to 10 (*strongly agree*) - on the various effects that ICT can incubate in an effective teaching approach. The teachers' responses demonstrate they are fully aware of the many advantages of using ICT in the context of Mathematics and Sciences lessons.

Items / score	1	2	3	4	5	6	7	8	9	10
Increase the students' interest and motivation for learning	0%	0%	0%	1%	0%	0%	0%	10%	30%	59%
Raise the students' attention	0%	0%	0%	0%	0%	1%	1%	2%	23%	73%
Facilitate the knowledge transfer and its assimilation	0%	0%	0%	0%	0%	8%	1%	1%	32%	58%
Items / score	1	2	3	4	5	6	7	8	9	10
Realize connections between Sciences and Life	0%	0%	0%	0%	0%	1%	1%	2%	32%	64%
Facilitate the evaluation process, trying to make it relevant	0%	0%	0%	0%	3%	1%	2%	10%	45%	39%
Develop the students' digital competences	0%	0%	0%	0%	0%	0%	1%	10%	24%	65%
Optimize the relation teacher - student	0%	0%	0%	0%	0%	3%	12%	4%	49%	32%
Facilitate the integrated approach of the curricula for the area of Mathematics and Natural Sciences	0%	0%	0%	0%	0%	1%	1%	4%	39%	55%

## Conclusion

The study conducted on a representative sample of teachers from the area of Mathematics and Sciences - participating in the ProWeb project - reveals that the training activities performed in the frame of two CPD programmes - (a) Modern approaches on teaching Mathematics and Natural Sciences, and (b) E-education in the curricular area of Mathematics and Natural Sciences - were effective in relation to the trainees' needs and aligned to the contemporary education issues. In this respect the participant teachers have been dealt with a number of specific methodological skills:

- increase the quality of projecting of the lessons design, by introducing and harnessing specific ICT applications, as web 2.0, virtual experiments and educational software;
- create innovative lessons and educational activities that involve the use of ICT;
- use and develop several assessment tools in the digital format;
- design and use teaching materials which exploit the ICT tools, in the context of an integrated curriculum for the area of Mathematics and Natural Sciences.

The use of ICT in teaching / learning process make the students more interested, more attentive to what is taught, more motivated and receptive. More, ICT proved that facilitate the learning through specific activities, like using virtual experiments and/or practical activities in which computers are present, encouraging so the individual study, but also the cooperative learning, mainly through discovery, exploitation of resources - an important step to design interdisciplinary and transdisciplinary approaches.

## Acknowledgements

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