Abstract

Over the last decade, information and communication technologies have enabled significant changes in the way people live, work, interact and learn. Some of these changes have been quite rapid in time, which is the reason why we believe that more research is needed for finding evidence on how new technologies can enhance learning. Does the use of ICT tools lead to significant improvement in independent thinking? Are motivation and enthusiasm growing when setting cooperative learning groups? Does collaboration generate new forms of communication outside the classroom, is it extended beyond school? How do we learn to learn with ICT? The paper intends to give some answers to these questions.

We approached the above issues on students of Vasile Alecsandri University of Bacau, that graduate and become teachers. We looked for significant facts related to the effects of using ICT tools both on independence increase and on collaboration increase of the subjects. We defined indicators in order to measure the two categories and we compared the results of our test with student’s perception on their ICT competencies.

In order to run the research, questionaires and interviews have been applied and work samples of students (projects, portofolios) have been studied. As well, psycho-pedagogical observation and some statistical methods have been used.

The study reveals the necessity to carrefuly complement the tasks that lead to an improvement of independent thinking with group activities and collaboration strategies. It appears that the major factor with impact on future teachers’ ICT competencies is a creative practical approach. ICT tools need to be used in a manner which responds to their needs to personalize the learning process in a mutual environment.

The findings of the study will be applied in an operational model designated to improve the professional competencies of the beginning teachers.

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1. Introduction

Computers and information technology changed our lives. Scientists are now concerned about what is going to be: how do people use devices, how can we better design technology to make it more usable, how are we affected, or what positive changes may come in government, industry, business, and education. There are a lot of interdisciplinary research centers—such as those coordinated by Stanford University: H-STAR, the Human-Sciences and Technologies Advanced Research Institute (http://hstar.stanford.edu), Persuasive Technology Lab (http://captology.stanford.edu), AAAlab (http://aaalab.stanford.edu)—trying to explain the huge impact that ICT has on humans. Even new areas of research appeared—captology, for example (Fogg, 2003) deals with the design, research, and the analysis of interactive computing technologies (like web sites, PDAs, kiosks, mobile phones, and video games) intentionally created to change people's attitudes or behaviors.

The educational process also benefits from bringing the new informational and communicational technologies (ICT) into schools. The informational society, based on knowledge, imposed the use of technology as a reference point for significant changes into the learning systems. Most schools in countries worldwide adopted ICT, implementing various ideas that lead to some enhancement of the learning process (Newhouse, 2002; Machin, McNally and Silva, 2006; Van den Brande, Carlberg and Good, 2010), while pupils and teachers, as well as parents, agree that ICT has a general positive impact on learning (Balanskat, Blamire and Kefala, 2006).

In Romania, the challenges delineated, at the beginning, on three major directions: a) ICT investments in schools (computers and broadband connectivity), b) professional development of the teachers (new ICT content embedded into the curricula, training programmes for teachers) and c) providing the necessary resources (learning content, effective and appropriate ICT support in order to transform teaching and learning). Later on, considering other prioritary directions such as ensuring quality in education, long-life learning, and professional performance of the teachers, the above three directions have been detailed and completed. Therefore, the specialists are talking nowadays of an acceleration of the process. As the premises are dynamic, there is a need of theoretical, psychological and pedagogical background in order to re-build the teaching and learning strategies that are going to provide ICT competencies.

Several European and American studies (OECD study, 2005; Ramboll Management elearning Nordic study, 2006; Korte and Hüsing, 2006) revealed that the overwhelming majority of the teachers gained a positive attitude towards ICT. This conclusion is also available for Romania, where the government ruled several interventions (MERYS, 2008; MERYS, 2010; MERYS, 2011). Teachers’ basic ICT skills have increased significantly over the last five years (Vital Wave Consulting, 2010). But the effects of ICT depend, above all, on the pedagogical implementation of technology.

Our research focused on several aspects related to the ways through which ICT enhance learning. Do computers help students to improve their independent thinking? Do the web 2.0 technologies allow new collaborative ways of learning and communicating? Do all these computer-related methods and strategies raise motivation and enthusiasm for learning? We approached the above issues on students of Vasile Alecsandri University of Bacău, România, that graduate and become teachers. We looked for significant facts related to the effects of using ICT tools both on independence increase and collaboration increase of the subjects.

2. Collaborative Learning versus Independent Learning with ICT support

Collaborative learning is a method of teaching and learning that implies exploration of a certain topic or design and creation of a meaningful product in teams of pupils or students. According to Myers (1991), “collaborative learning advocates distrust structure and allow students more say if forming friendship and interest groups. Student talk is stressed as a means for working things out. Discovery and contextual approaches are used to teach interpersonal skills.” Cooperative learning is a specific kind of collaborative learning, in which work groups are small and each individual is accountable for his work. The result of the group activity is assessed as a whole, as well. Obviously, ICT technologies have added new dimensions to collaborative and cooperative learning: time and space barriers have been dissolved. Information and its transmission have always been important—in all societies and in all times—but the impact of inter-connectivity, supported by information technology and networks, is a phenomenon of our times. Starting with desktop computers and going on with laptops, notebooks, PDAs, tablet PCs
to mobile phones, learning reached new and sophisticated forms, such as mobile multimedia microblogging (Holotescu and Grosseck, 2011).

Collaborative learning leads to an active participation of the subjects (IVLOS, 2000; Yildirim, Ozden and Aksu, 2001), who become interested and feel that the objective to be fulfilled challenges them. Sometimes teachers become learners, but – especially in the field of computer science – learners successfully teach in certain situations. Every member learns to give and require respect for its contribution, finding that diversity is desirable. If conflicts arise, these must be peacefully and efficiently solved, without affecting the goals of the group. No matter the subject or the task, researchers showed (Lipponen, Rahikainen, Lallimo and Hakkarainen, 2003; Ma, 2008) that collaborative learning proved to be more efficient for students: they learn more and retain the information longer than in other learning situations. Moreover, they are satisfied with their experiences and time spent in such situations (Nechita, Talmaciu, Timofti and Tomozei, 2010). Gaining enjoyment from their work in groups is also an aspect that deserves to be mentioned.

Independent learning must be a way of life. In a rapidly changing society, people need to be able to learn new skills for new jobs and permanently improve their competencies. Independent learning involves: problem-solving, inter-personal skills, self-motivation, creativity, being reflective (Boud, 1995; Barab, 2002).

According to Candy, “Independent study is a process, a method and a philosophy of education whereby a learner acquires knowledge by his or her own efforts and develops the ability for enquiry and critical evaluation.” (Candy, 1991).

While teachers can facilitate independent learning through the acceptance of their students’ responsibility and by passing them some prerogatives, the students learn how to use their own judgement on how is best to learn and mirror this attitude in their whole life.

With ICT tools, a student-centred approach becomes more accessible for teachers. Greater differentiation (various learning tasks, adaptation of strategies to different levels of independence, offer of freedom of choice within certain established limits) and modalities to fulfil individual educational needs count through the most important benefits of using computers in education (Ramboll Management elearning Nordic study, 2006). With ICT, the teacher tends to become more of an advisor, critical dialogue partner and leader for specific subject domains (Biggs, 1999; Watson, 2002; Ala-Mutka, 2008). Meanwhile, through ICT, a wide range of resources (Anghel, 2008) are available for students (and for teachers, too).

For pupils with special needs or behavioural difficulties, ICT instruments become a support. For groups where members have different ethnic backgrounds, computers are a cohesion factor – positive effects on behaviour and communication have been registered (Toseland, Jones and Gellis, 2004). ICT use in schools is a factor for minimising the digital divide phenomena (Pennington, 2011). High-capacity broadband, ready to use in the classroom, increases the quality and quantity of educational activities that can be undertaken (Brut, 2006).

3. Research Design

Purpose of the study. The objective of our research is to look for significant facts related to the effects of using ICT tools both on independence increase and on collaboration increase of the subjects and to evaluate their ICT competencies at the end of their license stage. As well, we compared the results of our findings with student’s perception on their ICT competencies. The aim is to identify efficient strategies to be integrated in an operational model, designated to improve the professional competencies of the beginning teachers.

Subjects and settings. The subjects of our research are students in the third year of Vasile Alecsandri University of Bacău, which prepare for the didactic career. The group is comprised of 46 students, aged 21 to 24, chosen through a random sampling from the whole assembly of the students that attend the courses of the Department for Teacher Training (nevertheless, students in Mathematics and Informatics were excepted because they have a special training in ICT, due to their curricula). The participants are distributed as follows: 39 are women (84.8%), 7 are men (15.2%); 43.5% come from urban areas and 56.5% come from rural areas. According to their specialization, students prepared to teach: Romanian language - 6 (13%); Romanian language (primary) and a foreign language, English or French (secondary) – 9 (19.5%); English language - 2 (4.4%); French language – 2 (4.4%); History – 4 (8.8%); Preschool and Primary School Education - 13 (28.2%); Biology – 2 (4.4%); Economic Sciences and Accounting – 5 (10.8%).
Research stages. The work was undertaken between October 2010 and June 2011. During the academic year 2010-2011 (October to May), the participants attended, as a compulsory activity within their training as future teachers, a course entitled Computer Assisted Instruction. This period was designated for: students’ training, application of questionnaires and interviews, study of work samples of students (projects, portofolios and/or e-portofolios), and psycho-pedagogical observation of the subjects. In June 2011, a test was applied in order to find out the student’s perception on their ICT competencies.

Methodology. During the first stage of the research, students were trained and evaluated with respect to the two dimensions that we follow up: collaborative learning and independent learning with ICT support.

The following collaborative learning (CL) instruments have been presented and students used them in their laboratories and their assignments:

- **CL1. Wiki technology.** Wiki is a web 2.0 technology based on the principle of collaboration between users, with the aim of creating online content. Students were taught about using wikis for managing content for a school (presentation of the school, description of the community, images from school and community, school calendar, information on teachers and pupils, pages of the teachers and of the projects that the school joined). Exercises have been realized in teams, with various tasked being assigned to students who had to communicate in order to design and put together such wiki sites. Other types of exercises related to wiki technology concerned materials for lessons and collaborative projects with the pupils.

- **CL2. VoiceThread.** This is a new collaborative work instrument (www.voicethread.com) that allows a registered user to share images, to write, to register an audio comment, to talk to other users, or to write text comments. VoiceThread can be used as a complementary teaching method, as well as for developing projects in a collaborative manner. In e-learning, students can follow a lesson afterwards it took place in the classroom. Projects to be presented to an audience, especially in the field of arts, history, artistic education, religion, etc. are also suited to be realized with VoiceThread.

- **CL3. RSS (Risch Site Summary).** This is a web 2.0 technology that allows a person who browses the Internet to follow automatically the modifications of another site, without accessing that site. The students were taught to use as aggregators FeedReader (www.feedreader.com) and SharpReader (www.sharpreader.com), as well as online RSS aggregators like Bloglines (www.bloglines.com) and Weblog (www.weblog.ro), that can be collaboratively used by registered users. They where showed how this technology can help in raising efficiency in accessing teachers’ blogs or educational sites.

- **CL4. Collaborative bookmarking.** Bookmarks are shortcuts to web pages, which can be generated by any browser. These bookmarks can be put together by a number of users and used in a collaborative way. Such a modality is available on the portal del.icio.us (www.delicious.com), which contains millions of bookmarks from users all over the world, sorted by tags. This collaborative bookmarking system is interesting for education because it facilitates the access of certain users (for example, pupils from a classroom or students in a study group) to the resources that have been identified by themselves or by one of their coordinators. Examples have been given for these uses.

- **CL5. Slideshare.** This portal (www.slideshare.com) contains Microsoft PowerPoint and OpenOffice Impress presentations. Students found new ideas for their presentations and learned how to introduce comments or presentation notes. Used mainly as a facile communication tool that can enhance public presentation abilities, this kind of instrument can be very useful and can motivate the students in lessons. While teachers’ blogs can contain links to presentations, the portal can also be used in order to disseminate information. Students had to upload their own presentation on Slideshare, and to look for presentations on a given topic, to improve and deliver them in front of their classmates.

- **CL6. Flickr.** This is the largest image resource for the moment. Flickr (www.flickr.com) is a portal where registered users can upload images or video content and can comment them. A lot of collaborative projects involve the use of images. Students learned how to use this resource and deal with graphic content.

- **CL7. Simile Timeline.** This is a free resource (www.simile-widgets.org/timeline/) that generates temporal graphic representations for the events introduced by the user. It works as an element of a web page and can be embedded in any web page. The result is a temporal line that can also include supplementary information about every temporal point, with links to external sites or to other pages in the site. Simile Timeline was used as an educational resource by the work groups, in order to manage their collaborative projects. Students faced with the
necessity of proving some skills regarding the search of the appropriate information and communication competencies with their colleagues in the group.

The following tasks that were intended to encourage independent learning (IL) have been experienced:

- **IL1. e-portfolios.** Students had to prepare specific assignments, according to their individual needs. They had a large period of time for this work, so they could organize the studies and prepare the items of the portfolio as wanted.
- **IL2. Internet research.** Students have been encouraged to find educational resources, use them in a creative manner, build content and upload it on the Internet.
- **IL3. Creative practice.** Lessons that students had to teach invited them to come up with new and better ways of learning and teaching with the support of ICT tools.

Moreover, the following essays (E) of the students have been studied:

- **E1. Integration of ICT in the teaching-learning-evaluating process** became, during the last two decades, a priority of the educational policies all over the world, because of the new horizons that are opened for the educational practice:
  - Facilities with respect to the presentation of the information.
  - Diversification of the possibilities that the pupils have to process it.
  - New possibilities for building knowledge.
  - Imagine a situation for each of the above.

- **E2.** Suppose that you have to ask a team of specialists to realize a drill-and-practice software. How do you present them your requirements?

- **E3.** Simulation allows the controlled representation of a phenomenon or of a real system through a model with an analog behavior. Describe, with examples, (at least) three of the advantages of using computer simulation programs.

- **E4.** How can you correlate the use of ICT instruments with your personal development?

- **E5.** How can you develop/interpret the following statement?
  
  “Use of ICT turns learning into a constructive process. Knowledge is not simply acquired, but created and recreated, based on previous knowledge. Acting like this, the individual participates in its own education. Learning is motivated by searching a meaning.” (Prawat, 1996).

- **E6.** How do you think that ICT tools allow an enhanced participation of an individual to political, social or economic life?

- **E7.** Comment the following proposal: “Drop the e in e-learning – it is about learning in a digital and networked society!”

- **E8.** How can you describe the relationship between you and your teachers? With respect to the understanding of concepts and to the attitude towards learning, how often have you been advised to use the computer? Do you think that working at the computer was of a real help?

- **E9.** In what degree and how often have you been involved in learning experiences that assume cooperation modalities between you and your colleagues, in school and outside the school? Describe such experiences, if any.

- **E10.** Describe the modern audio-video devices and the ways you could use them in lessons, online conferences, e-learning, communication, and personal life.

Questionnaires (Q) applied during the year were structured on the following items:

- **Q1.** A blog can be used in various manners:
  - As an administrative instrument used to communicate with pupils and parents.
  - As an instrument used for the exchange of ideas and reflections.
  - As an (online) publishing instrument.
  - If you have experimented situations described above, please describe the context.

- **Q2.** The use of blogs for supporting your own educational practices supposes:
  - Exchange of blog addresses with your colleagues.
  - Following the content in your colleagues’ blogs.
  - Answers to the ideas and reflections in their blogs.
  - Reflections and discussions on the way that your understanding and knowledge developed, in time.
Mark the situations that reflect your experience.

Q3. In order to realize, with your pupils, different activities that require the use of e-mail, chat, logs, and wikis, you need the agreement of the parents with respect to the protection of their image. Do you know the laws that are involved, concerning protection and promoting child’s rights? If you do, please specify what these laws state.

Q4. If you have used a computer in order to learn a foreign language, in what ways have you done this? What online dictionaries have you accessed?

Q5. Enumerate and describe the modalities that you are able to use in order to realize a computerized test.

Q6. Describe (at least) three situations in which social networks can support collaboration.

Q7. What are the objectives of Longlife Learning Programme?

Q8. On a scale from 1 to 10, in what degree have you used computers for:
- Applications.
- Analysis.
- Synthesis.

Q9. On a scale from 1 to 10, in what degree have you used computers in order to:
- Illustrate a concept.
- Realize and end product.
- Solve a problem.
- Solve other tasks, such as …

Q10. What period of time do you spend at the computer, during a day? Split this period into slices of time corresponding to:
- Learning/ individual study.
- Communication.
- Finding new information.
- Reach other objectives, such as …

Ongoing evaluation. The ICT competencies were decomposed in 5 categories of specific competencies, and each specific competence was made operational in 3 level descriptors referring to: declarative and procedural knowledge, abilities, and attitudes towards ICT use in learning and teaching. Table 1 presents the five categories and the instruments on whose bases the ongoing evaluation has been done. Due to the structure of the students’ perception evaluation test (described in table 2), the overall score for each competence was scaled between 3 (minimum score) and 15 (maximum score). Means of the scores obtained by the students at the ongoing evaluation of each competence are depicted in table 3.

Table 1. ICT competencies and instruments used to evaluate them

<table>
<thead>
<tr>
<th>ICT competence</th>
<th>Instruments for evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICT1. The competence to use correctly the computer and its devices and to identify the role of the computer in the educational process.</td>
<td>CL1, IL1, IL2, E3, E4, E6, E8, Q3, Q7, Q8, Q9, Q10</td>
</tr>
<tr>
<td>ICT2. The competence to use correctly some applications that are absolutely necessary in the educational process.</td>
<td>CL5, IL1, IL2, IL3, Q4</td>
</tr>
<tr>
<td>ICT3. The competence to adequately use the modern audio-video tools.</td>
<td>CL2, CL5, CL6, IL3, E2, E7, E10, Q5</td>
</tr>
<tr>
<td>ICT4. The competence to design and realize educational software.</td>
<td>CL1, CL5, CL7, IL2, E3, E9, Q1, Q2</td>
</tr>
<tr>
<td>ICT5. The competence to create new learning situations through the use of ICT.</td>
<td>CL1, CL2, CL3, CL4, CL7, IL2, IL3, E1, E5, E9, Q1, Q2, Q6</td>
</tr>
</tbody>
</table>

Students’ self-assessment on their ICT competencies. Students’ perception evaluation test was structured in 15 items, 3 for each competence (table 2). The answers were required on a scale with 5 degrees of intensity: “to a very little extent” (assigned 1 point), “to a little extent” (assigned 2 points), “to a moderate extent” (assigned 3 points), “to a great extent” (assigned 4 points), “to a very great extent” (assigned 5 points). Consequently, the minimum score for each competence is 3, and the maximum possible score is 15.
4. Findings and discussion

The data analysis was conducted by using SPSS (version 16.0 for Windows). Table 2 presents the results of the self-assessment through descriptive statistics in the form of frequency, percentage and mean.

Table 2. Corresponding descriptors for ICT competencies and scores at the perception test

<table>
<thead>
<tr>
<th>Descriptor</th>
<th>To a very little extent</th>
<th>To a little extent</th>
<th>To a moderate extent</th>
<th>To a great extent</th>
<th>To a very great extent</th>
<th>Mean of scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICT1.1. I know computer components and their functionality</td>
<td>-</td>
<td>-</td>
<td>4</td>
<td>6</td>
<td>36</td>
<td>4.69</td>
</tr>
<tr>
<td>ICT1.2. I know and I use properly the concepts and the terminology that are specific to the ICT area</td>
<td>-</td>
<td>-</td>
<td>(8.7%)</td>
<td>(13.0%)</td>
<td>(78.3%)</td>
<td>4.58</td>
</tr>
<tr>
<td>ICT1.3. I identify correctly the moments that are adequate, during the lessons, for an intervention that involves the computer</td>
<td>-</td>
<td>1</td>
<td>5</td>
<td>15</td>
<td>25</td>
<td>4.39</td>
</tr>
<tr>
<td>ICT2.1. I know and I use the most important facilities of Microsoft Word (or another text processor)</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>8</td>
<td>37</td>
<td>4.78</td>
</tr>
<tr>
<td>ICT2.2. I make use of the facilities of Microsoft PowerPoint (or another presentation software)</td>
<td>-</td>
<td>1</td>
<td>2</td>
<td>11</td>
<td>12</td>
<td>4.63</td>
</tr>
<tr>
<td>ICT2.3. I use the most important facilities of the browsers and I know about networks and Internet</td>
<td>-</td>
<td>-</td>
<td>(2.2%)</td>
<td>(2.2%)</td>
<td>(26.1%)</td>
<td>4.60</td>
</tr>
<tr>
<td>ICT3.1. I know how to use, during a lesson, modern audio-video tools</td>
<td>-</td>
<td>1</td>
<td>4</td>
<td>15</td>
<td>26</td>
<td>4.43</td>
</tr>
<tr>
<td>ICT3.2. I use, in an efficient manner, the video-projector and the laptop</td>
<td>1</td>
<td>-</td>
<td>(2.2%)</td>
<td>(8.7%)</td>
<td>(32.6%)</td>
<td>4.41</td>
</tr>
<tr>
<td>ICT3.3. I use correctly the interactive multimedia tools</td>
<td>-</td>
<td>1</td>
<td>3</td>
<td>16</td>
<td>26</td>
<td>4.45</td>
</tr>
<tr>
<td>ICT4.1. I easily identify the specific objectives of an educational software</td>
<td>1</td>
<td>2</td>
<td>6</td>
<td>20</td>
<td>17</td>
<td>4.08</td>
</tr>
<tr>
<td>ICT4.2. I can enunciate the specifications of an educational software</td>
<td>2</td>
<td>-</td>
<td>16</td>
<td>16</td>
<td>12</td>
<td>3.78</td>
</tr>
<tr>
<td>ICT4.3. I know the algorithm of developing an educational software</td>
<td>3</td>
<td>2</td>
<td>20</td>
<td>12</td>
<td>9</td>
<td>3.47</td>
</tr>
<tr>
<td>ICT5.1. I regularly use virtual libraries and/or e-learning platforms</td>
<td>3</td>
<td>1</td>
<td>9</td>
<td>21</td>
<td>11</td>
<td>3.71</td>
</tr>
<tr>
<td>ICT5.2. I can advise the pupils to use, in a useful manner, the social networks (eg: Facebook, Twitter)</td>
<td>-</td>
<td>4</td>
<td>6</td>
<td>17</td>
<td>19</td>
<td>4.10</td>
</tr>
<tr>
<td>ICT5.3. I know the correct (ethical) conditions for using the online materials</td>
<td>-</td>
<td>2</td>
<td>-</td>
<td>15</td>
<td>29</td>
<td>4.54</td>
</tr>
</tbody>
</table>

Means and standard deviations were also computed for the overall scores obtained for each competence category (table 3), both for the ongoing evaluation and for the self-assessment test. Correlation coefficients between the two data series are also presented.

It appears that the students overestimated themselves with respect to each of the five categories of competencies. This is a trend that we usually notice at all students. We think that we need to make them aware of the fact that simply using Messenger or Facebook, browsing the Internet or even mastering a few software applications is not enough. For them, as future teachers, the aim is to use ICT tools for reaching the objectives of this noble profession.

Table 3. Comparison between teachers’ evaluation and self-assessment evaluation

<table>
<thead>
<tr>
<th>ICT competence</th>
<th>Mean scores for ongoing evaluation</th>
<th>SD</th>
<th>Mean scores at self-assessment</th>
<th>SD</th>
<th>Correlation coefficients</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICT1</td>
<td>11.70</td>
<td>2.2</td>
<td>13.65</td>
<td>1.8</td>
<td>0.78</td>
</tr>
<tr>
<td>ICT2</td>
<td>13.20</td>
<td>2.1</td>
<td>14.02</td>
<td>1.6</td>
<td>0.87</td>
</tr>
<tr>
<td>ICT3</td>
<td>12.30</td>
<td>2.5</td>
<td>13.30</td>
<td>2.1</td>
<td>0.95</td>
</tr>
<tr>
<td>ICT4</td>
<td>9.43</td>
<td>2.7</td>
<td>11.28</td>
<td>2.7</td>
<td>0.93</td>
</tr>
<tr>
<td>ICT5</td>
<td>11.08</td>
<td>2.1</td>
<td>12.50</td>
<td>2.1</td>
<td>0.91</td>
</tr>
</tbody>
</table>
The best results have been registered for the second category of competencies (use of applications that are essential for the educational process) and the worst results relate to the fourth category (design of educational software). This is not unexpected, as this last task is not at all a simple one. The values of standard deviation parameters show how homogenous the study group was, while the correlation coefficients show that, at least for the last three categories of competencies, the overestimation was not an exception. The results were discussed with the students.

Some items in the questionnaires allowed us to observe what types of activities, and in what degree, are familiar to the students when working with ICT tools:

- **Question Q8** required a ranking, on a scale from 1 to 10, for the use of computers for applications and for analysis/synthesis processes. The mean of the gathered values showed that the most familiar is using computers for analysis (7.71), less for applications (7.09), and even less (6.33) for synthesis.
- **Question Q9** required the same with respect to some tasks that are important for future teachers and can be facilitated by using ICT tools: solve a problem (6.71), realize an end product (6.23), and illustrate a concept (5.52). Other tasks, such as communication, reading, playing games, received the rank 8.71.
- **Question Q10** was meant to offer information on the duration time spent at the computer by the participants in the study group. The mean of the given values is 5 hours and half (with a minimum value of half of our and a maximum of ten hours; for those who have a job that implies work at the computer, this period was excluded). The mean durations are allocated as follows: for learning and individual research - 2 hours (36.4%); for communication with friends, colleagues and family – 1 hour and half (27.3%); for acquiring general information – 1 hour (18.2%); for other activities – 1 hour (18.2%). As “other activities at the computer”, students mentioned: view of movies (music is listened simultaneously with other tasks), games (including educational ones), online banking (payments, shopping), and relaxing activities.

Other significant facts and testimonials that we extracted from students’ essays and concluded in our discussions with them are listed in what follows:

- Some students expressed their preference for individual work. We noticed that they acted with special exigency with respect to the tasks they received and wanted to have the control over all aspects. At first, we encouraged them to coordinate some online collaborative projects. Later on, they were involved in working groups in laboratories, under teachers’ supervision. They felt appreciated and ended by accepting the interactivity with their colleagues.
- Concerning the collaboration with their teachers, students appreciated that they were treated with respect and the relationship was “open-minded”. It extended outside the school, mainly through communication software, personal web pages of the teachers, and online projects.
- Social involvement has also been present: “You have the possibility to express your opinion”. Social networks have been used to support people: “I used Facebook to help my friends, at difficult times for them”.
- Continuous learning proved to count through students’ objectives. Learning during the lifetime is seen as an “investment in oneself”. Their attitude towards ICT is positive and they are aware of the benefits that computer generally brought in our life: “With a computer, you are always updated”. When talking about learning with ICT tools, they express very suggestive (and characteristic for the young): “Learning online is the same as learning on a book, with an extra-help from computer and Internet”.
- Benefits of teaching with ICT tools (related to their experiences when they hold lessons in schools) are mentioned: “Computer helps the development of creativity. We can find more learning methods, and choose the suited one”. Audio-video instruments are recognized to be of great help in teaching: “Conceptual diagrams and images are the most relevant”. The joy of interacting with pupils is also expressed: “Satisfaction is huge when you can help others”.
- Most students search for and use online resources. Dictionaries and online libraries were mentioned (with specific examples) in all essays. Some resources have been linked to personal development and reflexive practice.
- Even they recognize the value of the computers, students wonder about the old traditions: “What are we going to do about nights spent at a light candle by poets, with feathers melted in ink?” They reminded that teachers have advised them to study in (classic) libraries, too. As well, students are aware of the negative impact that computers can have on some individuals.
5. Conclusions

The study reveals the necessity to carefully complement the tasks that lead to an improvement of independent thinking with group activities and collaboration strategies. It appears that the major factor with impact on future teachers’ ICT competencies is a creative practical approach of ICT tools. Such an approach was received with enthusiasm, really motivated the students, and responded to their needs to personalize the learning process in a mutual environment.

It proved that cooperative activities lead to new ideas when students harness their potential, developed on past experiences and understandings. Therefore, independent learning is fundamental. We encourage all students to take notes that are relevant for their individuality and for their needs. Technology offers solutions that have to be found by each of them, through processes of analysis and synthesis, followed by a personal decision.

An overwhelming majority of teachers in Europe (90%) use ICT to prepare their lessons (Klopfer, Osterweil, Groff and Haas, 2009). Our study matches these facts, showing that the future teachers are ready to apply what they learned and they master ICT instruments that allow them to: plan the lessons, plan and improve their work through a collaborative approach with their colleagues, use educational and administrative software applications.

The results of our research validated the efficiency of the strategies used, during the academic year, within the Computer Assisted Instruction course, and applied in the other courses that students attended (according to their specialization). The formative attributes of the evaluation modalities were also revealed. Therefore, the instruments listed in table 1 were caught up and extensively described in “The Development of Professional Competencies in Beginning Teachers. The Good Practice Guide”. This guide is part of the “Beginning Teacher’s Portfolio”, that was conceived into the framework of the research project “Operational Model for Developing the Competencies of the Beginning Teachers”. This model is complex (integrative, operational, normative, and formative) and embedded, as an essential chapter, the ICT competencies and their creative approach for the beginning teacher.

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