

THE ATTITUDES OF THE CZECH STUDENTS TO E-LEARNING IN THE LONG-TERM PERSPECTIVE

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Abstract

At present, the use of information and communication technologies in education at all types of schools is becoming commonplace. Information and communication technologies bring many positive effects which appropriately complement and support the process of education. Some modern forms of study, applied at Czech as well as foreign universities, are even based on the use of information and communication technologies. Above all, this regards education realized through e-learning with information, curriculum, control incentives and communication being transmitted by means of modern communication technologies and using the World Wide Web, called simply the Internet.

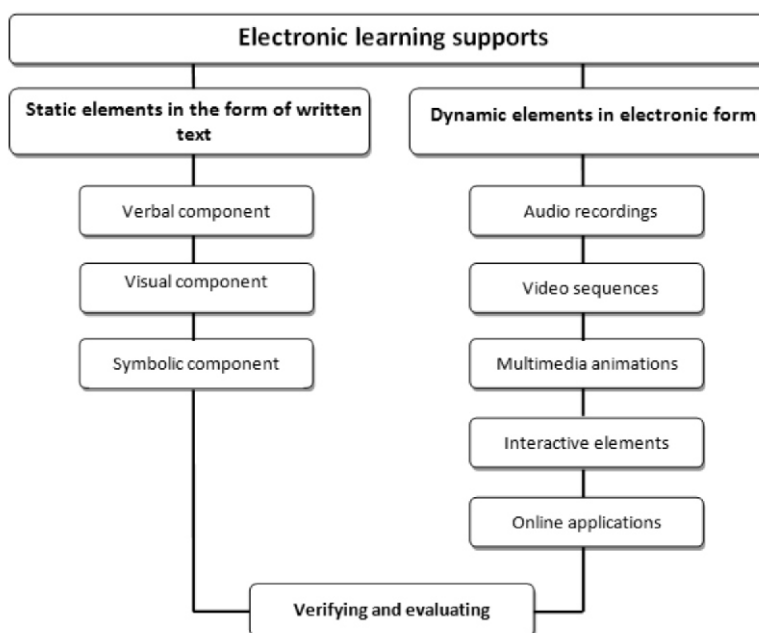
The study presents the attitudes of university students towards e-learning, as one of the up-to-date forms of education, within the framework of their undergraduate studies. It also illustrates the course of the research investigation, carried out from the year 2007 to 2011, and submits some of the outputs. The main objective of the above mentioned investigation having been to determine the preferences and opinions about the form, the organization of e-learning and about the tools applied, the present study is conceived as a contribution to the discussion about the possibilities and limits of the use of a fully electronic learning within the framework of the undergraduate and lifelong learning, based on the use of modern information and communication technologies.

Introduction

The perception of e-learning is often ambivalent and inconsistent, the main reason being an inhomogeneous terminology, to a great extent influenced by the linguistic impacts and by the diversity of approaches and technologies used (Saettler, 1990). Within the transatlantic space, activities related to the supporting of the education process by ICT (i.e. e-support) are not defined as e-learning, in favor of relatively set phrases of Computer-Based Training (CBT), Internet-Based Training (IBT) or Web-Based Training (WBT) (Lowenthal, Wilson, 2009). In Europe, a consensus was reached upon the use of a unified term of e-learning, which, according to the information at the e-learning portal for Europe Elearningeuropa.info, is understood as the application of new multimedia technologies and the Internet in education, in order to improve its quality by enhancing access to resources, services, the exchange of information and cooperation (Simonova, 2010).

According to this definition, e-learning covers not only a wide range of tools that are used for the presentation or the transfer of the educational content and for the management of studies, but also an entire spectrum of communication channels. The tools are used via LMS (Learning Management System), which is a prerequisite for the implementation of a truly effective learning process through e-learning. LMS thus represents a virtual 'classroom' environment comprised of tutorials, quizzes, study instructions, exercise plans or discussion forums (Mauthe, Thomas, 2004).

Apart from LMS, properly structured and didactically adapted educational texts, referred to as e-learning supports (Paulsen, 2003) contribute significantly to the implementation of e-learning. To get a clear and permanent definition of the term, it is therefore necessary to focus on the structure and the arrangement of individual elements that such a teaching material is composed of. Study materials for distance learning, in both classical form and the form of e-learning, have gradually evolved from textbooks. In terms of the text structure, a classical textbook (Möhlenbrock, 1982) is composed of two basic components, i.e. text components ('written text') and extra textual components (graphical components). It should nevertheless be noted that e-learning supports have their own unique characteristics as they are intended for a particular form study, characterized above all by a higher level of independence and individuality (Bates and Poole, 2003). A characteristic feature of thus structured electronic study supports designed for e-learning is the fact that their nuclear structure is enhanced by various interactive and multimedia elements, i.e. animation, multimedia records, dynamic simulation, sound recordings, etc., as shown in the figure number 1.



Flowchart- 1 Electronic learning support structure

Having taken into account all the above stated facts, the author of the study present carried out a long-term investigation research focused on monitoring and evaluating students' attitudes to e-learning enhanced by sophisticated electronic and multimedia enriched learning supports (Klement, 2010). These comprised and made use of tools designed to achieve cognitive, affective, as well as psychomotor learning objectives, completely in compliance with modernization trends in this area. Thus each e-learning support contained not only a static text part, i.e. verbal component of the text, a visual portion of the text, i.e. visual component of the text (images, diagrams, graphs, etc.), but also a dynamic part, i.e. dynamic component of the text in the form of multimedia extension, i.e. animation solutions, or even interactive simulations of particular steps (Chudy, Candik, 2004), through which students could acquire the necessary skills.

Moreover, each electronic study support included a set of long and short tasks, allowing for a fast student – teacher interaction when solving specific tasks. These e-learning supports were integrated into the LMS system in order to control the process of study and self-study which were implemented as fully distant, with the exception of two attendance tutorials, one of them having been realized prior to the commencement of the course and having been of informative character, the other one having taken place at the very end of the cycle of teaching and having had an evaluation character. The conditions, under which the entire research investigation was carried out, were in compliance with the general model of the implementation of education through e-learning.

Objectives of the research investigation and conditions under which it was carried out

The main objective of the research investigation was a collection and an evaluation of the ideas and attitudes of the students to the training carried out through e-learning. This objective was planned to be achieved through particular component parts, each of them designed to seek the views and attitudes of students to the e-learning form of study as a whole as well as to its individual components and to the very electronic structure of the learning supports. Every single component part of the research investigation was formalized into questions, which were then put together to create an anonymous structured questionnaire (Foddy, 1994), which students filled out according to the instructions supplied. At that time, the students interrogated had no pedagogical

training, to which fact the terminology was adapted and their definition was simplified (e.g. instead of the term verbal component of the text, static text information was used, instead of the term visual component of the text, static image information was applied, and instead of the term dynamic element in electronic form dynamic visual information - interactive simulation and animation were included).

Each sub-goal of the research investigation maps three areas, covering a particular aspect of distance education through e-learning. The main objectives of the research investigation realized, the way towards the achievement of which will be described in detail herein under, can be summarized as follows:

- To determine whether the students were satisfied or dissatisfied with the training carried out via e-learning.
- To find out what were the students, studying by means of electronic learning supports incorporated into the LMS system, most interested in.
- To determine which structural element within electronic learning supports proved of most importance to the students in order to gain knowledge, real ideas and skills.

The validation of the research objectives set was carried out by means of the static nonparametric method of Pearson chi-square (Pearson's chi-squared test), which helped us to determine the level of the dependence of the results on a particular feature significant for a group of respondents, such as gender or age (Greenwood, Nikulin, 1996). To determine the significance of particular groups of respondents who answered the same way, basic descriptive statistics and their visualization through tables was used. For the calculation purposes, the statistical system Statistica 9.0 (Nisbet et al., 2009) was applied.

Formulation of the main assumptions of the research investigation and the description of the investigation sample

Based on previous personal experience and results of other research studies or investigation conducted in this field, whether in our country or abroad, we came to the conclusion that in comparison with the classical education methods, distance learning implemented through e-learning is endowed with significant features which allow for increasing the very efficiency of the educational process. This concerns mainly the psychomotor skills, where information and communication technologies, represented by multimedia extensions or simulations, or even by virtual reality, allow for the creation of such instruments, the replacement of which by static elements of an electronic study support would be extremely difficult.

In compliance with the above mentioned, we formulated the research assumptions that would respect the modernizing trends in the field of education supported by information and communication technologies. We stemmed from the following assumptions:

- students are satisfied with the education realized through e-learning because they like the fully electronic learning environment in the form of LMS. Their interest in the above mentioned is a long-term one,
- students prefer multimedia elements of interactive character. Their interest is stable,
- students gain most knowledge using static elements of electronic learning supports in the form of text, as they consider them optimal for achieving cognitive learning objectives,
- most real ideas are adopted by students through static elements of electronic learning supports in the form of pictures, graphs and tables, as the latter allow them to exploit a wider range of learning strategies based on demonstration,
- students get most practical skills using dynamic elements of electronic learning supports in the form of interactive simulations and animations, as the latter enable them to achieve learning objectives in the field of psychomotor and affective skills.

The investigation sample (Creswel, 2008), selected in order to verify the assumptions of the research, consisted of 501 first-year students of universities, who carried out a part of their studies through e-learning. The investigation sample composition respected a proportional representation of male and female respondents, thus

reflecting the gender proportion in other forms of study. The structure of the investigation sample is shown in the following table- 1

Table - 1
Research sample structure

Gender	Number of respondents in particular years	Total number of respondents	Total number of respondents (%)	Education implemented through e-learning satisfaction level (%)
Women	year 2007	40	220	44%
	year 2008	39		
	year 2009	46		
	year 2010	56		
	year 2011	39		
Men	year 2007	53	281	56%
	year 2008	63		
	year 2009	59		
	year 2010	48		
	year 2011	58		
				94%

Students had the opportunity to express their views and attitudes to the education implemented through e-learning using e-learning supports. The research questionnaire comprised a total of 9 questions that students answered anonymously.

Selected results of the research investigation focused on the ideas and the attitudes of the students concerning distance education through e-learning

The main factor examined in this part of the investigation was the level of satisfaction of the students with the organization of education implemented through e-learning, the educational content being transmitted not primarily within the framework of a regular full-time teaching, but via monitored self-study (Vasutova 2002), making use of convenient e-learning supports, incorporated into LMS. A research premise was set up that students are satisfied with the organization of teaching through e-learning, with the educational content being primarily mediated via e-learning supports and the LMS system providing them with the communication, evaluation and management aspect of study. We verified this assumption by analyzing data collected throughout the investigation. In addition to the general opinion on this issue, we monitored the long-term trends in this area and we also analyzed the potential dependence of the students' opinions on gender. The results of this verification are given in the Table 2 and the contingency Table 3.

Having analyzed the results obtained, we could state that the students actually are satisfied with the organization of education through e-learning, supposing that the educational content is primarily mediated via e-learning supports and the LMS system provides them with the communication, evaluation and management aspect of study, as the total of 94.2% of the respondents gave an affirmative response to the question and only 5.8% of them answered negatively. It is possible to say that the students' satisfaction with the organization of education through e-learning is permanent, as over the years the investigation was conducted, consistent results were obtained. The highest level of dissatisfaction with the organization of education through e-learning was recorded in 2008 and amounted to 7.8% of the respondents, while the highest level of satisfaction with the arrangement of education through e-learning appeared in 2005 and amounted to 95.7%. However, both these values only slightly deviate from the overall outputs (as regards dissatisfied respondents, the difference is about 2%, with satisfied respondents the numbers differ just by 1.5%). It is thus possible to say that the results obtained in different years do not differ significantly, and therefore we can state that the development trend in this area, i.e. the opinions and attitudes of students, is stable and shows neither growth nor decline. This fact is illustrated in Table 2.

Table - 2
Organization of education implemented through e-learning satisfaction level in % of student

Organization of education implemented through e-learning satisfaction level in % of students						
	year 2007	year 2008	year 2009	year 2010	year 2011	Total
dissatisfied students in %	4.3	7.8	5.7	5.8	5.2	5.8
satisfied students in %	95.7	92.2	94.3	94.2	94.8	94.2

The objectivity of the outputs was verified by the implementation of a further analysis, the aim of which was to determine potential dependence of the data obtained on the gender of the respondents. To achieve this, we made use of the chi-squared test, the results being presented in the contingency table - 3.

Table - 3
Organization of education implemented through e-learning satisfaction level in % of students (women versus men)

Contingency table, cell frequency > 10 marked in italics			
Pearson's chi square: 4.1202, levels of skewness: 1, level of significance = 0.0424			
Respondents 'gender	Dissatisfied	Satisfied	Line sums
Women	18	202	220
Men	11	270	281
All gropus	29	472	501

Since the calculated level of significance is 0.04, as shown in table 3, we can state that the frequency of responses given by men and women as regards the level of their satisfaction with the arrangement of teaching through e-learning are different, and therefore the assessment partly depends on the gender of the respondents. The interpretation of the result obtained can be such that dissatisfied women are more numerous than discontented men. It is also true that the level of the respondents unhappy with the above stated situation being so low (see the total percentage of the students dissatisfied where women make up only 3.6% and men even only 2.2%), the dependence of the outputs on gender was rather surprising and incited further examination.

A possible explanation for the above stated finding could be just another assumption that in addition to e-learning, as a predominantly non-contact form of teaching, using primarily self-study and online communications, women also prefer different forms of the educational process, which can provide them with other things they value. These might for example be such components or characteristics of the educational process as a personal contact with colleagues, a personal contact with the teacher, a more directive way of monitoring the study, a smaller degree of autonomy in planning studies, and so on. Briefly, it regards those aspects of the educational process, which clearly belong to the domain of a regular full-time teaching. Another investigation assumption was therefore formulated that there exists a group of students who reject distance learning and unequivocally prefer regular full-time teaching.

As it was necessary to support the assumption by a tangible statistical output that would confirm the former with the desired degree of accuracy, a further analysis, based on the comparison of positive and negative answers by the respondents to the particular investigation questions, regarding the level of satisfaction among the students with e-learning as an appropriate form of study (students actually answered the question of whether e-learning was their preferred form of study) and the level of satisfaction among the students with the arrangement of teaching through e-learning (students were asked whether they preferred learning by means of electronic learning supports) was carried out. We conducted this analysis by comparing the results and by evaluating them via the chi-squared test.

The Calculated significance is 0.001, which clearly shows a high level of dependence in both areas analyzed. The interpretation of this output could be that the group of the students who are not satisfied with e-learning as an appropriate form of education is identical with the group of the students who are not satisfied with the very structure of e-learning. So there probably is a group of students, though not numerous at all, i.e. comprised of 21 students, which is 4.2% out of the total of 501 respondents, whose attitude to educational activities via e-learning is rejection.

According to the evidence shown, there exists a group of the students, who refuse e-learning as an appropriate form of education and tend rather to regular full-time teaching with a higher degree of personal contact with the teacher. To be able to further describe this group of the students, one more analysis, the aim of which was to determine whether or not such a result depended on gender and whether males or females prevailed in this group, was carried out. Once again, we supported the verification process by the chi-squared test.

From the calculated significance level, which in this case again reaches a very low value of 0.0001, it is possible to deduce that there is a high level of dependence between the gender proportion of the respondents and the structure of the group of the students rejecting teaching activities through e-learning. Explained in detail, this dependence is such that within the framework of the whole sample (a total of 501 male and female students), the proportion of women (a total of 192 students) and men (a total of 257 students) who expressed their satisfaction with e-learning both as an appropriate form of teaching, as with its arrangement, reaches the value of 0.74. Consequently, the statement being supported by the Table 5, it is possible to deduce that in the group of the students who reject the teaching activities through e-learning, women prevail over men in terms of percentage. To be even more precise, let us say that out of those 4.2% of students who reject the e-learning teaching, there is a majority of women, i.e. 61.5%.

Another research assumption to be examined within the framework of the research investigation present was that the most preferred element of the studies realized by means of electronic learning supports is the dynamic element in the form of interactive educational animations. We put the idea forward as a reaction to the fact that the classical concept of evaluating electronic does not accent some modern trends in implementing e-learning in its very up-to-date form, i.e. using e-twinning or virtual reality. These educational strategies that are mainly based on the achievement of psychomotor and affective educational objectives of education have been coming to the fore of both students and authors and tutors (Kluge, Riley, 2008). To sum up, the students were proposed a choice of three options: a static element in the form of text, a static element in the form of visual information (pictures) and a dynamic element in the form of interactive visual information (simulation and animation).

According to the results obtained as regards the structure of electronic learning supports, the students preferred dynamic elements in the form of interactive teaching simulations or animations. The static element in the form of 'written' text came only as number two which, on the one hand was rather surprising, on the other hand completely in compliance with the preset research assumption. To sum up, we can say that that the total of 43.5% of the respondents preferred the dynamic element in the form of interactive simulations and animations as the most suitable constituent of the structure, while 34% of the respondents preferred the static element in the form of text and another 22% of respondents valued the static element in the form of images. It is therefore possible to say that the most preferred element of the electronic structure of learning supports is the dynamic element in the form of interactive training simulations and animations, followed by static elements in the form of texts and images.

Based on Table-4, showing the percentage of the students' opinions on the issues explored in each year of the research implemented, it can be stated that the trend in this area, i.e. opinions and attitudes of the students, is stable and shows neither growth nor decline.

Table - 4
Students' opinions on the most appropriate element of e-learning supports' structure (percentage)

Students' opinions on the most appropriate element of e-learning supports' structure (percentage)						
	year 2007	year 2008	year 2009	year 2010	year 2011	average
Static textual information %	36.6	30.4	37.1	30.8	39.2	34.7
Static visual information %	25.8	23.5	21.0	19.2	19.6	21.8
Dynamic visual information %	37.6	46.1	41.9	50.0	41.2	43.5

With regard to the existence of possible differences in the perception of men and women, we subjected the partial result to a further analysis, focused on whether there exist any differences at all between the evaluation given by men and women. The assumption was verified through the above mentioned sample of 501 respondents, by means of the chi-squared test. For calculation purposes, the statistical system Statistica 9.0 was applied. The results are shown in table -5.

Table - 5
Students' opinions regarding the most appropriate e-learning support structural element (women versus men)

Contingency table, cell frequency > 10 marked in italics Pearson's chi square: 0.9986, levels of skewness: 2, level of significance = 0.6067				
Respondents' gender	Favorite element-text	Favorite element pictures, images	Favorite element animations	Line sums
Women	72	47	101	220
Men	102	62	117	281
All Groups	174	109	218	501

Since the calculated value of significance is 0.61, as shown in table-5, we can state that the frequency of particular responses given by men and women as regards their favourite form of presenting the subject matter within the framework of the educational process carried out by means of electronic learning supports are identical. This evaluation is thus independent of the gender of the respondents.

Selected results of the investigation research in the field of the opinions of the students on particular structural elements of electronic learning supports

Our preparation and implementation of another part of the investigation mainly drew on Bloom's taxonomy of educational objectives, which, as one of the major pedagogical theories, deals with various aspects that affect the concept of education planning and curriculum development. Its contribution is perceived primarily in terms of the indication by it of the way towards specifying and operationalizing of educational goals. As early as in 1956, the lead author of the theory published a classic study entitled "The Taxonomy of Educational Objectives, The Classification of Educational Goals, Handbook I: Cognitive Domain" (Bloom, 1956), which was crucial, particularly because it defined the structure of cognitive training objectives in relation to various levels of thought processes. According to this model, the latter are arranged so that they follow each other from the trivial to more complex and comprehensive ones. In addition to the cognitive circuit, learning objectives from other two circuits were gradually identified, i. e. the affective circuit (simplified as attitudes) designed along with Bloom's cooperator D.B. Krathwohl (Krathwohl et al., 1964) and also the sensor motor or psychomotor circuit (simplified as skills) defined by H. Dave (Kalhous & Obst, 2002).

Based on the above stated facts, we decided to apply this theory on the area of e-learning supports as well, because we believed that to achieve adequate goals within each of these circuits taxonomy of educational objectives, it is always advisable to use a selected structural element of electronic learning supports. As we have

already mentioned above, our basic assumption was that students would regard dynamic elements in the form of interactive training simulations and animations as their far most favourite structural element of electronic learning supports. Although we managed to confirm the assumption, as shown above, we performed a further analysis focused on identifying the students' opinions on the suitability of particular structural elements of electronic learning supports for gaining knowledge, real ideas and skills.

The results obtained in particular component parts of this area of the investigation research are demonstrated in the following parts of the study. Each result is supported with a statistical analysis that aims at demonstrating the dependence or the independence of the results obtained on the gender of the respondents, at indicating the development trends with regards to the students' opinions and attitudes, all this based on an analysis of the answers of the respondents in each year of the research and on a comparison of the partial results with the overall ones.

Students' opinions on the best structural element of the electronic learning supports with respect to the acquisition of theoretical knowledge

In this case, we again applied the above mentioned investigating method to find out which structural element of electronic learning supports students prefer in order to gain theoretical knowledge when studying the subject matter by means of electronic learning supports designed for e-learning.

Based on the analysis of the results obtained, it can be said that with respect to gaining knowledge, the total of 54.1% of the respondents declared the static element in the form of textual information to be their most favourite structural element of the electronic learning supports, followed by 32.1% of respondents who preferred dynamic elements in the form of interactive animations, and 13.8 % of the respondents valuing static elements in the form of images. It is therefore possible to say that, with respect to gaining knowledge, the most preferred structural element of the electronic learning supports are static elements in the form of textual information. As it also follows from Table 8, showing the percentage proportion of the students' opinions on the issues explored in each year of the research, the trend in this field, i. e. the students' opinions and attitudes, is stable and shows neither growth nor decline, as the partial results obtained do not differ substantially from the overall ones encompassing the entire period of the investigation research realization.

Furthermore, we focused on whether the views of women and men were identical in this area. According to the results of the analysis, we concluded that the views of men and women in this area vary considerably, as evidenced by the pivot table -6.

Table -6
Students' opinions on the best structural element of the electronic learning supports with respect to the acquisition of knowledge (women versus men)

Contingency table, cell frequency > 10 marked in italics Pearson's chi square: 14.4260 levels of skewness: 2, level of significance = 0.0007				
Respondents' gender	<i>Favorite element-text</i>	<i>Favorite element pictures, images</i>	<i>Favorite element animations</i>	Line sums
Women	135	17	68	220
Men	136	52	93	281
All Groups	271	69	161	501

Since the calculated value of significance is 0.0007, as shown in table - 6, we can conclude that the frequency of the responses given by men and women as regards their favourite electronic learning supports' structural element with respect to the acquisition of knowledge are not the same, and therefore this assessment is

dependent on the gender of the respondents. The observed results can be interpreted so that in comparison with men, women more often prefer acquiring knowledge via text.

Students' opinions on the best structural element of the electronic learning supports with respect to the acquisition of real ideas

The next step in the investigation research was to analyze the students' opinions regarding their favourite structural element of electronic learning supports with respect to obtaining real ideas.

Having analyzed the collected data, we came to a conclusion that with respect to gaining real ideas within the framework of the studies using electronic learning supports, students regard as the most appropriate element static structural elements, in the form of static visual information (pictures, graphs, tables, etc.). To sum up, it is possible to state that the most preferred structural element for the acquisition of real images within the framework of the study realized through electronic learning supports is the visual static information. It is also possible to argue that this trend in the students' opinions is stable and shows nor growth neither decline, because the partial results observed in individual years did not differ significantly from the overall results obtained through the entire period of the investigation research conduct. The fact is illustrated by table-7.

Table -7
Students' opinions on the best structural element of the electronic learning supports with respect to the acquisition of real ideas (percentage)

	year 2007	year 2008	year 2009	year 2010	year 2011	average
Static textual information %	24.7	22.5	21.9	24.0	23.7	23.4
Static visual information %	55.9	52.9	58.1	46.2	56.7	53.9
Dynamic visual information %	19.4	24.5	20.0	29.8	19.6	22.8

We can also prove that the above stated result is independent of the gender of the respondents, which is shown by the contingency table-8.

Table -8
Students' opinions on the best structural element of electronic learning supports with respect to the acquisition of real ideas (women versus men)

Contingency table, cell frequency > 10 marked in italics Pearson's chi square: 5.1077 levels of skewness: 2, level of significance = 0.0007				
Respondents' gender	Favorite element-text	Favorite element pictures, images	Favorite element animations	Line sums
Women	41	128	51	220
Men	76	142	63	281
All Groups	117	270	114	501

Since the calculated value of significance is 0.08, as shown in table-8, we can argue that the frequency of particular male and female responses in terms of their views on the best structural element of electronic learning supports aimed at the acquisition of real ideas are identical. This evaluation can thus be regarded as independent of the gender of the respondents.

Students' opinions on the best structural element of the electronic learning supports with respect to the acquisition of practical skills

The last output to be stated here concerns the investigation conducted among the students with respect to their opinion on which structural element of electronic learning supports with respect to obtaining practical skills they preferred.

The results show that as regards obtaining practical skills within the framework of the education realized via electronic learning supports, undoubtedly the most popular structural element is the dynamic element in the form of interactive teaching simulations or animations. Once again, the argument can be supported by the fact that the total of 75.4% of the respondents claimed the dynamic element in the form of interactive teaching animations or simulations to be their favourite structural element of the electronic learning supports aimed at the acquisition of practical skills, another 14% of the respondents preferred the structural element in the form of static visual information, and only 10.6% of respondents valued static textual information. As in the previous cases, we can argue that the trend in the students' opinions on the most preferred structural element aimed at acquiring practical skills within the framework of the studies realized by means of electronic learning supports, is stable and shows no substantial growth or decline, because the partial results observed in individual years did not differ significantly from the overall results obtained through the entire period of the investigation research conduct.

Another very interesting finding concerns the dependence of the results obtained on the gender of the respondents. The table-9 below reveals that men more often prefer texts and animations, while women prefer rather animation and visual information.

Table - 9
Students' opinions on the best structural element of the electronic learning supports
with respect to the acquisition of practical skills (women versus men)

Contingency table, cell frequency > 10 marked in italics Pearson's chi square: 7.2764 levels of skewness: 2, level of significance = 0.026303				
Respondents' gender	Favorite element-text	Favorite element pictures, images	Favorite element animations	Line sums
Women	18	40	162	220
Men	35	30	216	281
All Groups	53	70	378	501

Since the calculated value of significance is 0.03, as shown in table-9, we can state that the frequency of male and female responses regarding their favourite structural elements of electronic learning supports aimed at the acquisition of knowledge are not identical, and therefore this assessment can be seen as dependent on the gender of the respondents

Discussion of the results achieved

The idea of a completely natural use of ICT, including e-learning tools and LMS, by today's generation of students, is more or less taken as a fact, based on two major arguments. The first one stems from the fact that today's adolescents and even infants deal with and manage the computer technology with a rather striking spontaneity. The second argument is based on the statistics demonstrating the level of dependence of the use of ICT on age, showing that unlike older generations; nearly all adolescents use the Internet and mobile phones (Lupac, 2011). It is around these arguments that Don Tapscott American (1998) built his essays claiming that the power model of the family was disturbed, because, unlike the past, children were taking over the teaching role and educated their parents with respect to the orientation in the digital environment. His concepts of N-GEN and that of the digital generation were soon followed by other concepts, i.e. digital natives (Prensky, 2001a), homo-zappiens (Veen, Vrakking, 2006), digitally birth (Palfrey, Glasser, 2008) and others. "Digital natives are used to receiving information very quickly. They like doing more activities at a time (i.e. multitasking). They prefer the image processing over the processing of the text. They prefer a random access to information (i.e. hypertext) and they like best working in a networked environment (online). They expect immediate praise and frequent evaluation of their work". (Prensky, 2001a). The ideas of Prensky and Tapscott were quite influential at the time and have later become subject to several attempts, more or less successful, by

various researchers, to refute them (Bennett, Maton & Kervin, 2008).

Although the author of the present study is neither a supporter nor the opponent of the idea of a different approach to the education of 'digital natives', he believes that education through e-learning, with the widest possible use of ICT, may offer a suitable scope for the verification of certain characteristics of the generation of digital natives. The above stated attitudes of the Czech university students on e-learning can thus help with the identification or the determination of the extent of a potentially existing group of students who do have digital thinking (Prensky, 2009). Since the students involved in the research implemented fall into this group (all students were born after 1990), it is possible to verify some selected features, typical for a group of digital natives, on the results identified.

- Firstly, a group of digital natives can be characterized as "preferring random access to information (hypertext) and giving best performance in a networked environment (online)" (Prensky, 2001a). According to the results achieved, there is a group of the students who demonstrably refuse to study via e-learning, even with the latter being implemented through hypertext instructional materials and online environment. Although many other factors may have impact on the fact, the question arises whether the generation of the students born after 1990 (this corresponds to the general implementation of ICT in the Czech Republic) really do prefer only online educational activities or not.
- Secondly, a group of digital natives should be "preferring processing visual material prior to the text" (Prensky, 2001a). In this case, the results obtained definitely confirmed the characteristic as it is clear that students absolutely prefer visual information to text.

Within the framework of such a rapidly evolving field as this one undoubtedly is, it is almost impossible to keep sufficient distance, necessary for the achievement of an 'unbiased assessment', which itself is a prerequisite for a professional discussion supported by facts. It is thus necessary to perceive the above stated findings rather as stimuli for further discussion, resulting in a more responsible and balanced approach to the needs of the students whose studies are, though only partly, implemented through e-learning. Although they actually might not be the digital natives and current problems associated with school systems and the results of their action might have their origin elsewhere, the fact cannot be denied. It is therefore necessary to monitor this area constantly, to regularly analyze and evaluate the attitudes of the students involved in this form of education and to keep trying on searching for the best ways to meet their expectations.

Conclusion

Although the above stated results cannot be regarded as significant, they indicate trends that should be taken into consideration by up-to-date education making use of electronic distance learning texts and LMS. The attitudes of the students could provide us with a guideline helping to find the optimal way towards satisfied, educated and professionally prepared tertiary education graduates and graduates of lifelong learning programmes. The investigation research conducted shed some light on some of the preferences and attitudes of the students related to this field, which can be regarded as long-term. It can therefore help all those who want to design e-learning tools to meet the needs of their students or pupils the best way possible.

Taken into account other ways of designing appropriate e-learning tools, conducting surveys of attitudes and opinions of the students on the education via e-learning, or carrying out investigations focused on the issue of the evaluation of electronic learning supports, it will be useful to respect the recommendations as stated below. They partly result from the research carried out:

- It is necessary to accept the fact that the 'classical' concept of distance learning (from which e-learning is often said to have derived) is focused on the text, in the form of a distance learning text or electronic learning supports, as they are often referred to, as the main carrier of information (knowledge, skills, attitudes, etc.). This fact actually copies the historical development (see the corresponding form of distance learning) and

that is why numerous methods of assessing the electronic learning supports are primarily based on assessing the properties of the text, which is far from being sufficient.

- It is essential to recognize the fact that e-learning allows the use of electronic distance learning texts or electronic learning supports, as they are often referred to, comprising several carriers of the educational content, which are very often of multimedia character. It is therefore possible to say that with respect to the achievement of educational objectives in the cognitive, affective and psychomotor fields; at least one of these carriers (text, static visual animation, dynamic visual information, multimedia, animations, simulations, etc.) is always available and appropriate.
- Simulation and virtual reality makes for the extension of the field of achieving psychomotor educational goals through e-learning by experimental activities in virtual labs and via virtual simulations. Moreover, this method often makes use of the possibilities offered by virtual reality and associated advantages of using cyberspace.
- When using the above stated education forms, it is necessary to choose an appropriate teaching strategy, reflecting the possibility of using such carriers of the educational content, which would match the objectives to be achieved. It is necessary to take into account that apart from electronic forms (e-learning, e-twinning, e-blending etc.) there still exist traditional printed educational learning materials intended for distance learning.

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