ACADEMIC SCHOLARS' VIEW ON THE CONTRIBUTION OF ICT TO THE ENHANCEMENT OF DISTANCE LEARNING ELEMENTS OF UNIVERSITY STUDIES

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Abstract: *The study defines the basic constructs which are used in the university distance learning theories and practice. Distance learning is currently linked with eLearning and is becoming to be titled "online distance learning". The research on a representative sample of the University of Ostrava students, which was carried out within the scope of the 7th FP IRNet project, was aimed at how the individual components of the electronic learning environment, which enhance university distance learning elements, can be used.*

Keywords: open and distance learning (ODL), online learning, university education management, massive open online course (MOOC), open educational resources (OER), equal opportunities

INTRODUCTION

As educational institutions, universities react to the development of modern educational technologies and to the development of educational and learning theories. The higher level of ICT literacy of students – high school graduates or people who already work – who start studying at universities is demonstrated by their higher expectations concerning teaching methods and the organization of studies (mainly concerning the use of the current ICT technologies). Massification of university education results in both the daily attendance (DA) and combined study (CS) students studying and working at the same time, which means that they prefer the curriculum to be presented in a more distance manner, which does not require their direct presence in the classroom. When dealing with the mentioned phenomena, university teachers intend to (according to their capabilities and qualification) adapt their classes to students' expectations and possibilities and thus ensure the quality of their study outcomes. Online education, which can be understood as the interconnection of distance education and eLearning, has the

potential to take the abovementioned facts into account. The possible utilization of the potential can be influenced by a number of organizational, managerial, pedagogical and technical factors, the analyses of which are the subject of the annually issued reports on the situation of online education and universities in the U.S.A. These analyses are inspiring and draw attention to the critical parts of online learning and its development trends. Within the scope of the 7th EU framework program called IRNet *(International research network for study and development of new tools and methods for advanced pedagogical science in the field of ICT instruments, e-learning and intercultural competences)*, a questionnaire research was conducted in each of the nine countries of the research consortium which was aimed at finding how important the university teachers consider the use of electronic resources in education, for goals of which they use them, which resources they use most often, how they help them influence students' activities and what they do to ensure that they are useful to all students. The paper presents the results of the research for the Czech Republic.

1. ONLINE DISTANCE LEARNING

The title of the chapter suggests that today online technologies are used in distance education. A large number of universities use online technologies to demonstrate that they offer study programs or individual courses realized mostly or entirely without direct contact with the teacher.

Essential elements and advantages of distance learning and its specific features concerning universities should not only be mentioned but also looked at from the point of view of its connections to both eLearning and online learning.

Distance learning (Průcha, Veteška 2012) is a form of study based on managed self-study with the use of information and communication technologies. It is a form of education with multimedia elements which is mostly used for the realization of university study programs and for further education (upskilling). However, it is used less often for the realization of high school study programs.

Zlámalová (2008) argues that the main goal of distance learning is to provide education to those students who – for some reason – cannot participate in daily attendance study programs (distance from the university, workload, family responsibilities, medical or social handicaps).

The so-called tutor – the student's advisor, who methodically arranges their education and evaluates going tasks – is the typical representative of distance learning. The student's self-study guided by the tutor and based on their (mostly electronic) communication is the basic principle of this form of study. Quality technological background, communication means and study materials (both printed and electronic) are essential for the successful realization of distance learning. Printed texts (study supports), which are significantly different from the text used in the DA study programs, are the basic study material. The distance study supports are

problem-oriented – full of questions, text gaps, exercise subjects, short tests, summaries, case study assignments, etc. (Eger, Dvořáková 2003).

Lojda (1999) argues that the changing social and technological conditions increase the attractiveness of distance study, which results in the increased availability of this form of study for potential students. As far as the new competitive environment is concerned, the use of ICT results in the approximation of the DA and CS forms of study in terms of multimediality. However, he also argues that the written text still is the basis for the successful study and that ICT is used only as a means of its distribution. Kopek (1999, in Eger, Dvořáková) explains that undoubtedly the multimedia part of distance learning is an important element of this form of education, but the main advantage lies in the quality methodology for the processing of study materials. Lojda (1999) adds that there also needs to be quality organization in terms of study management. He stresses that the organization of distance learning does not lie only in the evidence and administration of students and study materials, which are being distributed to students. He mentions the importance of a friendly study environment, support for study, encouragement, counseling, explaining the evaluation process to the student, etc.

Midgley (2015) offers an interesting look at distance learning in Great Britain when he argues that "Distance learning is a way of learning remotely without being in regular face-to-face contact with a teacher in the classroom. In the UK such learning has its roots in students learning through correspondence courses. More than 270,000 undergraduate students are taking their first degrees via distance learning, together with some 108,000 postgraduate students. In recent years the advent of the Internet and widespread use of the computer has led to a huge growth in distantly delivered tuition and study. At undergraduate level distance learning usually means students engaging with learning materials at home or work. These materials are produced by the university, college or learning provider and are either sent directly to the student or more usually today accessed via the Internet. Tutorial support is provided via a virtual learning environment, telephone, email or other electronic means. There may be occasional face-to-face encounters with tutors and attendance at week-long summer schools".

He further specifies the advantages and disadvantages – why choose distance learning. The main advantage of distance learning is that it allows you to fit your learning around your work and home life. You can usually also set your own pace of study. It is your decision as to when and where you study. It doesn't matter where you live – you can gain a degree from anywhere in the world. As with a full-time degree, students may find that they gain useful, transferable skills, such as planning and research. A distance learning course often costs less than a full-time degree. The downside is that you will not enjoy the conviviality of being on a campus and rubbing shoulders with fellow students on a daily basis. Loneliness and feelings of isolation should be avoided, however, by frequent online contact with tutors and taking part in virtual forums, virtual help groups and discussion rooms. Distance

learning providers usually offer dedicated support to their online or distance learning students.

In the Czech Republic distance learning is most commonly associated with eLearning. According to Průcha and Veteška (2012), it is an educational process that uses information and communication technologies for the creation and distribution of study content, communication between students and teachers, evaluation of educational results and the organization and management of study. It is realized mainly through computer networks such as the Internet or Intranet.

Mužík (2011) offers a similar perspective and adds that eLearning constitutes a segment of didactics and that it is popular with both teachers and students.

Eger (2005) characterizes eLearning as education which is provided in an electronic form, needs a computer with software and a browser in the Internet or Intranet network and contains a multimedia platform based on the use of CD or DVD. Primarily, however, it uses a computer and a network as an interactive environment with the possibility of visual contact.

Various types of eLearning are becoming the subject of research with the results being equally important for both teachers and students. Individual teaching methods and technological solutions are developing as one gadget is being replaced by another. The student frequently chooses the teaching method according to their technical options, capabilities and the suitability of the educational product. According to Mužík (2012), the advantages of eLearning are as follows: the quality of the didactical-methodical level of study materials, the possibility of enhancing the content of the curriculum, relatively easy contact with the tutor. As far as the disadvantages of eLearning are concerned, he states a lower level of computer literacy, limited time to open some of the products on the monitor and reluctance toward interactive learning. The author further presents a simplified general overview of the possible variants of eLearning.

- Electronic media on the basis of television – the disadvantages are insufficient interactivity and feedback;
- Courses on CD-ROM and DVD – the student is not online and uses the multimedia elements of the study material (graphics, video, audio, animations);
- E-courses on the Internet/Intranet – teachers upload them on various educational portals and they can be studied online or downloaded for offline study;
- Virtual classroom (webinar) – interactive web tool which enables people to meet in a virtual space, communicate, cooperate without them having to be physically present. This variant puts pressure on the student as they need to be able to plan, organize and adjust their studies.

Zounek (2006) argues that the advantages of eLearning are as follows: flexible learning, individualization of study, support of the development of the student's ability to self-study and their sense of responsibility for their own learning. Moreover, the student can participate in the creation or development of study content. As far as the disadvantages of eLearning are concerned, he states limited or no contact of the teacher and students (mainly in distance learning), the preparation and realization of eLearning courses being time-consuming and the choice of improper information resources and didactic methods. He also sees a problem in students with insufficient competence for self-motivation and learning.

The recent rise of ICT and the expansion of electronic networks have resulted in the change of people's behaviour on the Internet and the change of their working and education styles. While in the past people were only passive consumers of the information on the Internet, today there are a large number of tools for active use of the Internet which enable communication, publishing, sharing, discussion about the best practice and learning. eLearning, however, plays a key role not only in informal education but also in informal learning concerning mastering computer work (Zounek 2009).

The development of online education within the classification of the methodological realization of taught courses or entire educational programs mentioned below shows the need for specific preparation of teachers for the realization of blended learning. As a result, appropriate qualification frameworks are being created (e.g. iNACOL Blended Learning Teacher Competency Framework, see Powell et al., 2015). The mentioned framework has four main domains: Mindsets, Qualities, Adaptive Skills and Technical Skills. Each domain has defined competences which are being specified by a particular standard. For each standard there is a detailed description with the study resources. This standard could inspire the preparation of university teachers for online education.

2. RESEARCHES OF ONLINE DISTANCE LEARNING AT UNIVERSITIES

As far as the (low number) of such focused resources are concerned, it is necessary to mention annual reports on online education in the U.S.A. The 2010 report (Allen and Seaman 2010) collected data from 2,500 dormitories and universities (i.e. from 57.3% of all tertiary institutions). It provides the classification of university courses from the point of view of their didactic interpretation, i.e. the methods used, which was created on the basis on the comparison of classification approaches of the interviewed institutions. The traditional type of courses has a zero share of the online presented content. The web facilitated course can have a 1-29% share of the

online presented content. The blended/hybrid[1] course has a 30-79% share of the online presented content. The online course has a share higher than 80% while it has no share of direct instruction. 63% of all the interviewed institutions consider online education an integral part of their long-term strategy.

5.6 million students (nearly 30% of all university students; the number continues to rise) studied at least one online course in the year the research took place. The number of leaders of academic institutions, who consider the study results of online education the same or better than the results of traditional education, is also rising (from 57% in 2003 to 66% in 2010). More than 75% of public school leaders state that online education is the same or better than traditional (face-to-face) education. 75% of institutions state that economic decline increases the requirements for online courses and programs.

The 2011 report (Allen and Seaman 2011) shows only small shifts concerning the application of online education. The number of university students who study at least one online course has increased to 6.1 million, which is 31% of all students. The number of leaders of academic institutions, who consider the study results of online education the same or better than the results of traditional education, has increased to 67%. Academic leaders at institutions with online offerings have a much more favorable opinion of the relative learning outcomes for online courses than do those at institutions with no online courses or programs. It is interesting that over the past eight years the acceptance of online education almost has not changed and that it is different at different types of schools in spite of the fact that the number of online programs and courses is still rising. Only less than one-third of leading academic scholars believe that their department accepts the values and justness of online education. The departments profusely support the development of online education by combining mentoring and optional courses, which ensures pleasant and successful realization of online courses.

Omitting the three following reports, the 2015 report (Allen and Seaman, 2015) includes the summary of incorporation or planning of Massive Open Online Courses (MOOCs), which already exist in 8% of institutions. The percent of higher education institutions that currently have a MOOC: Many institutions (39.9%) report they are still undecided about MOOCs, while the single largest group (46.5%) says they have no plans for a MOOC. Only 16.3% of academic leaders believe that MOOCs represent a sustainable method of offering online courses (down from 28.3% in 2012). Decreasing numbers of leaders see MOOCs as a way for institutions to learn about online pedagogy: 27.9% this year, down from 49.8% and 44.0% for the last two years. The acceptance of online education decreased to 28%, this slightly declining trend is permanent. The report once again deals with a question whether or not … *do Students Require More Discipline to Complete Online Courses? Academic*

[1] Blended learning may fall into four basic models: Rotation model (with variants: rotation, lab rotation, flipped rotation and individual rotation), Flex model, a La carte model and Enriched virtual model (see Powell et al., 2015)

leaders have been consistent in their belief that "Students need more discipline to succeed in an online course than in a face-to-face course." In 2005, a majority of respondents (64.7%) agreed with this statement. By 2013, the proportion had grown to 68.9%, and it now stands at 68.3% for the current 2014 results.

Moreover, the report pursues the identification of the development barriers of online education. It argues that "When online education first arrived on the scene one of the hopes was that teaching with technology would be more efficient than current methods. Perhaps faculty could teach more students with improved quality by taking advantage of the new technology. This has not proven to be the case. Academic leaders have continued to report that it takes more time and effort for a faculty member to teach an online course than to teach a corresponding face-to-face course (Allen and Seaman 2015: 26). Unfortunately, „A majority of leaders report that the additional effort required to deliver an online course represents a barrier for online instruction. New technologies, faculty experience with teaching online, and expanded and improved institutional support services have not had any effect in reducing this problem. The level of concern in 2014, with 78.0% reporting it as an "Important" or "Very Important" barrier to the adoption of online instruction, is higher than it was in 2008 (76.3%).

It seems that the technical support of university teachers in using online education alone cannot limit the perception of this way of education as more demanding compared to the traditional way, which can result in the teachers' lack of motivation concerning online education and its application.

Moreover, the report also showed considerable variability concerning the perception of the term Open Educational Resources (OER), which is caused by the lack of terminological uniformity. It mentions the findings of the previous reports (Allen and Seaman, 2012), which came to two crucial conclusions:

> "Nearly two-thirds of all chief academic officers agreed that open educational resources have the potential to reduce costs for their institution. There was wide agreement among academic leaders that open educational resources will save time in the development of new courses". (Allen and Seaman 2015: 28)

On the other hand, the result of faculty awareness of open educational resources is surprising. "A bit more than one-third claimed to have some level of awareness. Just over 5% reported that they were very aware ("I am very aware of OER and know how they can be used in the classroom"), with around three times that many (15.2%) saying that they were aware ("I am aware of OER and some of their use cases"). An additional 13.8% of faculty reported that they were only somewhat aware ("I am somewhat aware of OER but I am not sure how they can be used"). This left nearly two-thirds of faculty reporting that they were generally unaware of OER ("I am not aware of OER" or "I have heard of OER, but don't know much about them")". (Allen and Seaman 2015: 29)

Another remarkable issue, which was part of the latest report, was the retention of students in online courses. "There is a growing concern among academic leaders on the issue of student retention. A total of 44.6% of chief academic officers reported that they agreed that retaining students was a greater problem for online courses than for face-to-face courses. This compares to rates of 40.6% in 2013, 28.4% in 2009 and 27.2% in 2004 for the same question". (Allen and Seaman 2015: 24)

The authors of the report explain the issue by stating that the students choose online courses because they are not able to attend traditional courses because of work, family or other commitments. The essential answer, however, can be more complex: "*If students are more likely to drop out of an online course because of work or family commitments, does that reflect on the nature of the course, or the nature of the student?"* (Allen and Seaman 2015: 24). In any event, *two-thirds of all academic leaders continue to consider retention of online students a critical issue for the future of online education.*

3. RESEARCH ON THE USE OF ICT FOR THE ENHANCEMENT OF DISTANCE LEARNING ELEMENTS OF UNIVERSITY STUDIES

At the end of the 2014/15 academic year, the collecting of data from a questionnaire research among academic scholars took place. The aim of the questionnaire research was to present the real picture of the current situation concerning university teachers' opinions on online education and the current situation concerning the use of the basic components of the university electronic environment for educational purposes.

The main research problem was unfamiliarity with the academic scholars' opinions on the instruments ensuring online education and the absence of relevant data concerning their actual use in the education process and for managed self-education of students.

Through the questionnaire compiled by the consortium of the project solvers answers to nine formulated questions were acquired, which can provide a more detailed picture of the researched issue.

3.1 Research file and data collecting

The research file consisted of 40 university teachers working at the Pedagogical Faculty of the University of Ostrava, 26 of which were men (65%) and 14 women (35%). 38% of the entire number of 106 academic scholars working at the Faculty participated in the research. The majority of respondents were Assistant Professors (72.5%), the rest were Docents and Professors. The majority of them were aged 41-50 (35%) and 31-40 (25%) while 62.5% of the respondents were no older than 50. As far as the level of ICT use is concerned, 7.5% of the respondents considered themselves beginners, 62.5% considered themselves intermediate users and 30%

considered themselves advanced users. The questionnaire was sent via email to all 106 teachers of the Pedagogical Faculty of the University of Ostrava. They were asked to fill it out in the Google environment. It was up to the addressed teachers whether or not they wanted to participate in the research. Therefore, it can be said that the selection of respondents was random.

3.2 Research results

The research results (after being statistically processed) are presented in the form of answers to partial research questions.

Research question 1 results:

How important do university teachers find the use of electronic resources in selected parts of university education?

Using the five-point scale the respondents were asked to evaluate the significance of the use of six given electronic resources in education (1 means low significance and 5 means high significance). Values in Table 1 and Figure 1, respectively show that teachers consider the possibility to provide students with study materials and organize their group, collective or individual work to be the most significant.

Table 1.

Examination of the significance of the use of electronic resources in the selected parts of university education

Item	Mean	Std. Deviation
To provide necessary study materials	3,65	1,292
To organize classes of self-study for students	3,33	1,328
To provide distance learning	3,28	1,485
To increase students' interest in the studied subject	3,13	1,265
To organize students' work	3,08	1,163
For inspection, introspection, and reflection	2,85	1,210

Source: Own work

It was not possible to compare the averages (the data are not normally distributed). As a result, medians had to be compared through Friedman’s test. The result of Friedman’s test (significance = 0.000) proved that the opinions of academic scholars on the significance of the use of the mentioned resources differ. They consider some resources to be more significant than other (see Table 1 and Figure 1, respectively).

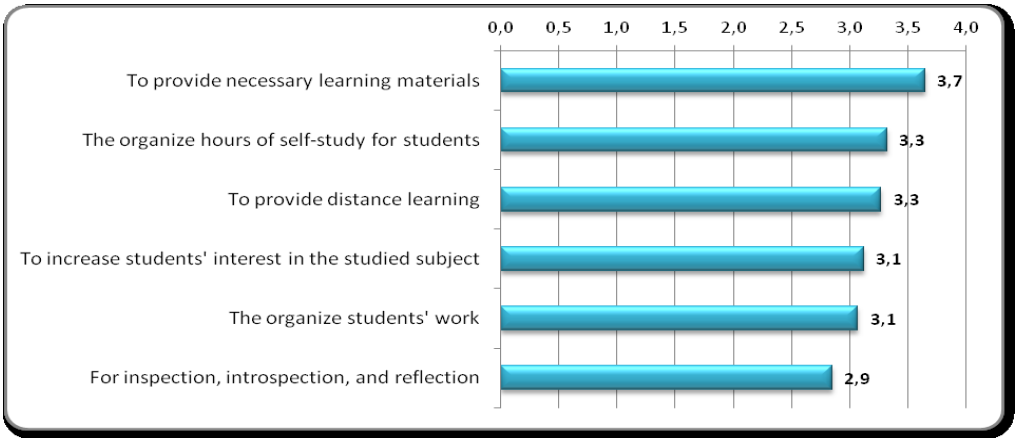

Figure 1. Examination of the significance of the use of electronic resources in the selected parts of university education

Source: Own work

Research question 2 results:

According to university teachers, which goals should be achieved through the use of electronic communication means in education?

The respondents were asked to select those of the eight proposed goals that – according to them – could be achieved through the use of electronic communication means. They were allowed to choose as many goals as they wished.

The data in Table 2 and Figure 2, respectively show that 65.5% of all teachers are convinced that the electronic communication means are suitable for student consultations, 60% of them think that they should be used for evaluation of and comments on students' tasks and 40% think they should be used in discussions about study problems, preferably in online mode.

Table 2.

Goals which could be achieved through the use of electronic communication means

Items	Frequency	Percent of teachers	Percent of cases
Student consultations	27	67,5	32,5
Evaluation of and comments on elaborated tasks	24	60,0	28,9
Discussions about study problems, online discussions	16	40,0	19,3

Encourage students to mutual evaluation	6	15,0	7,2
I do not use any of them	5	12,5	6,0
Creation of the educational social network	3	7,5	3,6
Other	2	5,0	2,4
Organization of problems with telecommunications	0	0,0	0,0
Total	83	207,5	100,0

Source: Own work

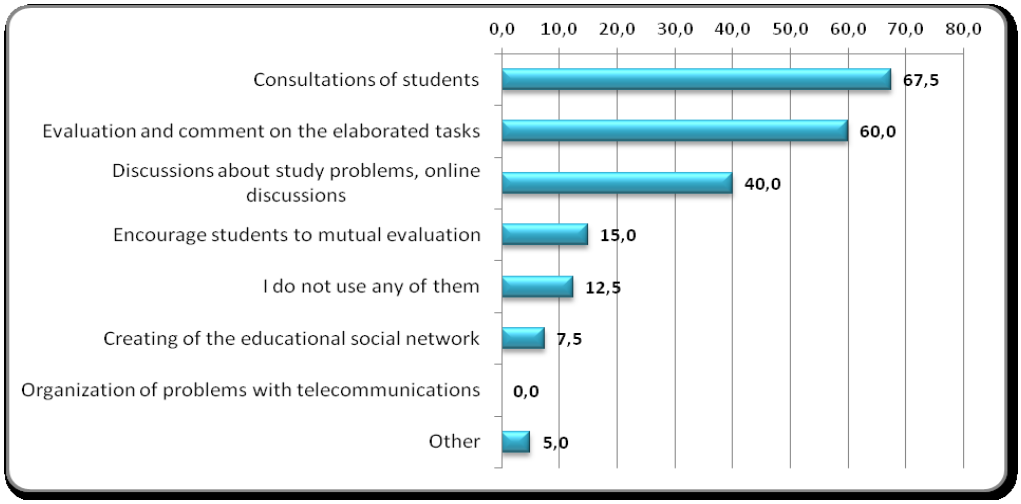

Figure 2. Goals which could be achieved through the use of electronic communication means

Source: Own work

When testing the hypothesis whether or not teachers prefer some entries to others, a statistically important difference was determined at a level of less than 1%. Therefore, it can be stated that the interviewed teachers have different opinions on the role of the mentioned electronic means in achieving educational goals (see the results in Table 2 and Figure 2, respectively).

When testing the hypothesis whether or not the opinions of teachers up to 50 years of age and over 50 years of age on which goals should be achieved through the use of electronic communication means in education differ, no significant difference between the two groups of teachers was determined. However, a difference was

determined in the question whether or not the instruments should be used in the discussion about study problems (based on whether or not the teachers regularly use social networks):

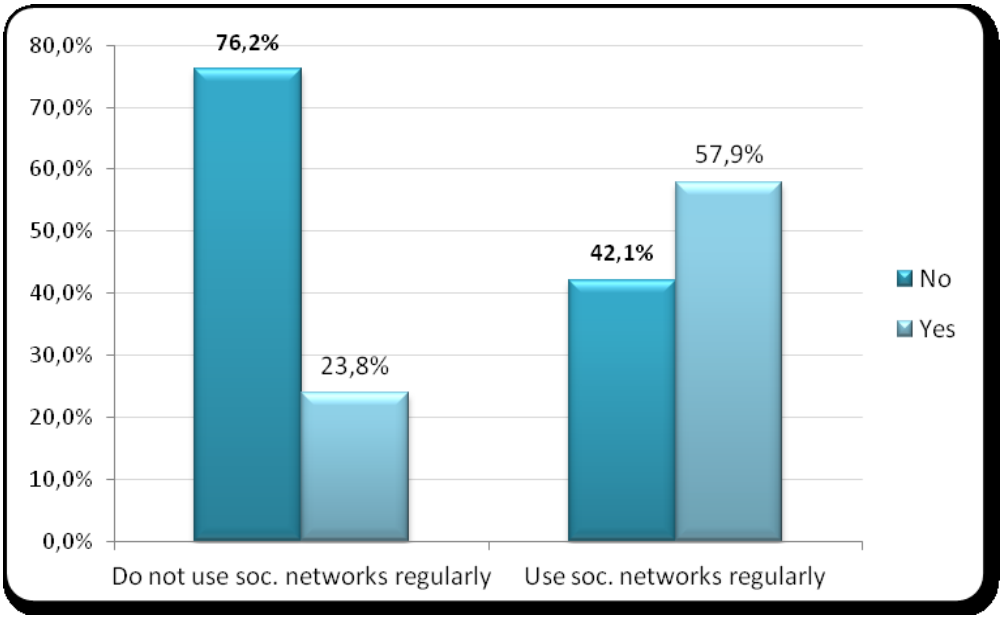

Figure 3. Evaluation of the contribution of online discussions about study problems according the regularity of the use of social networks

Source: Own work

As far as the contribution of online discussions about study problems to the successful education process is concerned, opinions of those who use social networks regularly and those who do not are significantly different (chi-squared significance = 0.028). The teachers who regularly use social networks consider online discussions beneficial (see Figure 3).

Research question 3 results:

Which resources do the teachers use the most for the preparation and realization of education?

The respondents were asked to select those of the fifteen proposed resources which they use in education. They were allowed to choose as many resources as they wished.

The teachers preparing electronic content for their courses (probably in the form of PowerPoint presentation) represented one-fourth of the 106 selected answers. The majority of teachers (87.5%) do so. It is followed by the preparation of film fragments and television or radio shows (12.9% of all answers and 45% of all

teachers) and the preparation of digital materials for self-study (12.1% of all answers and 42.5% of all teachers). Another frequented answer was that the teachers prepare thematic websites (11.4% of all answers and 40% of all teachers). Other applications are presented in Table 3 and Figure 4, respectively.

Table 3.

The most frequently used resources for the preparation and realization of education

Items	Frequency	Percent of teachers	Percent of cases
I prepare electronic content for my courses	35	87,5	25,0
Fragments of films, television or radio programs, etc.	18	45,0	12,9
I prepare digital materials to help students with self-study	17	42,5	12,1
Thematic websites	16	40,0	11,4
Electronic resources developed by students as part of their projects	11	27,5	7,9
Sources from scientific databases of various universities	10	25,0	7,1
E-books as an additional recommended reading	8	20,0	5,7
Educational programs	7	17,5	5,0
Independently created e-courses	7	17,5	5,0
E-books as the major recommended reading	5	12,5	3,6
Digital multimedia learning objects from the accessible collections	4	10,0	2,9
Virtual laboratories	1	2,5	0,7
List of current educational information resources in education	1	2,5	0,7
Institutional repository	0	0,0	0,0
Total	140	350,0	100,0

Source: Own work

Also tested was the hypothesis that the use of individual resources is influenced by subjectively felt ICT skill level of university teachers about which they were asked. They could evaluate themselves as advanced users, intermediate users or as beginners. Considering the low number of teacher respondents, the beginner and intermediate user categories were merged.

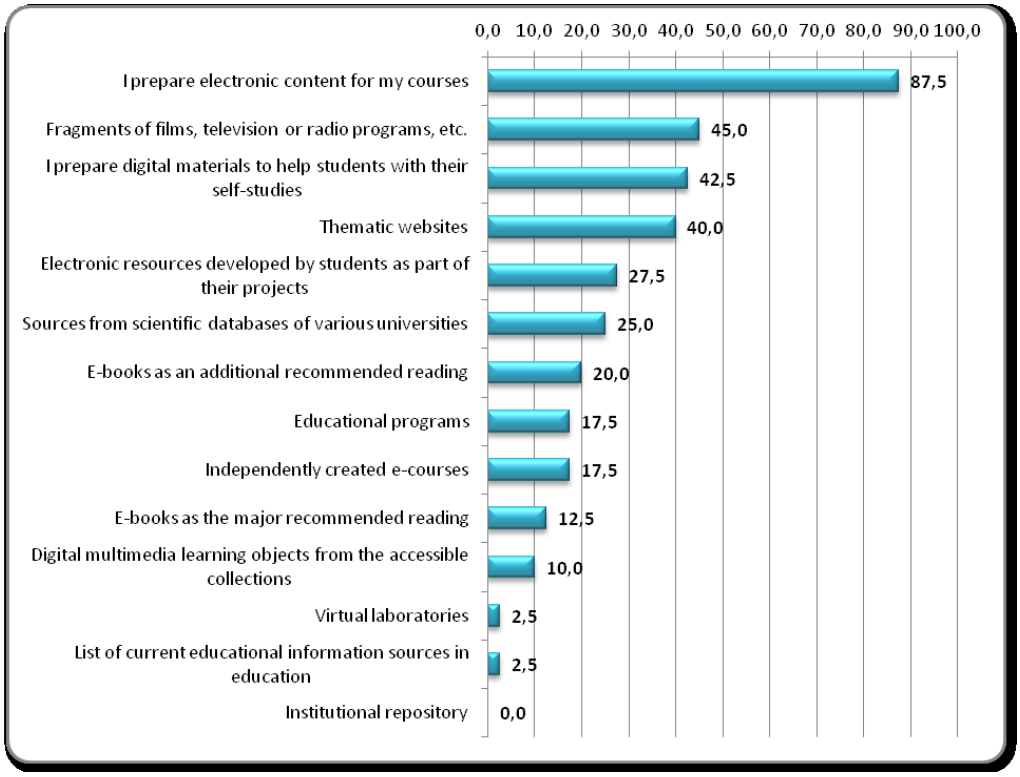

Figure 4. The most frequently used resources for the preparation and realization of education

Source: Own work

The advanced users' evaluation of the use of three entries is different from beginners or intermediate users (see Table 4): "I prepare digital materials to help students with self-study" (chi-squared significance = 0.43), "Thematic websites" (Fisher's test significance = 0.037, chi-squared could not be used due to a high number of low expected frequencies), "Independently created e-courses" (Fisher's test significance = 0.001). All three entries are used more frequently by the advanced users.

Table 4

Influence of ICT skill level on the use of individual resources

Item		Advanced users	Beginners or intermediate users	Total	Sig.	Test
I prepare digital materials to help students with self-study	Count	8	9	17	,043	Pearson Chi-Square
	%	66,7%	32,1%	42,5%		
Thematic websites	Count	8	8	16	,037	Fisher's Exact Test
	%	66,7%	28,6%	40,0%		
Independently created e-courses	Count	6	1	7	,001	Fisher's Exact Test
	%	50,0%	3,6%	17,5%		

Research question 4 results:

To what extent (how often) do university teachers use the three established quality levels of the application of ICT in university education?

The first level is represented by the following answer: partial use of information instruments in teaching (presentation in class, computer tests, exchange of information via email, etc.).

The second level is represented by the following answer: Creation of eLearning courses, the use of information technologies in the system.

The third level is represented by the following answer: Creation and support of open educational resources (MOOC – massive open online course, personal open online resources – e-portfolio).

Using the five-point scale the respondents were asked to evaluate the three levels according to the frequency of use (1 means low degree of use and 5 means high degree of use).

The "first level" of the application of ICT was evaluated above average (3.8). The degree of the "second level" of the use of ICT was significantly lower. The application in the form of massive open online courses or open education resources was rare (see Table 5 and Figure 5, respectively).

Table 5

Frequency of the application of ICT in education according to three quality levels

Item	Mean	Std. Deviation
Partial use of information instruments in teaching	3,8	1,42
Creation of e-learning courses, use of information technologies in the system	2,3	1,44
Creation and support of the open educational resources	1,4	0,92

Source: Own work

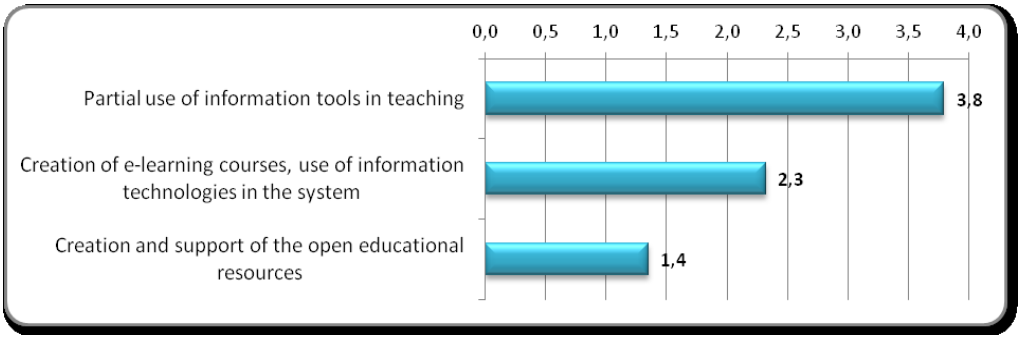

Figure 5. Frequency of the application of ICT in education according to three quality levels

Source: Own work

Subsequently, the hypothesis that "the user level" of teachers concerning ICT influences the level of their application was tested (see Table 6). The comparison was made through the Mann-Whitney U test. However, no statistically significant difference was determined. Therefore, with regard to the respondents' user level, their answers concerning this group of answers are uniform.

Table 6.

Influence of the user level of teachers in the ICT field on the level of ICT use in education

ICT competence		Partial use of information instruments in teaching	Creation of e-learning courses, use of information technologies in the system	Creation and support of the open educational resources
Advanced users	Mean	3,92	2,92	1,58
	Std. Deviation	1,443	1,782	1,084
Beginners or intermediate users	Mean	3,75	2,07	1,25
	Std. Deviation	1,430	1,215	,844
Total	Mean	3,80	2,33	1,35
	Std. Deviation	1,418	1,439	,921
Sig. (M.-W. test)		,637	,135	,244

Source: Own work

Research question 5 results:

Which instruments do university teachers use if they want to change the trajectory of students' study activities?

The respondents were asked to choose those instruments which they use if they want to change the trajectory of students' study activities. They could choose more than one of the six possible answers. The majority of teachers do not use electronic instruments for the stated purpose (62.5% of all teachers). 30% of all teachers stated that they use individual student portfolios within the course. Every eighth teacher uses the individual portfolio within students' study or social interests and every tenth teacher uses the individual portfolio within the education process. However, the differences in the three types of portfolios were not specified to the teachers. As a result, it could happen that the teachers could not notice the differences. If we merged the use of the three types of portfolios into one group of answers, it would be used by more than 40% of all teachers (42.9%).

Table 7.

Instruments used by teachers to change the trajectory of students' study activities

Items	Frequency	Percent of teachers	Percent of cases
I do not use any	25	62,5	51,0
Student portfolio within the course	12	30,0	24,5
Student portfolio within their interests	5	12,5	10,2
Student portfolio within the education process	4	10,0	8,2
Electronic diary	2	5,0	4,1
Other	1	2,5	2,0
Total	49	122,5	100,0

Source: Own work

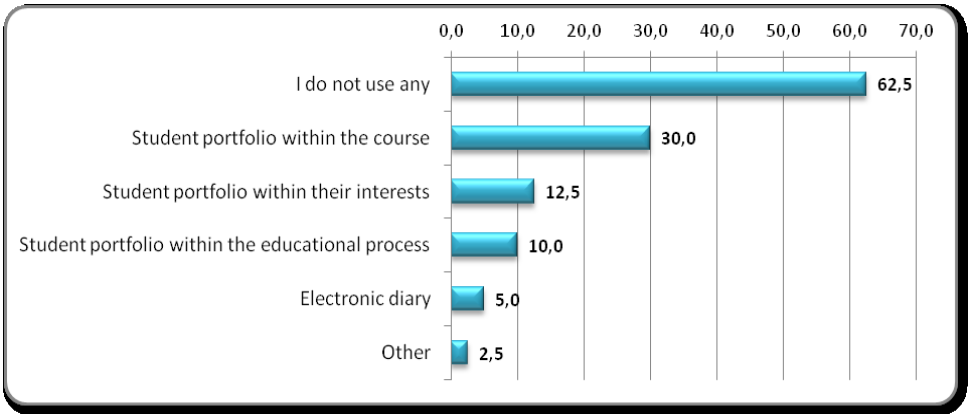

Figure 7. Instruments used by teachers to change the trajectory of students' study activities

Source: Own work

A number of hypotheses were being verified concerning the relation of answers to this question and the remaining parts of the questionnaire. However, no relation was found between any of the positive answers and the fact that the teachers participate in social networks. Moreover, no other criteria influence the respondents' answers to this question.

Research question 6 results:

According to the level of their specialty, to what extent (how often) do university teachers use particular programs in university education?

Using the five-point scale the respondents were asked to evaluate the use of the four presented computer programs, which differed in the degree of commonness or specialization for university education (1 means less often and 5 means very often).

The data presented in Table 8 and Figure 8, respectively show that the more specialized a program is, the less often it is used. In other words, non-specific office programs are used very often while programs managing the education process and the choice of its content are used rarely.

Table 8.

Item	Mean	Std. Deviation
Office programs, email, search engines, etc.	3,98	1,387
Programs managing the education process and electronic content	3,45	1,501
Specialized educational computer programs	2,05	1,395
Modern utilities and services (the Internet, mobile devices, etc.)	1,83	1,130

Frequency of teachers' use of determined groups of programs in education

Source: Own work

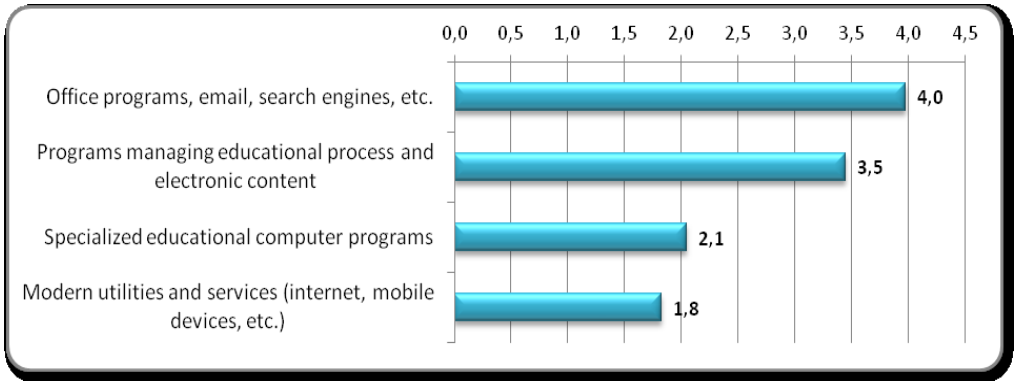

Figure 8. Frequency of teachers' use of determined groups of programs in education

Source: Own work

The hypothesis was tested (through the Mann-Whitney U test – non-parametric version of t-test) that the advanced users use all four groups of programs more than the intermediate users and beginners. As far as the advanced users are concerned, they differed from the others in that they used modern tools and services in education more often (significance = 0.040) (see Figure 9).

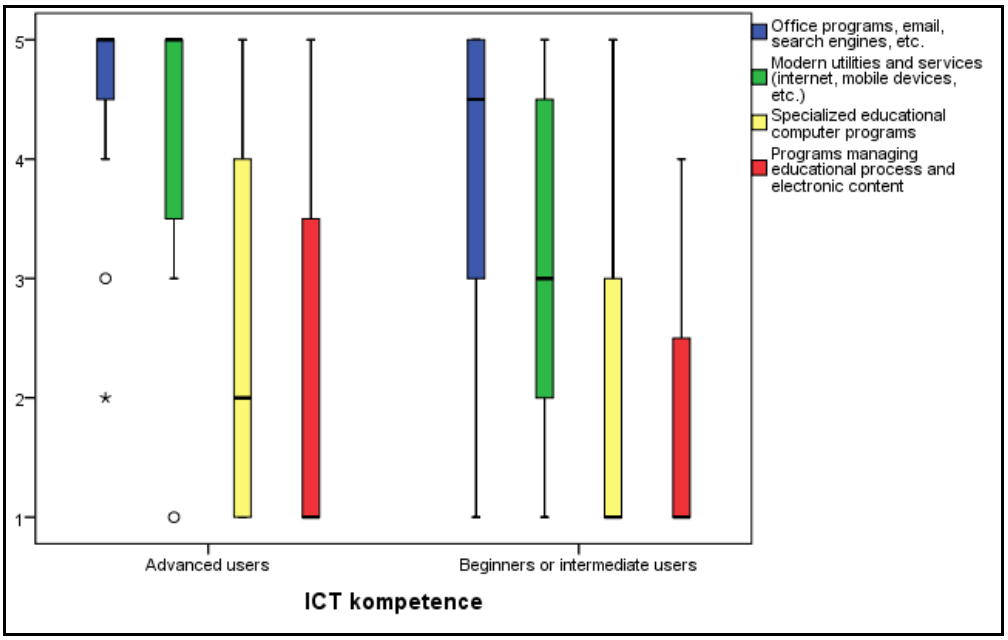

Figure 9. The use of the defined groups of programs according to teachers' ICT competencies

Source: Own work

Research question 7 results:

Which electronic communication means do university teachers use most often for communication with their students?

The respondents could choose more than one of the 8 possible answers. The results are summarized in Table 9 and Figure 10, respectively.

When communicating with their students, university teachers from the research file prefer emails and relevant LMS tools (85% of all teachers and 55.7% of all answers). 20% of all teachers use medial channels and 12.5% of all teachers use Internet discussions. Every eighth teacher, however, does not use any of the electronic communication instruments yet. Four teachers use one of the social networks and one teacher uses teleconferences for communication with his students.

Table 9.

Electronic communication instruments used in education

Items	Frequency	Percent of teachers	Percent of cases
Messages (email, instant messaging, LMS, etc.)	34	85,0	55,7
Media channels (publishing audio and video files, comments)	8	20,0	13,1
Internet discussions (blog, forum)	5	12,5	8,2
I do not use any	5	12,5	8,2
Social networks	4	10,0	6,6
Joint work on documents (wiki, mass smart cards)	3	7,5	4,9
Teleconferences	1	2,5	1,6
Other	1	2,5	1,6
Total	61	152,5	100,0

Source: Own work

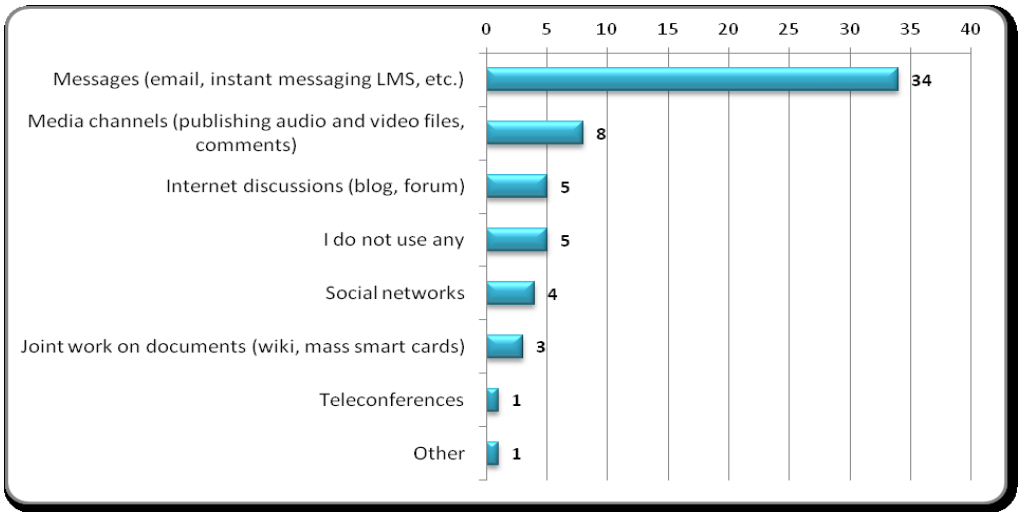

Figure 10. Electronic communication instruments used in education

Source: Own work

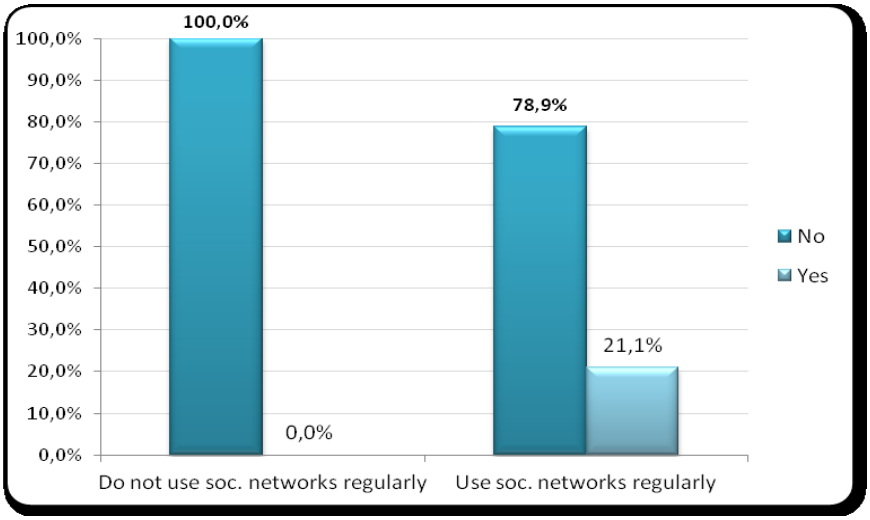

Figure 11. Influence of teachers' involvement in social networks on their use of social networks for communication with their students

Source: Own work

The respondents, who stated that they use social networks regularly, also stated more often that they use social networks in the education process (Fisher's test significance = 0.042; chi-squared could not be used due to a high number of low expected frequencies). As far as the remaining answers to this question are concerned, no significant difference was determined between frequent and infrequent users of social networks.

Research question 8 results:

Which of the following possibilities do university teachers consider to be the most suitable way of electronic communication with the teacher, in group (the student can choose)?

The respondents could choose more than one of the 4 possible answers. However, they mostly chose only one of them. The results are summarized in Table 10 and Figure 12, respectively.

The results prove that the teachers prefer a unified communication instrument for communication with their students (62.5% of all teachers). Moreover, 25% of all teachers prefer various methods of electronic communication with the teacher or in the study group, which the students themselves can choose. Every tenth teacher would choose the way of communication based on students' preferences.

Table 10.

Teachers' preferred ways of electronic communication with their students

Items	Frequency	Percent of teachers	Percent of cases
Unified communication instrument for all the students	25	62,5	56,8
Various methods of electronic communication with the teacher or in the study group	10	25,0	22,7
I do not use electronic communication	5	12,5	11,4
Examination of suggestions and preferences of students in the field of electronic communication	4	10,0	9,1
Total	44	110,0	100,0

Source: Own work

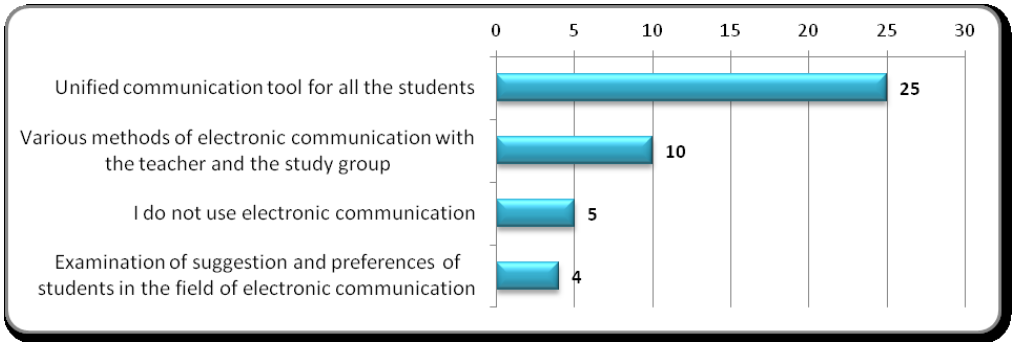

Figure 12. Teachers' preferred ways of electronic communication with their students

Source: Own work

A series of hypotheses trying to determine the factors influencing the choice of preferred ways of communication with students was tested through statistical methods.

As far as the respondents' age is concerned, no difference was determined. However, in one of the entries there was a difference with regard to users' competencies and whether or not the respondents regularly use social networks (see Table 11).

Table 11.

Influence of selected factors on the preferences concerning various methods of electronic communication with the teacher or in the study group

Various methods of electronic communication with the teacher or in the study group	Count	Percent	Sig. (Fishers Exact Test)
Do not use social networks	2	9,5	
Use social networks regularly	8	42,1	,028
Total	10	25,0	
Advanced users	6	50,0	,041
Beginners or intermediate users	4	14,3	
Total	10	25,0	

Source: Own work

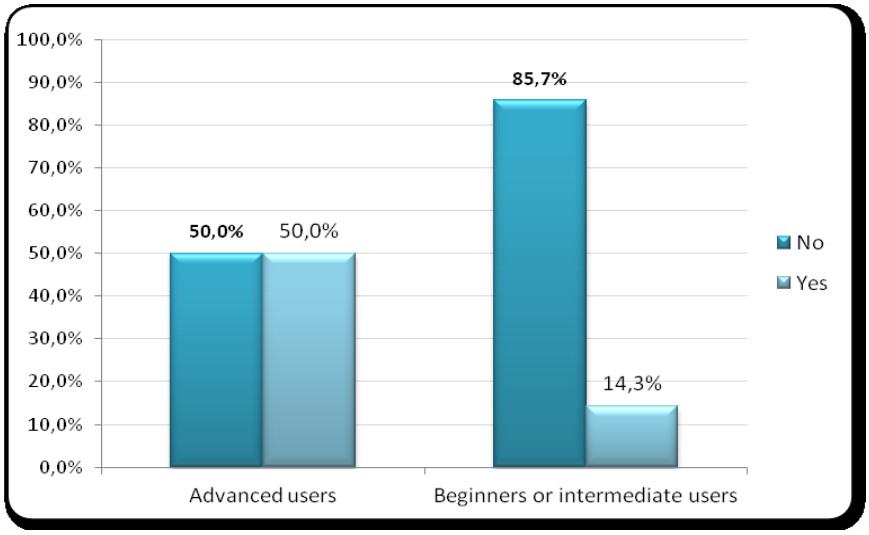

Figure 13. Influence of teachers' ICT competence on the preferences concerning various methods of electronic communication with the teacher or in the study group

Source: Own work

As far as the evaluation of the "Various methods of electronic communication with the teacher or in the study group" entry is concerned, a statistically important

difference was determined between the advanced users and the intermediate users or beginners (Fisher's test significance = 0.041; chi-squared could not be used due to a high number of low expected frequencies). Beginners and intermediate users chose this entry significantly less often than the advanced users (see Table 11 and Figure 13, respectively). In the same entry, a significant difference was determined between the evaluation of those who do not use social networks regularly and those who do so (Fisher's test significance = 0.028; chi-squared could not be used due to a high number of low expected frequencies). The respondents, who stated that they use social networks regularly, chose this entry significantly more often (see Table 11 and Figure 14, respectively).

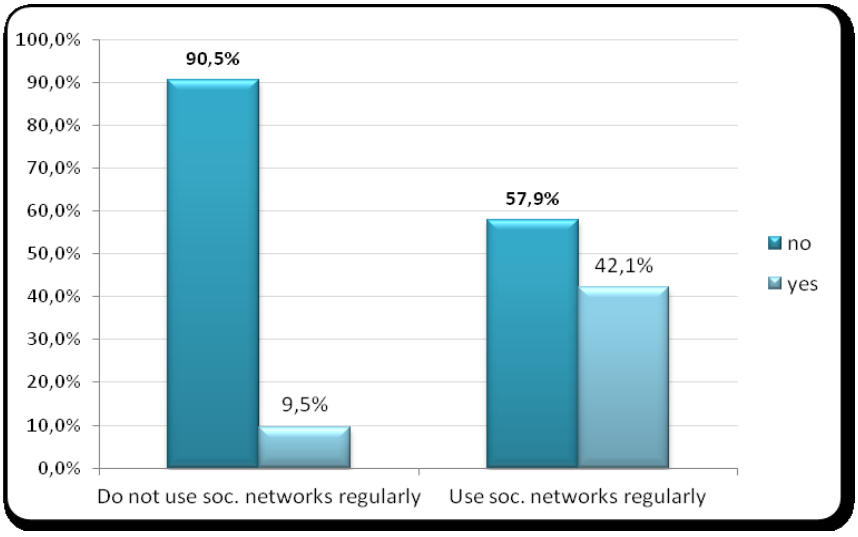

Figure 14. Influence of teachers' involvement in social networks on the preferences concerning various methods of electronic communication with the teacher or in the study group

Source: Own work

Research question 9 results:

Which of the presented possibilities do university teachers consider the best way to ensure that the electronic resources are useful to all students?

Two important features of university studies were incorporated into this question: to offer all students equal opportunities and conditions for personalized learning. The respondents could choose more than one of the 5 possible answers. The teachers chose 1-2 answers (65 chosen variants altogether). The interesting results are presented in Table 12 and Figure 15, respectively. A slight majority of teachers (55%) consider offering all students the same set of tools to be the best way to ensure that the electronic resources are useful to all students. Half of the teachers

consider the best way of providing students with electronic resources one that takes students' knowledge and skills into account (The question is, if this possibility is realistic or theoretical considering that the adaptive or personalized systems of online education are in the phase of being transferred from theoretical solutions to practical applications). Nearly one-third of all teachers (30%) stated that it would be best if electronic resources could take students' learning styles into account. The comment made for the previous answer also applies to this answer. The answers show that university teachers reflect current principles of respective educational policy and are able to imagine their application in the research field.

Table 12.

Preferences concerning the best way to ensure that the electronic resources are useful to all students

Items	Frequency	Percent of teachers	Percent of cases
The same set of electronic resources for all students	22	55,0	33,8
Electronic resources reflecting the knowledge and skills of students	20	50,0	30,8
Electronic resources reflecting the learning styles of students	12	30,0	18,5
Electronic resources that help students with the selection of resources in the information environment	7	17,5	10,8
Other	3	7,5	4,6
Electronic resources for advanced users	1	2,5	1,5
Total	65	162,5	100,0

Source: Own work

The deep analysis of the data did not show differences between the respondents with regard to their age. However, it showed differences concerning their ICT competency level when choosing the answer that the provided "electronic resources should take students' learning styles into account".

As far as the choice of the "Electronic resources reflecting students' learning styles" entry is concerned, a statistically important difference was determined between the advanced users and the intermediate users or beginners (Fisher's test significance = 0.028; chi-squared could not be used due to a high number of low expected frequencies). The advanced users, contrary to the less experienced users, consider this entry to be the best way to ensure that the electronic resources are useful to all

students (see Figure 16). The teachers' ICT user level seems to also represent the level of knowledge about the potential of current instruments of electronic systems or environments and the confidence that they can be used in personalized learning which reflects university students' learning styles preferences.

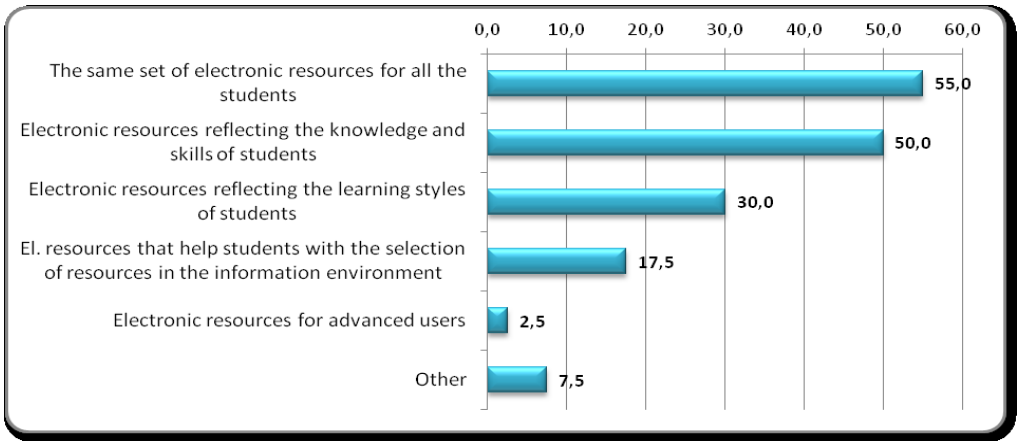

Figure 15. Preferences concerning the best way to ensure that the electronic resources are useful to all students

Source: Own work

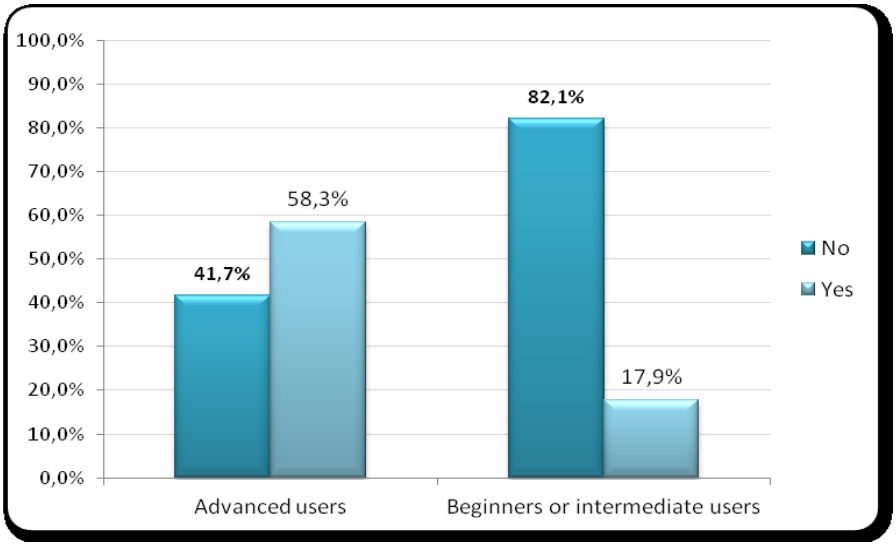

Figure 16. Influence of teachers' ICT competence on the choice of the answer that the provided electronic resources should reflect students' learning styles

Source: Own work

CONCLUSION

The research results showed that, within the scope of blended learning, university teachers use a number of electronic instruments for the realization of education, the management of students' self-study and study communication to enhance the elements of online distance learning. Its actual choice or potential preference is not much influenced by teachers' age but rather by their ICT competence user level and in some cases also by their involvement in social networks. So far, teachers use fewer specific educational applications and prefer generally user-defined instruments. So far, they use or contemplate using electronic instruments for the preparation and realization of education or for consultations with students rather than for the organization of students' study activities and online learning. Even though they prefer the incorporation of individual communication instruments for all students, the higher the ICT competence user level, the more diverse their preference concerning instruments which would reflect students' learning styles when providing them with electronic resources.

In the following phase of realization of the IRNet project the results of the questionnaire research acquired in the Czech Republic will be included in a comparative study containing data acquired in the other solving countries. On the basis of the results generally applicable conclusions can be made concerning the application of electronic information resources in university education with varying degrees of the use of online education.

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