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ON FORMING KEY COMPETENCES WITHIN THE ICT–SUPPORTED INSTRUCTION IN HIGHER EDUCATION

ABSTRACT. Šimonová Ivana, Poulová Petra, Sokolová Marcela, Bílek Martin, *On forming key competences within the ICT–supported instruction in higher education* [Kształtowanie kompetencji kluczowych w szkolnictwie wyższym z wykorzystaniem ICT]. Studia Edukacyjne nr 26, 2013, Poznań 2013, pp. 381-397. Adam Mickiewicz University Press. ISBN 978-83-232-2658-1. ISSN 1233-6688

The paper presents research results of the two-year pedagogical experiment comparing test scores in three subjects (Database Systems, Management, IT English) taught either in the ICT-supported way or in the traditional face-to-face way at the Faculty of Informatics and Management, University of Hradec Kralove, Czech Republic. The main research objective was to find out whether the ICT contribute to increasing learners' knowledge and consequently to forming key competences. Didactic tests as the main tool were used within the pedagogical experiment which followed the "pre-test – instruction – post-test – post-test2" structure. The research sample included 687 respondents. The results obtained proved there were no statistically significant differences in learners' knowledge in both approaches to teaching/learning. The results were discussed from two important points of view: (1) teachers' and learners' IT competences in teaching/learning and (2) the role of teaching/learning styles. A teaching tool applicable in the ICT-supported process of instruction was provided.

Key words: ICT, key competences, online courses, e-learning, learning styles, Database Systems, Management, IT English

Introduction

Modern information and communication technologies (ICT) have penetrated the society, including the field of education. They have become its inseparable part which brought crucial changes and caused substantial consequences. Social and political development in the Czech Republic in last two decades evoked numerous changes in all spheres of

the society, including education. General development towards democracy and information and knowledge society transformed the existing structure of the educational system; defined new competences reflected in the learning content; called for new teaching methods, organizational forms, and others. These features are slowly but steadily being included into the new educational system, which is hardly to be imagined without implementation of modern technologies.

It is generally accepted that all educational outcomes should result in forming key competences which have been defined as Four Pillars of Education[1] (learning to know, learning to do, learning to live together, learning to be). Based on these requirements the key competences were defined combining knowledge, skills and attitudes appropriate to the context. They are particularly necessary for personal fulfilment and development, social inclusion, active citizenship and employment. This framework defines eight key competences: communication in the mother tongue, communication in foreign languages, mathematical competence and basic competences in science and technology, digital competence, learning to learn, social and civic competences, sense of initiative and entrepreneurship, cultural awareness and expression. Within each competence the emphasis is laid on critical thinking, creativity, initiative, problem solving, risk assessment, decision making and constructive management of feelings[2].

Resulting from the above mentioned the research was run at the Faculty of Informatics and Management (FIM) University of Hradec Kralove (UHK), Czech Republic, dealing with question whether there is any ICT contribution to the process, i.e. to increasing the university students´ knowledge which should result in developing their key competences.

Research Design

The research focused on the impact of the ICT-supported instruction (managed by LMS versus real teacher) on students´ knowledge. The main objective was to compare the level of students' knowledge developed within the ICT-supported way of instruction to the traditional face-

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[1] J. Delors, *Four pillars of education*, Retrieved, 2000, 10/01/2012, from: http://www.unesco.org/delors/fourpil.htm.

[2] European Parliament *Recommendation 2006/962/EC of the European Parliament and of the Council of 18 December 2006 on key competences for lifelong learning*, 2006 [Retrieved 11/12/2011] from: http://europa.eu/legislation_summaries/education_training_youth/lifelong_learning/c11090_en.htm.

to-face instruction and find out whether the ICT contribute to increasing learners' knowledge, and thus forming the key competences.

We expected that university students taught with the ICT support would reach higher level of knowledge in comparison to those who were taught in the traditional process where the ICT were not applied. The researched educational outcomes include students´ knowledge, skills and attitudes, and the process of instruction as the whole defines the research field. Developing and reaching the key competences is a lifelong process which should provide students with "tools" (i.e. methods, strategies, techniques, approaches) to solve still unknown problems and become contributive to the society and succeed on the labour market.

The impact of ICT on the process of education should be researched continuously and systematically in the whole breadth. The ITC-supported instruction can be understood in various ways. Within this research we focused on online courses running in the Learning Management System (LMS) WebCT and their influence on the process of instruction.

• *Research Hypotheses*

Resulting from the research problem the main hypothesis was defined as follows:

Students reach higher level of knowledge in the ICT-supported instruction in comparison to the traditional way.

The research was held in three main subjects – Database Systems (DS). Management (M) and IT English (IT E), so the main hypothesis was structured into three partial ones:

H_1: Students of FIM UHK reach higher level of knowledge in the ICT-supported way of instruction in comparison to the traditional way in the subject of Database Systems.

H_2: Students of FIM UHK reach higher level of knowledge in the ICT-supported way of instruction in comparison to the traditional way in the subject of Management.

H_3: Students of FIM UHK reach higher level of knowledge in the ICT-supported way of instruction in comparison to the traditional way in the subject of IT English.

• *Research Method and Tools*

The main method applied within the research was the pedagogical experiment, partially supported by observation and interviews in several cases if additional data were required. Didactic tests as the main tool were used within the pedagogical experiment. It followed the "pre-test –

instruction – post-test – post-test2" structure. The entrance level of learners' knowledge was detected by the pre-tests in each subject the final knowledge was tested by post-tests, and after a three-month period the post-tests2 were applied to evaluate learners' knowledge after the given period.

Two educational strategies were applied. The process of instruction was organized either in the ICT-supported way (i.e. they studied online courses) in experimental groups (E), or in the traditional way (i.e. they attended face-to-face lessons where the ICT were not used) in control groups (C). Finally, the collected data (i.e. test scores) were statistically processed and results interpreted and discussed.

The didactic tests were piloted, the results and possible changes were discussed within the IT, Management and Applied Linguistics departments; then, the tests were adjusted according to the requirements and re-piloted. All tasks proceeded from learning objectives and were based on appropriate taxonomies. The tested items in Database Systems arose from four levels of the Niemierko´s taxonomy[3] Remember facts; Understand and organize facts; Apply knowledge to standard situations; Apply knowledge to a new situation. The pre-test contained 7 tasks; in post-test 15 tasks were solved (which is the reason for higher test scores in post-test and post-test2). The tested items in Management were constructed according to the Tollinger´s taxonomy[4] reflecting three categories: Remember and recall facts; Understand facts and prove the ability to apply them; Apply new knowledge in new problem situations. The pre-test contained 8 tasks, in post-test 12 tasks were solved. The IT English tests were built on the Bloom´s taxonomy[5] and followed three categories: Remember and recognize facts; Understand, i.e. summarize and interpret facts; Apply, i.e. implement and operate facts. The pre-test and post-test consisted of 32 tasks each. All post-tests and post-tests2 were identical.

The task characteristics were calculated for each item covering the difficulty, Upper-lower Index, Tetrachoric Coefficient, Point Biserial Coefficient. Test reliability was set by the Kuder-Richardson formula (Eq. 1)

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[3] B. Niemierko, *Taksonomia celów wychowania*, Kwartalnik Pedagogiczny, 1979, 24 (2), s. 67-78.

[4] D. Tollingerova, *K teorii učebních činností*, Praha 1986.

[5] L.W. Anderson, D.R. Krathwohl, *A taxonomy for learning, teaching and assessing of educational objectives*, New York 2001; B.S. Bloom, *The taxonomy of educational objectives. The classification of educational goals*, [in:] *Handbook I: Cognitive domain*, New York 1956.

$$r_{kr} = \frac{k}{k-1}\left(1 - \frac{\sum pq}{s^2}\right) \tag{1}$$

where:
k – number of tasks in test,
p – number of learners who solved the task correctly,
q – number of learners who did not solve the task correctly,
s – standard deviation of the total test result.

The reliability values reached 0.77 in the pre-test and 0.8 in the post-test in Database Systems; 0.72 in the pre-test and 0.75 in the post-test in Management; 0.85 in the pre-test and post-test in IT English. The test validity was considered by the expert groups consisting of academic staff of the related departments of FIM UHK; all tests were recognized reliable and valid. The collected data were processed by the NCSS2007 statistic software. The hypotheses were verified by two tests: the parametric equal variance t-test for the normal data distribution and the Mann-Whitney test for difference in medians (Z-value).

• *Research Sample*

The research sample included students of bachelor study program of Applied Informatics and master study program of Information Management who enrolled in subjects of Database Systems, Management and IT English in 2009/10 and 2010/11 academic years. All the subjects included in the research belong to compulsory ones taught in the first year (Management and IT English) and in the second year (Database Systems) of study. The experimental and control groups were formed by a random choice (i.e. following the schedule preferences).

Totally 772 respondents were included in the research sample at the beginning of the experiment, 687 of them went through the whole experiment. Amounts of respondents are presented in table 1.

In experimental groups the process of instruction was organized in the ICT-supported way, i.e. after the starting tutorial at the beginning of the term learners acquired the learning content from online courses for each subjects. The courses were organized in the virtual learning environment (WebCT) which had been designed especially for the educational purposes, i.e. it provided all tools required for running the process efficiently. All the courses underwent the university accreditation before first applied.

Table 1

Research Sample

Database Systems	**Pre-test**		**Post-test**		**Post-test2**	
	EXPR	**CONTR**	**EXPR**	**CONTR**	**EXPR**	**CONTR**
year 1	109	65	65	46	65	46
year 2	66	61	66	61	66	61
Total	**175**	**126**	**131**	**107**	**131**	**107**
Managenet	**Pre-test**		**Post-test**		**Post-test2**	
	EXPR	**CONTR**	**EXPR**	**CONTR**	**EXPR**	**CONTR**
year 1	35	37	32	34	32	34
year 2	44	39	42	38	42	38
Total	**79**	**76**	**74**	**72**	**74**	**72**
IT English	**Pre-test**		**Post-test**		**Post-test2**	
	EXPR	**CONTR**	**EXPR**	**CONTR**	**EXPR**	**CONTR**
year 1	90	66	90	66	90	66
year 2	94	66	94	66	84	63
Total	**184**	**132**	**184**	**132**	**174**	**129**
	Pre-test		**Post-test**		**Post-test2**	
	EXPR	**CONTR**	**EXPR**	**CONTR**	**EXPR**	**CONTR**
Total year 1	234	168	187	146	187	146
Total year 2	204	166	202	165	192	162
Total year 1+2	**438**	**334**	**389**	**311**	**379**	**308**
TOTAL	**772**		**700**		**687**	

• ***Process of Instruction***

In control groups learners attended face-to-face lessons managed by teachers, where no ICT were implemented in the process of instruction. Students work with books which include text recordings and related exercises towards developing the listening comprehension skill.

Research Results and Verification of Hypotheses

Below, the main statistic results are presented and the process of verification of hypotheses described.

The null hypotheses were set as follows:

H_{01}/ H_{02}/ H_{03}: There is no statistically significant difference in test scores in experimental and control groups in Database Systems / Management / IT English.

The collected data were processed by the NCSS2007 statistic software, applying the t-test and Z-test. Research results presented below are structured according to the subjects – Database Systems, Management, IT English.

• ***Research results in Database Systems***

The test results in Database Systems are displayed in tables 2 and 3.

Table 2

Descriptive statistics, Database Systems, year 1

	Mean	**SD**	**Min**	**Max**	**Modus**	**Median**	**Norm**	**t**	**Z**	**H_0**
Pre-test C	1.98	2.16	0	7	0	4	N	0.0557	-0.2511	**Accepted**
Pre-test E	2.00	1.93	0	6	0	2	N			
Post-tests	11.39	2.34	6	16	10	11	N	1.2929	-1.3541	**Accepted**
Post-tests	11.95	2.20	8	16	14	12	N			
Post-test2C	14.90	2.80	6	20	14	15	N	0.5108	-0.5195	**Accepted**
Post-test2E	15.83	2.61	7	21	17	16	N			

Legend: Experimental group: E; Control group: C; Norm (normality test): N (normal distribution), CR (cannot reject), R (reject).

Table 3

Descriptive statistics, Database Systems, year 2

	Mean	**SD**	**Min**	**Max**	**Modus**	**Median**	**Norm**	**t**	**Z**	**H_0**
Pre-test C	3.2	1.49	0	6	3	3	CR	-0.9936	1.1666	**Accepted**
Pre-test E	2.9	1.57	0	6	3	3	CR			
Post-tests	7.2	1.88	3	10	6	7	CR	0.5583	-0.5098	**Accepted**
Post-tests	7.4	1.77	3	10	9	8	CR			
Post-test2C	29.3	5.35	20	41	32	29	CR	0.9570	-1.0008	**Accepted**
Post-test2E	30.2	5.30	20	40	34	30.5	CR			

T_{crit} = 1,9866; $T_{calcul} < T_{crit} \rightarrow H_{03}$ was accepted in all tests (pre-test, post-test, post-test2), i.e. no statistically significant differences were discovered in test scores of experimental and control group in year 1 and 2.

$Z_{calcul} < Z_{crit} \rightarrow H_{01}$ was accepted in all three tests.

The test results are displayed in figures 1 and 2.

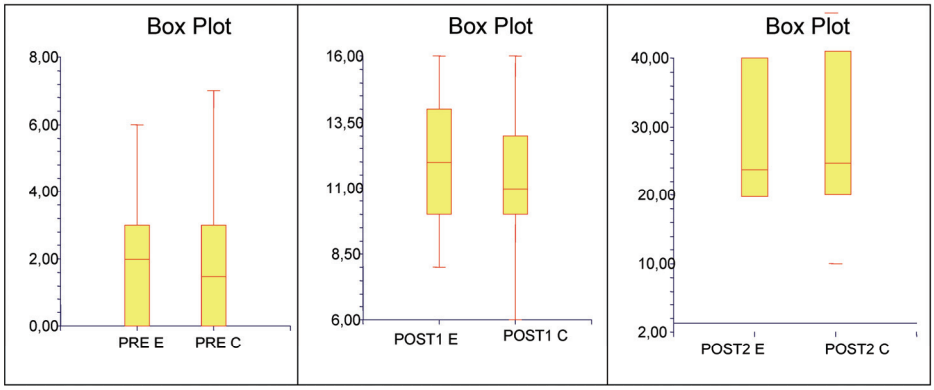

Fig. 1. Results of pre-test, post-test and post-test2, year 1, Database Systems

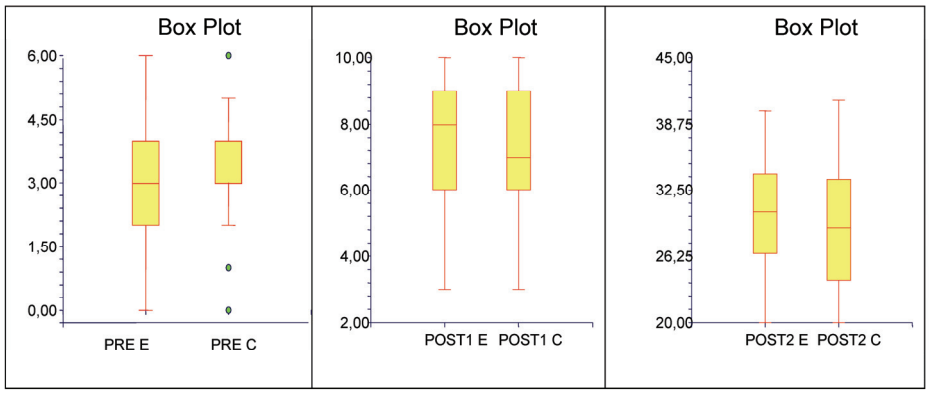

Fig. 2. Results of pre-test, post-test and post-test2, year 2, Database Systems

- ***Research results in Management***

The test results in Management are displayed in tables 4 and 5.

Table 4

Descriptive statistics, Management, year 1

	Mean	SD	Min	Max	Modus	Median	Norm	t	Z	H_0
Pre-test C	2.9	1.98	1	5	3	3	N	-1.2858	-1.3474	**Accepted**
Pre-test E	2.4	1.54	0	5	2	2	N			
Post-test C	9.3	2.48	3	14	10	9.5	N	-0.2314	-0.1078	**Accepted**
Post-test E	9.2	2.56	0	13	-	9	CR			
Post-test2C	9.3	2.48	3	14	10	9.5	CR	-0.2576	0.0974	**Accepted**
Post-test2E	9.4	2.00	4	13	-	9	CR			

Table 5

Descriptive statistics, Management, year 2

	Mean	SD	Min	Max	Modus	Median	Norm	t	Z	H_0
Pre-test C	2.5	0.91	1	4	2	3	N	0.6438	-0.4969	**Accepted**
Pre-test E	2.6	1.16	0	6	2	6	N			
Post-test C	9.1	2.48	3	14	9	11	CR	0.2722	-0.2303	**Accepted**
Post-test E	9.2	2.56	4	13	9	9	N			
Post-test2C	9.1	2.57	3	14	9	9	N	0.0640	0.0328	**Accepted**
Post-test2E	9.1	2.65	4	13	8	9	N			

T_{crit} = 1,9897; $T_{calcul} < T_{crit} \rightarrow H_{03}$ was accepted in all tests (pre-test, post-test, post-test2), i.e. no statistically significant differences were discovered in test scores of experimental and control group.

$Z_{calcul} < Z_{crit} \rightarrow H_{02}$ was accepted in all three tests.

The test results are displayed in figures 3 and 4.

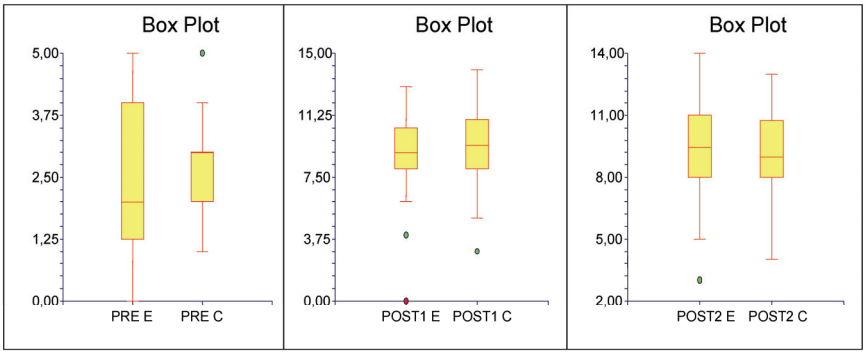

Fig. 3. Results of pre-test, post-test and post-test2, year 1, Management

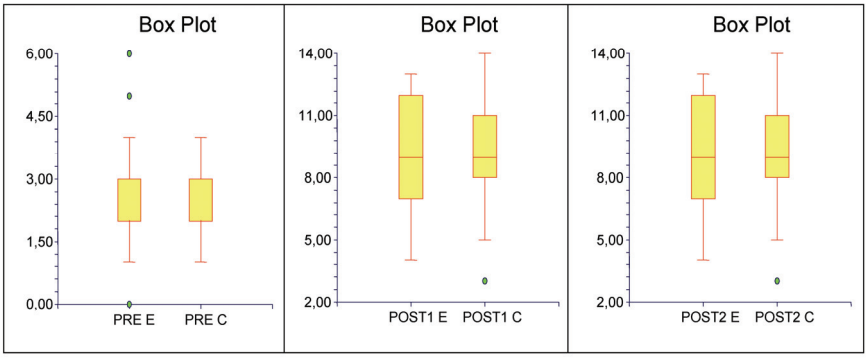

Fig. 4. Results of pre-test, post-test and post-test2, year 2, Management

• ***Research results in IT English***

The test results in IT English are displayed in tables 6 and 7.

Table 6

Descriptive statistics, IT English, year 1

	Mean	SD	Min	Max	Modus	Median	Norm	t	Z	H_0
Pre-test C	40.3	2.5	24	57	-	40	N	-0.9553	1.4449	**Accepted**
Pre-test E	42.7	2.3	18	61	29	41	CR			
Post-test C	93.8	3.3	82	103	-	95	N	-1.2278	0.8518	**Accepted**
Post-test E	92.2	3.1	68	112	96	93	N			
Post-test2C	92.8	1.3	66	103	103	99	N	0.5929	1.2728	**Accepted**
Post-test2E	93.6	1.9	80	104	97	95	CR			

Table 7

Descriptive statistics, IT English, year 2

	Mean	SD	Min	Max	Modus	Median	Norm	t	Z	H_0
Pre-test C	30.2	2.7	8	71	29	29	N	0.7791	-0.8972	**Accepted**
Pre-test E	31.9	2.2	8	71	-	30.5	N			
Post-test C	91.4	2.70	68	112	96	93	N	0.1719	-0.4551	**Accepted**
Post-test E	91.6	3.1	68	112	96	93.5	N			
Post-test2C	92.6	1.4	67	108	98	95	N	0.5227	1.2374	**Accepted**
Post-test2E	93.3	1.3	81	105	97	94	CR			

T_{crit} = 1,9866; $T_{calcul} < T_{crit} \rightarrow H_{03}$ was accepted in all tests (pre-test, post-test, post-test2), i.e. no statistically significant differences were discovered in test scores of experimental and control group.

$Z_{calcul} < Z_{crit} \rightarrow H_{03}$ was accepted in all three tests.

Results are displayed in figures 5 and 6.

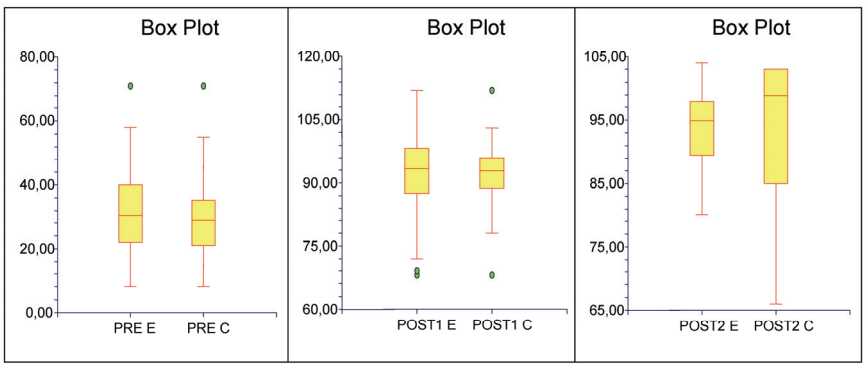

Fig. 5. Results of pre-test, post-test and post-test2, year 1, IT English

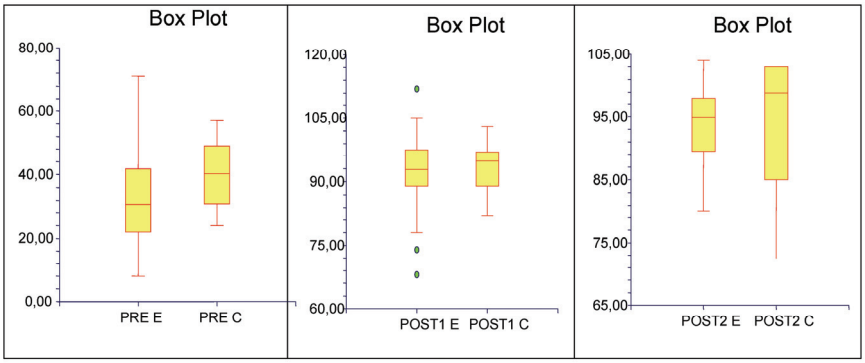

Fig. 6. Results of pre-test, post-test and post-test2, year 2, IT English

As clearly seen from both tables 2-7 and figures 1-6, the test scores in all three didactic tests (pre-test, post-test, post-test2) in all three subjects (Database Systems, Management, IT English) are very close. The data statistic processing proved there were no statistically significant differences discovered. Thus we can state that the null hypotheses H_{01}/ H_{02}/ H_{03}: There is no statistically significant difference in test scores in experimental and control groups in Database Systems / Management / IT English were accepted, i.e. the test scores in all experimental groups were comparable and very close to the adequate test scores of control groups. This result is supported by graphic research results displayed in box plots in figures 1-5.

Resulting from the above mentioned, all three partial hypotheses H_1; H_2; H_3 were not accepted. This result concludes that **the main hypothesis** *Students reach higher level of knowledge in the ICT-supported instruction in comparison to the traditional way* **was rejected**.

Results Interpretation, Discussions and Didactic Recommendation

Resulting from our research results we can state that students in the experimental group reached the same test scores in the ICT-supported process of instruction in memorizing, understanding, developing new knowledge and applying it in problem situations as the students within the traditional face-to-face process of instruction. This proves that in the ICT-supported process of instruction (i.e. teaching/learning in on-line courses within this research) learners reach the same level of knowledge as in the traditional instruction. In other words, teaching/learning via

on-line courses does not provide lower level of knowledge, which means that *the ICT-supported process of instruction contributes to forming and developing key competences of higher education learners in the same (comparable) degree as the traditional way of instruction does*. Above all, other factors (mainly motivation) work in favour of the ICT-supported instruction.

It should be emphasized the process of instruction was held by qualified teachers (tutors) with special training for running the ICT-supported instruction. The virtual learning environment WebCT is primarily designed for university (tertiary) education. It provides all tools necessary for simulating main phases of the instruction, i.e. motivation, explanation, fixation, evaluation, and managing the process in such a way which provides adequate conditions for teaching/learning, and thus contributes to forming and developing learners´ key competences. Some preconditions are required before the process starts, the crucial question is whether both teachers and students are able to realize the potential of modern technologies and use it within the process of instruction. Having undergone the starting period of hesitation, material and technical problems, the time came to deal with didactic aspects of ICT implementation into teaching/learning; and following questions should be answered.

First, are teachers able to apply suitable methods and forms of instruction, create and use appropriate didactic means which are offered by new technologies?

Second, are the new didactic means able to optimize the cognitive process of creating knowledge? Despite the expected answers are yes to both questions, this does not mean all students are able to reach better knowledge when this approach is applied.

The third question could be defined as follows: does the ICT-supported process of instruction meet the individual needs of a student which relate to the individual learning style? Experience gained in the process of ICT implementation re-started discussions on the role of learning and teaching styles. They play important role especially under such conditions if the process of instruction is managed by a learning management system. It offers designers and tutors a wide range of tools which accommodate all learning styles and students can choose those activities which suit them best. On the other hand, there exist several conflicting ideas concerning practical application of learning styles which should be taken into consideration.

The effectiveness of the educational process is given by such factors as learner's intelligence, prior knowledge, level of motivation, stress, self-confidence, and last but not least the learner's cognitive and learn-

ing style. It is generally acknowledged that the instructor's teaching style should match the students´ learning styles. Felder[6] says that mismatching can cause a wide range of further educational problems. It favours certain students and discriminates others, especially if the mismatches are extreme. On the other hand, if the same teaching style is used repeatedly, students become bored. Gregorc (1984) claims that only individuals with very strong preferences for one learning style do not study effectively, the others may be encouraged to develop new learning strategies. Only limited numbers of studies have demonstrated that students learn more effectively if their learning style is accommodated. Mitchell (1994) concludes that making the educational process too specific to one user may restrict the others. But the possibility of individualization of the educational process from the both students´ and teachers´ point of view is its greatest advantage[7].

From the above presented it can be seen that it is important for a student to be aware of his/her learning style, know what his/her strengths and weaknesses are and be provided a variety of instructional methods to choose the most suitable ones. In the days of fast technical and technological development, globalization, demand for further, lifelong education, the importance of education is increasing. Current terms and conditions support the development of the whole system. And teachers´ and students´ awareness of learning styles may help substantially.

• *The Bloom´s Digital Taxonomy*

It is generally accepted that the efficient ICT-supported learning does not mean aimless browsing on the Internet, not following any educational objectives. Except others, modern technologies provided impact on the Bloom´s taxonomy of educational objectives[8] which was revised by Anderson and Krathwohl (2001) in 1990s. The new version introduced changes in the process of reaching single objectives and in the way of defining them (Remember, Understand, Apply, Analyze, Evaluate, Create). Currently, when the ICT-implementation in the field of education has become standard, this process was reflected in the Bloom´s taxonomy and the concept of the Bloom´s Digital Taxonomy and Collaboration

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[6] F.M. Felder, L.K. Silverman, *Learning/Teaching styles in engineering education*, Journal of Engineering Education, 1998, 78 (8), p. 674-681; F.M. Felder, B. Soloman (nondated), *Learning styles and strategies* [Retrieved 10/07/2012] from: http://www4.ncsu.edu/unity/lockers/users/f/felder/public/ILSdir/styles.htm.

[7] F. Coffield, *Learning styles and pedagogy in post-16 learning*, A Systematic and Critical Review, 2004 [Retrieved 01/10/2012] from: http://www.Isda.org.uk/files/PDF/1543.pdf.

[8] B.S. Bloom, *The taxonomy of educational objectives. The classification of educational goals*, [in:] *Handbook I: Cognitive domain*, New York 1956.

was introduced by Churches (2010). Single learning activities are structured to the six taxonomy levels. Special attention (and column) is devoted to the field of Communication which Churches understands a crucial competence penetrating all teaching/learning activities. Reflecting his experience, Churches emphasizes and recommends the below listed activities to teachers' attention:

Within the Lower Order Thinking Skills, on the Remember level students mainly focus on retrieval of information using e.g. bulleting to mark key words or phrases for recalling, bookmarking favourite web pages or sites for future use, social bookmarking and social networking, searching (googling) etc.

For the Understand level, i.e. interpreting, summarizing, inferring, paraphrasing, comparing, explaining etc. some procedures towards refining the newly developed knowledge can be applied, e.g. blog journaling, twittering. Both techniques can easily move beyond the understanding level to higher ones of the taxonomy if these tools are used to develop greater understanding, or to collaborate with peers, for digital organizing, classifying etc.

The Apply level includes implementing and using information, and executing tasks, so examples of students´ active "doing" are provided, e.g. initiating a program and/or operating and manipulating hardware and software applications, gaming, uploading and legal sharing of materials on a site etc.

Within the Higher Order Thinking Skills, the Analyse level involves e.g. mashing ups, where several data sources are melded into a single set of usable information, making links within documents and web pages, but also validating the information, organizing, structuring and attributing online data etc.

The Evaluate level refers to verifying hypotheses, experimenting, judging, testing and monitoring, so it is place for providing informed judgments, for blog commenting and reflecting, examining materials in context, testing e-products etc.

On the highest, i.e. Create level students focus on designing, inventing, constructing, planning and producing, which includes e.g. finding a technology and applying it in the creative process. It could involve audio- and video-recordings, films, animations, podcasts, creating a application or developing a game, which results in creating completely new items.

In the extra column Churches provides the communication spectrum of activities from lower to higher levels: texting, instant messaging, e-mailing, chatting, networking, blogging, questioning, replying, reviewing, videoconferencing, skyping, net meeting, commenting, debating, moderating, collaborating etc.

To sum up, Churches work gives educators an excellent framework to begin and/or assess their digital practices. We recognize that he differs from numerous teachers who tend to push the "search" concept, and provides strong support to networking, social bookmarking, blogging, and at the highest level to producing unique items to enhance the learning. The authors highly appreciate Churches´ concept and consider it a wide didactic database of activities where every student of any learning style can accommodate his/her needs and which can be applied to any learning content.

Conclusions

Current orientation of university education, which is changing under the influence of latest technology development and new key competences, can be researched from various, different points of view. The ICT-supported instruction has been spreading because of growing popularity of modern technologies in general. Another reason is that this approach enables easier and more complex realization of the instructional process, offers choice of place, time and pace for studying, allows an individual approach to students preferring various learning styles. These are the key values important for the effectiveness of the process. Material and technical requirements having been satisfied, strong attention could be paid to didactic aspects of the instructional process. The main objective of project A flexible model of the ICT supported educational process reflecting individual learning styles" is to contribute to this process. Generally, motivation and engagement of both the learners and teachers within the process of learning and teaching may influence these processes and have strong impact on the research finding[9].

If teachers are provided modern technologies only – it does not change the situation much, but it can start new activities and approaches. Bringing computers to schools is less important than providing teachers with new ideas. Technologies do not aim at removing traditional educational methods and forms. The new technologies do not automatically bring positive changes into the process of instruction but they may contribute to increasing its effectiveness, under some conditions[10].

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Kształtowanie kompetencji kluczowych w szkolnictwie wyższym z wykorzystaniem ICT

Streszczenie

W artykule przedstawiono wyniki dwuletniego eksperymentu pedagogicznego, którego głównym celem było sprawdzenie, czy wykorzystanie ICT przyczynia się do

intensyfikacji postępu studentów w kontekście kształtowania kompetencji kluczowych. Badaniami objęto 687 respondentów. Otrzymane wyniki wskazały, iż nie ma statystycznie istotnych różnic w postępie (w kontekście kompetencji kluczowych) osób uczących się z wykorzystaniem ICT i studentów uczących się tradycyjnie.

Słowa kluczowe: ICT, style uczenia się, e-learning