

Online Course as an Encouraging Tool for Didactic Use of ICT in Higher Education

Sanja Jedrinovi
University of Ljubljana
Ljubljana, Slovenia, 1000
sanja.jedrinovic@pef.uni-lj.si

Anja Luštek
University of Ljubljana
Ljubljana, Slovenia, 1000
anja.lustek@pef.uni-lj.si

Vesna Ferik Savec
University of Ljubljana
Ljubljana, Slovenia, 1000
vesna.ferk@pef.uni-lj.si

Abstract

The technology has spread to various fields, including the field of education. In this area, questions arise as to how to combine information and communication technology (ICT) for learning and teaching purposes, with innovative teaching methods. For the purpose of informing higher education teachers about innovative teaching methods that support the use of ICT in the pedagogical process, different online courses were prepared at University in Ljubljana within the project "Digital UL - With Innovative Use of ICT to Excellence". This paper presents findings from the evaluation of an online course entitled Didactic use of ICT in the process of teaching and learning, that has been administered to 55 higher education teachers of the University of Ljubljana in two implementations during Spring 2019. The data was collected with a questionnaire, followed by the analysis of the teachers' reports of redefined study activities that the participants developed at the end of the course. The results suggest that higher education teachers found the added value of the course, however it was especially emphasized that they gained new experiences for the work with the use of ICT, new ideas in the field of innovative teaching supported with ICT, as well as the new knowledge in the field of innovative teaching. Regarding the criteria for selecting the specific ICT in support of the pedagogical process, it was found that teachers were prone to choosing the ICT that enabled them to support the development of students' higher levels of thinking according to Bloom's taxonomy. It was also found that with the online course the teachers were encouraged to redefine their study activities on different SAMR (Substitution, Augmentation, Modification, Redefinition) levels, mostly on the modification and redefinition levels. It can be concluded, that the online course Didactic use of ICT in the process of teaching and learning encouraged the majority of the involved higher education teachers to plan the didactic use of ICT with the aim of achieving development of the higher cognitive processes among students. Based on the course evaluation its further optimization is foreseen.

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1 Introduction

In the last two decades, education has experienced complex changes in the use of technological resources. In different studies, we can see that the use of the Internet, application of different ICTs and basic programming are nowadays all present in education [Pal16, Yuk17, Fer17, McC17]. These changes affect traditional approaches to teaching and learning [Pac03]. Research in the field of ICT-based education most frequently refers to the following innovative approaches [Kau16, Mel12, Nic12]: collaborative learning, learning by research, problem learning, project learning, learning with games, combined learning, reverse learning and storytelling. The aforementioned approaches have in common an active role of students in the study process (i.e. learner-centred approaches), whereby teachers encourage students to develop higher cognitive processes. Higher cognitive processes, in accordance with the revised Bloom's taxonomy of cognitive processes, representing a six-step model of classifying learning objectives with respect to their complexity, relate to the upper three stages, i.e. analysis, evaluation and creation, assuming that if we master the higher level, we also master all the lower stages, i.e. knowledge, understanding, and application. The role of ICT is in particular support for the study process, i.e. its didactic use [Mar01].

To help educators improve integration of technology into teaching and learning, many different standards, frameworks, models, and theories have been developed by researchers [Pue06, Koe14, Mis06, Mis08, Gar99].

1.1 SAMR Model

In order to promote the didactic use of ICT in the study process, different researchers often refer to the use of the so-called SAMR model [Jud14, Kih16, Kea16]. Using the SAMR model, the teacher can evaluate the level of didactic use of ICT in the study process with respect to four levels [Pue06].

The first stage is Substitution, where by using ICT we simply replace the previously used teaching methods and learning aids. ICT does not bring any new functionalities that promote the cognitive processes of students. Students, for example, instead of writing a document on paper, write it in digital form using a text editor [Pue14].

The second stage is Augmentation, where ICT is used as a substitute for previously used learning tools. ICT provides additional functionality to promote students' cognitive processes. Students, for example, solve a quiz via a web application that provides instant feedback [Pue14].

The third stage is Modification, where the use of ICT enables a substantial transformation of activities by introducing new functionality to promote higher cognitive processes of students. For example, students in groups, in collaboration with the use of ICT, prepare a presentation on a particular topic, while the rest of the peers comment on the product critically [Pue14].

The fourth stage is Redefinition, where the teacher has the ability to plan activities with ICT that he would otherwise not be able to perform. Students, for example, produce a short documentary film using ICT, independently acquiring all the necessary data and materials and presenting them in a joint product [Pue14].

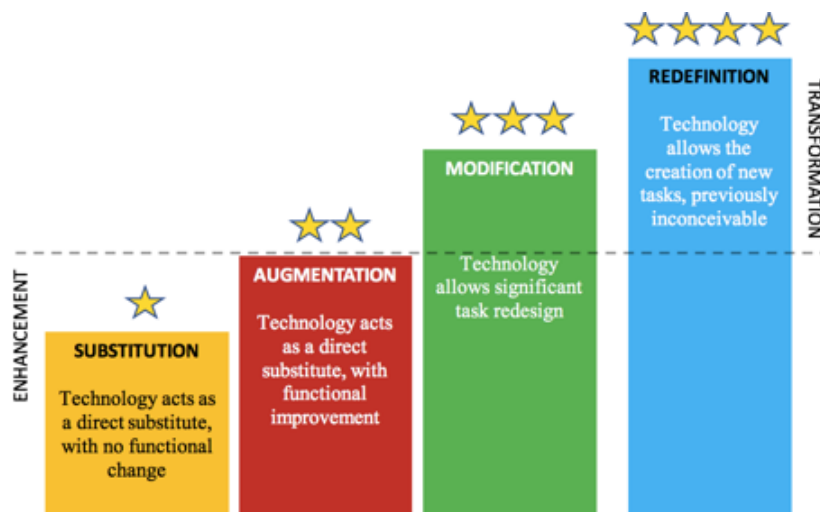


Figure 1: SAMR model (modified by Puentedura, R. R. (2006). Transformation, technology, and education in the state of Maine [Web log post]. Retrieved from <http://hippasus.com/resources/tte/> .

1.2 The Online Course As An Encouraging Tool

To use technology effectively you need time, proper equipment, institutional support, and positive attitudes towards ICT. Teachers must also interiorize their technological skills and quickly progress from low-level ICT knowledge to high-level mastery of technology [San13]. This has led to the need for systematic teacher training on ICT [Sch05, Don10, Hos10, Rad14, Gar09]. University academics must follow the ongoing development in their subject area, as well as advancements in the area of pedagogy.

The range of learning mode varies, from face-to-face to fully online [Bac07, Bat03], so we can conclude that the number of identifiable online delivery models is quite big and that Massive Open Online Courses (MOOCs) are just one more in this possible combination of ICT use. MOOCs can be placed at the far right end of the online learning continuum.

MOOCs were originally intended to provide an opportunity for education for a mass audience and were first focused on lowering the costs and accessibility of various courses [Rad14]. When a MOOC is used locally as an addition to classroom teaching, it is called a Small Private Online Course (SPOC) [Fox13]. This paper describes a study aimed at testing the hypothesis that SPOCs can be used as very useful, encouraging learning tools for didactic use of ICT in teaching and learning among higher education teachers.

The use of SPOCs in education offers several advantages to learners. Video lectures, for example, give learners a lot of flexibility, because they decide about their own pace of learning and can revisit them as many times as they wish, to review complex concepts, before any face-to-face lectures. They are also natural media for today's learners, so they are completely used to get information through online content. And they can also check their progress on the subject by solving various quizzes after watching videos [Mor16].

In this context, the idea of our study was to transform the traditional teaching materials of a course on Didactic use of ICT in teaching and learning into a SPOC. The course contents have been divided into small conceptual units and short videos are used to present each unit. The goal of the course is to provide basic knowledge about the didactic use of ICT in teaching and learning process, the course explains the concepts related to the Bloom's taxonomy, "Padagogy" Wheel by Allan Carrington, evaluation of the applicability of different ICTs based on didactic criteria, and formation of redefined educational activities supported by ICT using the SAMR model. The course includes different kinds of material:

- Short learning unit videos are used in order to focus learner's attention on relevant concepts.
- Interactive step-by-step instruction on how to use specific ICT.
- Auto-evaluation questions. Students can answer these questions and receive feedback about their answers.

This allows students to know whether they understand the presented concepts correctly and if they are able to apply them in an autonomous way.

- Online assignments that are presented to learners at the end of the course.
- Documentation in pdf format.

1.3 Elements For Effective Learning With An Online Course

While constructing the SPOC we were thinking of how to promote effective learning. The elements of effective learning we considered, as proposed by different authors [Wan16, Gua13] and based on our practices in teaching, can be summarized as follows:

Learner Empowerment. In the presented SPOC we assured learner empowerment by constructing SPOC in Moodle, a learning environment that enables us to develop activities that require learners' active participation - interactive resources, quizzes, creating a wiki, creating an assignment, conditional progress between different learning units.

A learning plan and clear orientations. In the presented SPOC, we ensured a clear learning plan with the introduction of each learning unit. The introduction had the description of the tasks, defined obligatory and recommended activities and their estimated time. Each learning unit was represented with a progress bar, so the learners always knew how far they are from completing a specific milestone. Until they reached the goal of one unit, the second unit was closed for them.

Collaborative learning. In the presented SPOC we included some of the Moodle activities that support collaboration - Wiki, and Forum.

Interactive learning. In the presented SPOC interactive learning was assured with interactive learning resources created with the Moodle H5P plugin.

Individual learning. In the presented SPOC we assured individual learning with multiple choice quizzes after each learning unit and with an individual assignment which included the integration of the knowledge learners

Osebnostni značaj študentov (prilagojeno po gradivih A. Carringtona, 2018)

- Osebnostni značaj študentov - 4.00 min
- Teaching character -- the other half of the picture - 12.53 min
- Can character be taught? - 4.09 min
- Teaching Moral Character in the Classroom - 3.40 min
- Praktični nasveti glede spodbujanja določenih osebnostnih lastnosti pri študentih - 10 min
- Viri
- Aktivnosti
 - Obvezna: Kviz na temo inovativnega poučevanja - 20 min
 - Priporočljiva: Wiki - Sprotnosti in atributi študentov - 15 min
 - Priporočljiva: Sodelovanje v razpravi na temo **Inovativno poučevanje** - (15 min)

PREVIOUS SECTION UVOD Skok na... NEXT SECTION 2. TEMA: MOTIVACIJA IN SODELOVANJE

Figure 2: Learner empowerment in the presented SPOC in Moodle.

UVOD

V uvodnem delu se boste seznanili z osnovnimi pravili in navodili za delo in medsebojno komunikacijo na spletni delavnici. Na koncu sklopa boste z namenom preverjanja razumevanja rešili kratek kviz. Si je tudi pogoj za odpiranje vsebine naslednje tematike.

Predvidene aktivnosti:

- Ogled virov.
- Obvezno reševanje kviza.

Predviden čas za uvodne aktivnosti je 20 min.

Disciplinarni progress

1. TEMA: INOVATIVNO POUČEVANJE

Pri prvi temi boste imeli priložnost spoznati nekaj inovativnih pristopov k učenju in poučevanju. Več boste izvedeli o transformativnem učenju, vzratnem načrtovanju pedagoškega procesa, sprotnosti in atributih študentov ter razvoju njihovega osebnostnega značaja.

Predvidene aktivnosti:

- Ogled gradiv in virov.
- Obvezno reševanje kviza.
- Priporočljivo sodelovanje v Wiki aktivnosti.
- Priporočljivo sodelovanje v Razpravi na temo inovativnega poučevanja.

Predviden čas za temo inovativno poučevanje je 150 min.

Disciplinarni progress

Omejeno Ni na voljo, razen če: Dejavnost **Kviz razumevanje delovanja spletne učilnice** je zaključena in uspešno opravljena

2. TEMA: MOTIVACIJA IN SODELOVANJE

Pri drugi temi boste imeli priložnost spoznati nekaj vidikov, ki imajo pomembno vlogo pri motiviranju in spodbujanju študentov k aktivnemu vključevanju v študijski proces.

Predvidene aktivnosti:

- Ogled gradiv in virov
- Obvezno reševanje kviza
- Priporočljivo sodelovanje v Razpravi na temo motivacije in sodelovanje

Predviden čas za temo Motivacija in sodelovanje je 55 min.

Disciplinarni progress

Omejeno Ni na voljo, razen če: Dejavnost **Obvezna: Kviz na temo inovativnega poučevanja - 20 min** je zaključena in uspešno opravljena

3. TEMA: UČNI CELJI GLEDÉ NA BLOOMOVO TAKSONOMIJO

Pri tretji temi boste imeli priložnost spoznati Bloomovo taksonomijo, katere namen je pomagati učiteljem klasificirati učne cilje glede na različne stopnje zahtevnosti.

Predvidene aktivnosti:

- Ogled gradiv in virov
- Obvezno reševanje kviza
- Priporočljivo sodelovanje v Razpravi na temo Bloomove taksonomije.

Predviden čas za temo Bloomovo taksonomijo je 60 min.

Disciplinarni progress

Omejeno Ni na voljo, razen če: Dejavnost **Obvezna: Kviz na temo motivacije in sodelovanje študentov - 10 min** je zaključena in uspešno opravljena

Figure 3: Learning plan and clear orientations in the presented SPOC.)

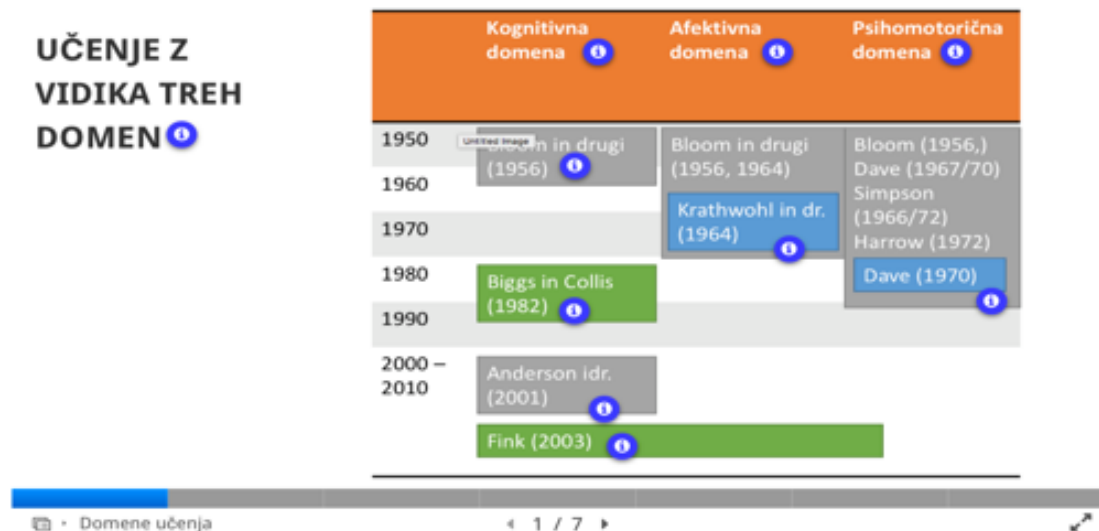


Figure 4: Interactive learning in the presented SPOC.

had gained through each of the presented learning units. Learners had to create a learning plan which included at least one activity, that was redefined in a way that considered specific learning goals, Bloom's' taxonomy, different ICT and SAMR model.

RAZMISLEK OB POSODABLJANJU ŠTUDIJSKIH AKTIVNOSTI Z DIDAKTIČNO UPORABO IKT						
Oblikovan cilj	Aktivnosti študentov s katerimi bodo dosegli zastavljen cilj	Bloomova taksonomska stopnja cilja (npr. pomnjenje, razumevanje, uporabljanje, analiziranje, vrednotenje, ustvarjanje)	Izbrana IKT	Kriteriji za izbiro IKT za podporo pedagoškemu procesu	Evalvacija izbrane IKT za podpro v pedagoškem procesu	SAMR stopnja (npr. zamenjava, nadgradnja, preoblikovanje, redefinicija)
<i>1. primer</i> Ob zaključku vsebinskega sklopa Bloomova taksonomija znaajo sodelavci zasnovati posodobitev študijske aktivnosti v skladu z Bloomovo taksonomijo.	Študij gradiv v spletni učilnici	Pomnjenje	Spletna učilnica Moodle, uporaba gradiv	Navedena IKT je bila izbrana zaradi: <ul style="list-style-type: none"> - Navajanje informacij - Opisovanje informacij, - Ipd. 	Bistveni doprinos navedene IKT je: <ul style="list-style-type: none"> - Prilagajanje posamezniku 	Zamenjava
	Sodelovanje v razpravi	Vrednotenje	Spletna učilnica Moodle, sodelovanje v Forumu	Navedena IKT je bila izbrana zaradi: <ul style="list-style-type: none"> - Sodelovanje - Komentiranje - Ipd. 	Bistveni doprinos navedene IKT je: <ul style="list-style-type: none"> - Sodelovanje - Omogoča povratne informacije 	Preoblikovanje
	Reševanje kviza	Pomnjenje, razumevanje	Spletna učilnica Moodle, reševanje kviza	Navedena IKT je bila izbrana zaradi: <ul style="list-style-type: none"> - Interpretacija povezav med informacijami, - Povzemanje dejstev ali idej 	Bistveni doprinos navedene IKT je: <ul style="list-style-type: none"> - Omogoča povratne informacije 	Nadgradnja
	Zasnova posodobitve študijskih aktivnosti	Ustvarjanje	Spletna učilnica Moodle, oddaja naloge; vsa IKT, ki jo VIS učitelji in sodelavci predvidijo v svojih posodobitvah	Navedena IKT je bila izbrana zaradi: <ul style="list-style-type: none"> - Ustvarjanje idej - Oblikovanje načrtov 	Bistveni doprinos navedene IKT je: <ul style="list-style-type: none"> - Uporaba miselnih procesov višjega reda 	Redefinicija

Figure 5: Individual learning with the final report in the SPOC.

2 Methodology

2.1 Setting

University of Ljubljana has recently launched a project entitled "Digital University of Ljubljana - with innovative use of ICT to excellence", funded by the European Social Fund in the operation of strengthening employment and mobility—opening pathways to work—encouraging flexible forms of learning. Our paper presents the results of the project where we have trained higher education teachers for the didactic use of ICT within the online course Didactic use of ICT in the process of teaching and learning. The main goal of the course was to present a range of innovative didactic approaches supported with the use of ICT in different teaching areas in order to stimulate teachers' reflections on students' cognitive processes and also on the possibilities of redefining the learning activities with the use of ICT to enable students to develop higher levels of thinking according to Bloom's taxonomy, related to the development of the necessary skills for the 21st century.

In the following table, we show the main topics and activities that were presented to the participants of the online course.

Topic	Activities
Introduction	In the introductory part of the online course, the participants were acquainted with the basic rules and instructions for work and communication at the online course. At the end of the introductory part, in order to check the understanding, a short quiz was prepared, which was a prerequisite for opening the following topic.
Innovative teaching	In this part, the participants had the opportunity to learn about some innovative approaches to learning and teaching. Namely, they had the opportunity to learn about transformative learning, backward design of the pedagogical process, skills and attributes of students, and the development of their personality. The participants first had to view resources. Then there was a recommended participation in a Wiki activity and in the Discussion on innovative teaching. In the end, there was a mandatory short quiz, which was a prerequisite for opening the following topic.
Motivation and collaboration	In this part, the participants had the opportunity to learn more about motivation and participation in the pedagogical process. The participants first had to view resources. Then there was a recommended participation in the Discussion on motivation and cooperation. In the end, we had a mandatory short quiz, which was a prerequisite for opening the following topic.

Learning goals by Bloom's taxonomy	Within this topic, participants had the opportunity to learn about Bloom's taxonomy. The participants first had to view resources. Then there was a recommended participation in the Discussion on Bloom's taxonomy. In the end, there was a mandatory short quiz, which was a prerequisite for opening the following topic.
Choosing ICT for support in teaching and learning	Within this topic, the participants got acquainted with the criteria that can help in choosing ICT in the pedagogical process. They were presented with different ICT: HP Reveal, Moodle, Kahoot!, H5P, EdPuzzle, GoConqr. The participants also got some additional resources regarding the evaluation of ICT in the teaching process. The participants first had to view resources. Then there was a recommended participation in the Discussion on the topic of ICT selection and evaluation in the pedagogical process. In the end, there was a mandatory short quiz, which was a prerequisite for opening the following topic.
Redefinition of learning activities - SAMR model	Within this topic, the participants had the opportunity to learn about the SAMR model. The participants first had to view resources. Then there was a recommended participation in the Discussion on the SAMR model. In the end, there was a mandatory short quiz, which was a prerequisite for opening the following topic.
Pedagogy Wheel for Students with special needs	Optionally, participants had the opportunity to get to know the pedagogical wheel for students with special needs. The participants first had to view resources. Then there was a recommended participation in the Discussion on the topic of the pedagogical wheel for students with special needs. In the end, there was a mandatory short quiz, which was a prerequisite for opening the following topic.
Conclusion	Conclusion At the end of the online course, the participants got a final assignment that brought together the acquired knowledge by each presented theme into a complete whole. Each participant designed an updated study activity for any content in the subject area in which they teach. Updated study activity contained learning goals, the defined activity of students, used ICT, criteria for choosing the selected ICT, evaluation of the selected ICT and SAMR level on which activity is.

2.2 Research Questions

All activities and resources within the online course were oriented towards the thoughtful use of ICT in order to support teachers in higher education in the development of skills and knowledge of didactic use of ICT. We wanted to determine if the provided support was sufficient and had an added value to higher education teachers in their own teaching process. With the research, we also wanted to find out what criteria were obtained while selecting ICT by higher education teachers in order to support the pedagogical process. We addressed the following research questions:

RQ1: What was the added value of the content presented at the course Didactic use of ICT in the process of teaching and learning for use in the ICT-supported teaching process, according to higher education teachers?

RQ2: What criteria were emphasized by higher education teachers while selecting the specific ICT in support of the pedagogical process based on the content presented at the course Didactic use of ICT in the process of teaching and learning?

RQ3: How did higher education teachers plan the use of ICT to achieve the specific goals of the study process at the workshop Didactic Use of ICT in the process of teaching and learning?

2.3 Sample

The research included higher education teachers who work at the members of University of Ljubljana (UL). The online course Didactic use of ICT in the process of teaching and learning involved 55 higher education teachers from the UL, from 16 different members. There were two different implementations of the online course. The first implementation of the course involved 35 higher education teachers from 14 different members of UL. The second implementation of the course involved 20 higher education teachers from 13 different members of the UL. The research included the results of those participants who successfully completed all the activities within the online course. At the first implementation of the online course, there were 15 participants who successfully completed all course activities. At the second implementation, there were 6 participants who successfully completed all course activities.

The following table (Table 2) shows the number of participants from each member of UL who participated in the online course Didactic use of ICT in the teaching and learning process in the 1st and 2nd implementation.

Table 2: The number of participants from each member of UL.

Higher education teacher inclusion by members of UL	The 1st impl.	The 2nd impl.
Faculty of Health Sciences	2	2
Faculty of Electrical Engineering	1	2
Biotechnical Faculty	3	2
Faculty of Medicine	4	1
Faculty of Natural Sciences and Technology	3	1
Faculty of Education	7	1
Faculty of Social Sciences	1	
Faculty of Arts	7	3
Faculty of Civil and Geodetic Engineering	1	2
Faculty of Mathematics and Physics	1	1
Faculty of Mechanical Engineering	1	1
Faculty of Sport	1	
Faculty of Public Administration	1	1
Veterinary Faculty	2	
Faculty of Law		1
Faculty of Computer Science and Information Science		1
Other		1
TOTAL	35	20

2.4 Instruments

For the research, the results from the online questionnaire and reports from the final assignment were taken into consideration. All the participants had to submit the final report in which they had to redefine different learning activities with didactic use of ICT. After submitting the final report, the participants had to answer an online questionnaire regarding the added value of the completed online course for their own teaching process.

Redefined learning activities with didactic use of ICT contained two sets of questions. The first set contained basic information as name of a participant, subject, study program, level and the subject-specific content (within which teachers intended to redefine learning activities). The second set of questions required from the participants to write (1) subject-specific learning objectives, (2) students activities to achieve the objectives, (3) Bloom's taxonomy levels emphasized in the activity, (4) selected ICT, (5) criteria for selecting ICT to support the pedagogical process, (6) evaluation of the selected ICT and (7) SAMR level.

The online questionnaire contained 12 questions related to the opinion about the course content, interactive materials, video tutorials, activities and organization of an online course. The questionnaire contained open- and close-ended questions, where the participants had to express their agreement with the statements on a five-point Likert scale. At the scale, score 1 means total disagreement and score 5 means total agreement. There were also open-ended questions, where participants had to back up their assessment from closed questions with a comment. All questions were compulsory. The following three questions were included in this research:

- The first question was close-ended. The participants had to decide on 5-point Likert scale if the presented content in the online course Didactic use of ICT in the process of teaching and learning (a) focused on questions that are interesting for them; (2) were important for their field of work; (3) helped to improve their pedagogical practice; (4) were strongly connected with their pedagogical practice; (5) were sufficiently professional; (6) encouraged their thinking about didactic use of ICT.

- The second question was close-ended. The participants had to decide on 5-point Likert scale if the presented content in online course Didactic use of ICT in the process of teaching and learning enabled them to gain: (1) new experiences for the work with ICT; (2) new ideas in the field of innovative teaching supported with ICT; (3) new knowledge in the field of innovative teaching.

- The third question was open-ended. The participants had to comment on the content presented in the online course.

2.5 Data Collection

The paper presents the results of the two implementations of the online course Didactic use of ICT in the process of teaching and learning.

The first implementation of the online course was held in December 2018. The online course was open to participants for 2 weeks. After the first implementation of the online course, we made an analysis of the feedback received from the participants, and on this basis, we made changes and upgrades before the course was re-implemented. Then, in March 2019, another implementation of the course followed. The second version was available to participants for 3 weeks.

We used a combination of a qualitative and quantitative approach to research. This is a so-called "mixed method of research", where qualitative and quantitative data is collected. A mixed method of research is a type of research in which researchers combine elements of a qualitative and quantitative research approach for the deeper and wider understanding and validation of acquired results (Teddlie and Tashakkori, 2011).

To answer the first research question: (1) the quantitative data collected with the first two close-ended questions in the online questionnaire were used; in addition (2) the qualitative data collected with the third open-ended question in the online questionnaire was used. To answer the second and third research question we used qualitative data collected with reports with different learning activities in which didactic use of ICT was included.

2.6 Data Analysis

The research intended to (1) find out what was the added value of the contents presented within online course Didactic use of ICT in teaching and learning process, (2) find out what criteria were emphasized by higher education teachers while selecting the specific ICT in support of the pedagogical process and (3) find out how the contents supported teachers in creating redefined learning activities using different ICT to achieve subject-specific objectives.

To answer the first research question, the data collected with close-ended questions in the online questionnaire was analyzed quantitatively. After that, the answers from the open-ended question in the online questionnaire were analyzed qualitatively with descriptive statistics. Participants' answers were coded using the coding table. The coding table was derived from 21 responses; the reliability of coding was ensured by independent coding by two researchers. Subsequently, both evaluations were contrasted at points where differences occurred and, after consideration, the more appropriate one was chosen.

The coding table regarding added value of the contents presented within the online course Didactic use of ICT in the process of teaching and learning includes 3 categories: (1) contents were interesting for them and provided them with new ideas; (2) contents helped to improve their pedagogical practice; (3) contents encouraged their thinking about didactic use of ICT.

To answer the second and third research question the data collected with the reports with redefined learning activities with didactic use of ICT were analyzed qualitative. Participants' documents took inductive qualitative content analysis, where data was coded using the coding table. The coding table was derived from 21 documents.

The coding table to determine the criteria according to which ICT was selected was formed based on Bloom's classification: (1) Remembering (2) Understanding (3) Applying (4) Analyzing (5) Evaluating (6) Creating.

The coding table was formed to determine selected activities basing on the four levels of the SAMR model. These levels are: (1) Substitution (2) Augmentation (3) Modification (4) Redefinition

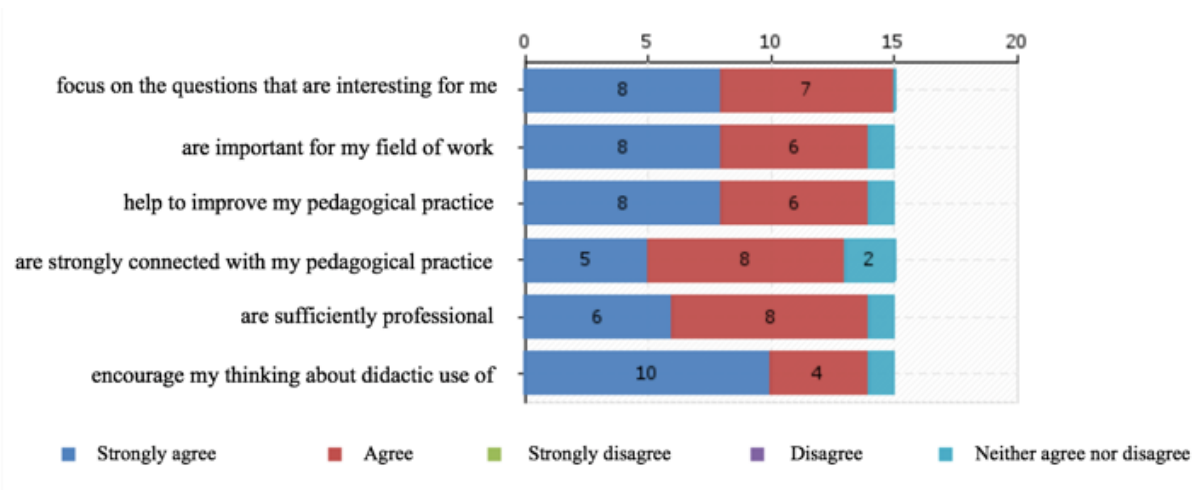
3 Results

3.1 The Added Value Of The Content, Presented Within Online Course Didactic Dse Of ICT In Teaching And Learning Process, For Use In ICT-Supported Teaching According To Higher Education Teachers

With the first research question we wanted to determine the added value of the contents, presented within the online course Didactic use of ICT in the process of teaching and learning, for use in ICT-supported teaching in learning according to higher education teachers.

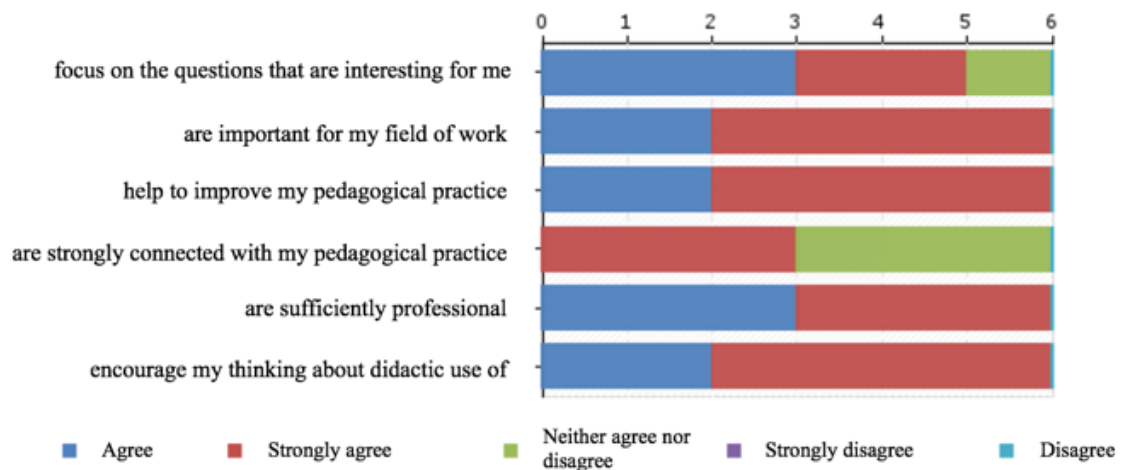
The results presented in Graph 1 and Graph 2 show how much the teachers who participated in online course Didactic use of ICT in the process of teaching and learning agreed that the presented content in the online course (1) c; (2) were important for their field of work; (3) helped to improve their pedagogical practice; (4) were strongly connected with their pedagogical practice; (5) were sufficiently professional; (6) encouraged their thinking about didactic use of ICT.

The results show that the participants of the online course Didactic use of ICT in the process of teaching and learning agreed the most with the statement that the presented contents encouraged their thinking regarding the



Graph 1: The first implementation of the online course: The presented contents in this online course (n = 15).

didactic use of ICT (M=4,6). Participants agreed the least with the statement that the presented topics were strongly connected with their pedagogical practice (M=4.20).



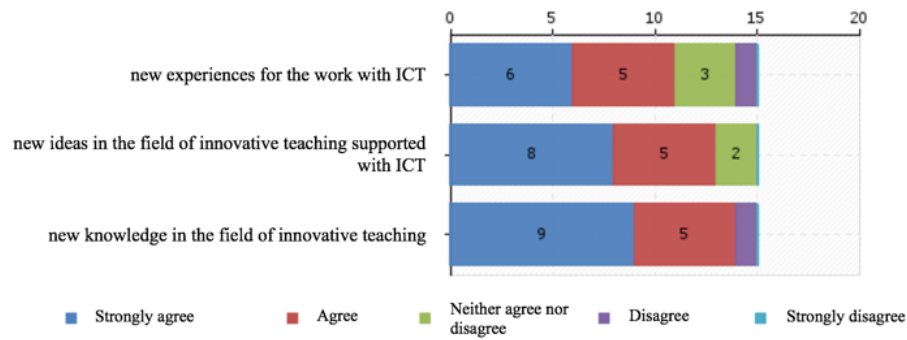
Graph 2: The second implementation of the online course: The presented contents in this online course (n = 6).

The results obtained after the completion of the second implementation of the online course show that the participants agreed the most (M = 4.67) with statements that the presented content was important for their field of teaching, helped them improve their pedagogical practice and encouraged their thinking about the didactic use of ICT. The participants agreed the least (M = 4.00) that contents were focused on the issues they were interested in.

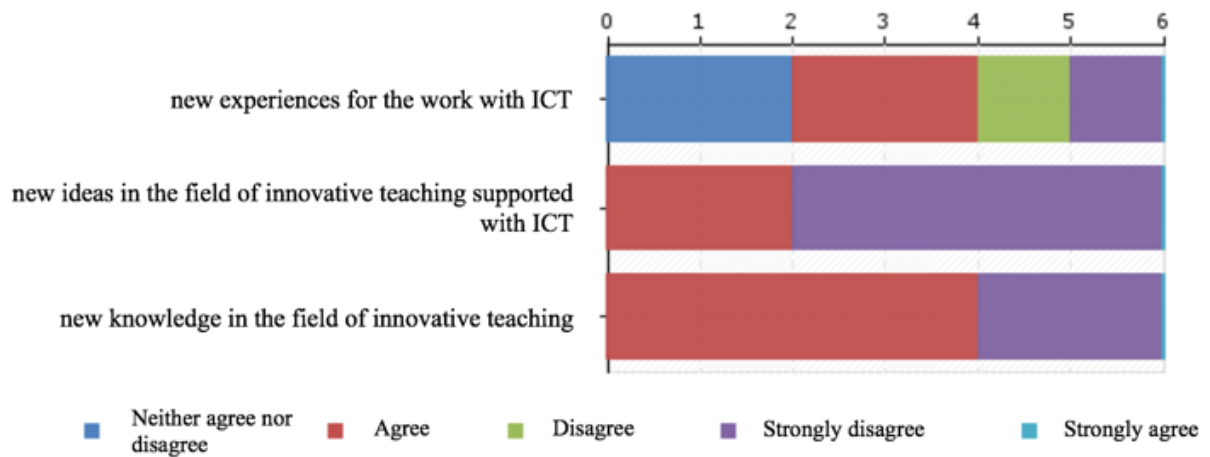
The results presented in Graph 3 and Graph 4 show how much the teachers who participated in online course Didactic use of ICT in the process of teaching and learning agreed that the presented content in the online course enabled them to gain: (1) new experiences for the work with ICT; (2) new ideas in the field of innovative teaching supported with ICT; (3) new knowledge in the field of innovative teaching.

The results obtained after the completion of the first implementation of the online course show that the participants agreed the most (M = 4.47) that the presented content enabled them to gain new knowledge in the field of innovative teaching. The participants agreed the least (M = 4.07) that the content at the course enabled them to gain new experience in working with ICT.

The results obtained after the completion of the second implementation of the online course show that the participants agreed the most (M = 4.67) that the presented content enabled them to gain new ideas in the field of innovative teaching using ICT. The participants agreed the least (M = 4.33) that the content at the course enabled them to gain new experience in working with ICT.



Graph 3: The first implementation of the online course: The presented contents in this online course enabled me to gain (n = 15)



Graph 4: The second implementation of the online course: The presented contents in this online course enabled me to gain (n=6).

Results from the open-ended question regarding the added value of online course Didactic use of ICT in the process of teaching and learning show that teachers found presented contents useful and essential for their pedagogical practice. They added that the presented contents were relevant, meaningful and professional. They contained key information, which is captured and supported by multimedia elements. The participants commented that the contents were well-structured and properly presented. They added that the contents would enable them to implement some of the presented concepts in their own teaching more easily. On the one hand, some teachers stated that the presented content was new for them and that they got new ideas on how to implement ICT in their teaching. On the other hand, teachers who already use the ICT in their pedagogical practice said they found new ideas on how to redefine their activities on the emphasis on didactic use of ICT.

3.2 Criteria For Choosing The ICT To Support The Learning Process

With the second research question, we wanted to find out what criteria were emphasized by higher education teachers while selecting specific ICTs in support of the pedagogical process.

Below we present the criteria stated by teachers for selecting specific ICTs. The criteria were divided into six categories, according to Bloom's taxonomy: (1) Remembering (2) Understanding (3) Applying (4) Analyzing (5) Evaluating (6) Creating.

The activities, planned by the participants of the online course were analyzed. In the first implementation of the online course, we received over 50 suggestions of updated study activities on different levels according to Bloom's taxonomy. In the second implementation of the online course, we gathered 22 additional activities.

Table 3: The criteria stated by higher education teachers while selecting specific ICT in support of the pedagogical process.

Bloom's taxonomy	Criteria	The 1st implementation	The 2nd implementation	Σ
Remembering	Define information			
	Retrieve information	11	4	
	Describe information	10	4	
	Recognize facts or ideas in context	1		
	Recall facts	1		
	List facts			
SUBTOTAL		23	8	31
Understanding	Summarise facts and ideas	3	1	
	Interpret relationships	5	3	
	Predict consequences			
	Give examples	3	1	
	Retell information in own words			
	State problem in own words	1		
	Explain ideas or concepts		1	
SUBTOTAL		12	6	18
Using	Demonstrate methods and procedures			
	Use ideas or knowledge	1	1	
	Discover a new purpose for skills or knowledge	1		
	Employ knowledge in a new situation	1	1	
	Experiment with concepts in a different setting	1	1	
SUBTOTAL		4	3	7
Analyzing	Discriminate fact from hypothesis	2		
	Distinguish the relevant from irrelevant	2	5	
	Observe the structure	2		
	Deconstruct content	1		
	Understand the relationship		1	
	Organize content			
SUBTOTAL		7	6	13
Evaluating	Check for accuracy			
	Detect inconsistencies			
	Monitor effectiveness			
	Evaluate procedures	7	2	
	Critique solutions	11	5	
	Check the probability of results	6	1	
SUBTOTAL		24	8	32
Creating	Construct design	3		
	Generate possibilities	3	2	
	Compose ideas	11	2	
	Propose hypotheses	1		
	Assemble plans	3		
	Produce solutions	5	4	
SUBTOTAL		26	8	34
TOTAL		96	39	135

The teachers mostly chose criteria on the two highest Bloom's taxonomy levels – evaluating and creating.

This was followed by criteria at the lowest level – remembering. Other levels have appeared, but in fewer cases. Next, we will represent the main findings regarding the criteria for choosing ICT on different Bloom’s taxonomy levels.

ICT that fits into the "remembering" stage improves the user’s ability to define terms, identify facts, and recall and locate information. Many educational apps fall into the "remembering" phase of learning. When choosing ICT, teachers ask themselves whether ICT enables them to: define information, retrieve information, describe information, recognize facts or ideas in context, recall facts, and list facts. The following table shows the criteria that teachers chose during the first and second implementation of an online course. In the first implementation of the online course, the participants most often listed ICT that enables retrieving information and describing information. It was followed by ICT that enables recognizing facts or ideas in context and recalling facts. Other criteria did not appear in the selection. In the second implementation of the online workshop, participants, like in the first implementation, most often set up an ICT that enables retrieving and describing information. They did not mention other criteria.

ICT that fits into this "understanding" stage provides opportunities for students to explain ideas or concepts. When choosing ICT, teachers ask themselves whether ICT enables them to: summarize facts and ideas, interpret relationships, predict consequences, give examples, retell information in one’s own words, state problems in their own words, and explain ideas or concepts. The following table shows the criteria that teachers chose during the first and second implementation of an online course. In the first and second implementation of the online course, participants most often indicated ICT that allows interpreting relationships between information. Then, at both implementations, it was followed by ICT that enables summarizing facts and ideas and gives examples. Other criteria were listed in a small number or were not selected.

ICT that fits into the “applying” stage provides opportunities for students to demonstrate their ability to implement learned procedures and methods. When choosing ICT, teachers ask themselves whether the ICT enables them to: demonstrate methods and procedures, use ideas or knowledge, discover a new purpose for skills or knowledge, employ knowledge in a new situation, and experiment with concepts in a different setting. The following table shows the criteria that teachers chose during the first and second implementation of an online course. In the first and second implementation of an online course, teachers planned a small number of ICT that corresponded to the taxonomic stage of applying. At both implementations, they selected ICT that enables using ideas or knowledge, discovering a new purpose for skills or knowledge, employing knowledge in a new situation, and experimenting with concepts in a different setting.

ICT that fits into the "analyzing" stage improves the user’s ability to differentiate between the relevant and irrelevant, determine relationships, and recognize the organization of content. When choosing ICT, teachers ask themselves whether ICT enables them to: discriminate fact from hypothesis, distinguish the relevant from irrelevant, observe the structure, deconstruct content, understand the relationship, and organize content. The following table shows the criteria that teachers chose during the first and second implementation of an online course. The most commonly selected criteria for ICT in the first implementation of the online course were discriminating fact from hypothesis, distinguishing the relevant from irrelevant, and observing the structure. In the second implementation of the online course one criterion dominated. That was ICT that enabled distinguishing the relevant information from irrelevant.

ICT that fits into the "evaluating" stage improves the user’s ability to judge material or methods based on criteria set by themselves or external sources. When choosing ICT, teachers ask themselves whether ICT enables them to: check for accuracy, detect inconsistencies, monitor effectiveness, evaluate procedures, critique solutions, and check the probability of results. The following table shows the criteria that teachers chose during the first and second implementation of an online course. In the first and second implementation of the online course, teachers selected the same criteria when planning the use of ICT. In both courses the choice of ICT enabled critique commenting. It was then followed by ICT that enables the evaluating of procedures and checking the probability of results.

ICT that fits into the "creating" stage provides opportunities for students to generate ideas, design plans, and produce products. When choosing ICT, teachers ask themselves whether ICT enables them to: construct design, generate possibilities, compose ideas, propose hypotheses, assemble plans, and produce solutions. The following table shows the criteria that teachers chose during the first and second implementation of an online course. In the first implementation of the online course, the teachers selected ICT that meets all given criteria. In the largest number, they selected ICT that enables composing ideas, followed by ICT that enables producing solutions. ICT that enables proposing hypotheses was selected the least. In the second implementation of the online course, ICT that enables producing solutions was selected most often. Followed by ICTs that enable

generating possibilities and composing ideas. ICT that meets other criteria did not appear.

3.3 Use Of ICT To Achieve The Specific Learning Objectives

With the third research question, we wanted to find out what kind of activities the teachers planned to achieve learning objectives with using ICT. For this purpose, we created four categories to describe data, which we gathered with reports. These are levels of the SAMR model: (1) Substitution (2) Augmentation (3) Modification (4) Redefinition.

In the first implementation of the online course, the participants of the course envisaged the activities of students to achieve the learning objectives at the first SAMR level SUBSTITUTION. The planned activities were the study of materials (e.g. slides, notes, articles, books, etc.), searching photos and information, describing learned content, and making simple products based on reading the information (e.g. sketches, photos, etc.). According to Bloom's taxonomy level, activities were placed on the level "remember" and "understand". Participants listed ICT for different purposes in order to support the pedagogical process. They listed ICT that enable the production of interactive materials and publication of literature. They also provided gadgets for making photographs (e.g. camera or mobile phone). Such examples of ICT in the prepared materials were online teaching environment Moodle (various activities and resources such as File, Lesson, Folder and URL), Wikipedia and H5P. In the second implementation of the online course, the participants of the course envisaged activities for students to achieve the set learning objectives at the SAMR level SUBSTITUTION. Most participants anticipated the activity of material studies. According to Bloom's taxonomy, activities were placed at the level of "remember". Participants listed ICT for different purposes in order to support the pedagogical process. They listed ICT that enable the presentation of information, a description of basic definitions, and publishing materials. Such examples of ICT in the prepared materials were online teaching environment Moodle, with the various functionalities offered by it, and various interactive books, which are available on various websites.

In the first implementation of the online course, the participants of the course envisaged the activities of students to achieve the set learning objectives at the SAMR level AUGMENTATION. The planned study activities were discussions in a group or in a pair, interpretation of the read content, the production of various simple products in regard to the discussed topic (e.g. web pages), solving quizzes, commenting on the given information, analyzing and critically assessing obtained information. According to Bloom's taxonomy, the activities were placed to "remember", "understand", "apply", "analyze" and "evaluate". In order to support the pedagogical process, they identified ICT that enable communication and collaborative work, formal monitoring of the study process, making quizzes, viewing images, making presentations, and constructive ICT that enable creating products for a specific field. Examples of ICTs include Moodle (Quiz, Forum), PowerPoint, Arnes Web, YouTube, Google (Drive, Maps), Kahoot, AdobePhotoshop, Illustrator, Slido, H5P, etc. In the second implementation of the online course, the participants of the course envisaged the activities of students to achieve the set learning objectives at the SAMR level AUGMENTATION. The predicted study activities included study materials, watching videos, a calculation based on given data, quiz solving and interactive simulation of some concepts. According to Bloom's taxonomy activities were based on the levels of "understanding", "application" and "analysis". In order to support the pedagogical process, they identified ICT that allows simulations, the publication of materials, collaborative work, and communication between students and teachers, interpretation and making e-portfolios. Examples of ICTs are Moodle (Quiz, Forum), YouTube, Vimeo, Mahara, and open-source Simulation Tools.

In the first implementation of the online course, the participants of the course envisaged the activities of students to achieve the set learning objectives at the SAMR level MODIFICATION. The planned study activities were peer collaboration and assessment, group discussions, presentations and solving quizzes. According to Bloom's taxonomy, activities were applied to the level of "apply", "analyze", "evaluate" and "create". In order to support the pedagogical process, they identified ICT that enable communication and collaboration, formative evaluation of the study process, preparation of various quizzes, making presentations/slides, and constructive ICT that enable the creation of products for a specific field. Such examples of ICT are Moodle (Quiz, Forum, Workshop, H5P plugin), Arnes Web, Kahoot, PowerPoint and H5P. In the second implementation of the online course, the participants of the course envisaged the activities of students to achieve the set learning objectives at the SAMR level MODIFICATION. The planned study activities were comparing, differentiating and analyzing the content (various phenomena, concepts), presenting content (video, images, text), quiz solving, peer evaluation and teamwork. According to Bloom's taxonomy, the activities were based on the levels of "understand", "analyze" and "evaluate". Participants listed ICT for different purposes in order to support the pedagogical process.

They listed ICT that enables simulation, collaborative work and communication, and the production of quizzes. Such examples of ICT are Moodle (Quiz, Forum, Workshop), Youtube, Vimeo, Socrative, Vevox, Kahoot, and PowerPoint.

In the first implementation of the online course, the participants of the course envisaged the activities of students to achieve the set learning objectives at the SAMR level REDEFINITION. The planned study activities were essay writing, content analysis, reflection, project work and construction, planning of the exhibition, role-plays, programming, video creation, animation design, and game development. According to Bloom's taxonomy, activities were ranked at the stage of "evaluate" and "create". Participants listed ICT for different purposes in order to support the pedagogical process. They listed ICT that enables gathering feedback information, preparation of articles, recording of ideas, the reflection of work, production of materials, creation of plans for creating ideas and making games. Such examples of ICT are Moodle (Forum, Workshop, Task), Arnes Web, Padlet, Mobile Phones, Scratch, 3D Printers, HP Reveal, and H5P. In the second implementation of the online course, the participants of the course envisaged the activities of students to achieve the set learning objectives at the SAMR level REDEFINITION. The planned study activities were the production of a prototype, preproduction, and production of audio-visual media, the reconstruction of the signal from the calculated spectrum, and the design, manufacture, and testing of a product. According to Bloom's taxonomy, activities were placed at the stage of "evaluate" and "create". Participants listed ICT for different purposes in order to support the pedagogical process. They listed ICT that enables watching movies, editing their own recordings, collaboration, and communication on the web, development of project products and visualization of results. Examples of such ICTs are Moodle, YouTube, Audition Adobe, Premiere, Encoder, Scilab and etc.

4 Discussion And Conclusion

4.1 Online Course As An Encouraging Tool For Didactic Use Of ICT

With the project "Digital UL – with innovative use of ICT to excellence", University of Ljubljana is encouraging higher education teachers for didactic use of ICT in their pedagogical practice. Within more than 60 pilot implementations, where didactic use of ICT is emphasized, teachers have the opportunity to participate in an online course that presents basic concepts related to the didactic use of ICT. With the course we want to support teachers within pilot implementations, encourage their thinking regarding the didactic use of ICT, and offer them enough knowledge for further research and successful pilot implementation. According to the results, it turned out that such courses for teachers are necessary and useful. Some teachers met with the content for the first time and the course enabled them to develop new ideas in their own pedagogical work.

When the participants actively participated in the course activities, they prepared a report with the didactic use of various ICTs with the aim of achieving specific learning objectives for students. It was clear that they were referring to a different ICT to support the development of different levels of thinking according to Bloom's taxonomy. They also highlighted various criteria that were taken into account when choosing ICT. At the level of remembering, the participants highlighted ICT that enables the description of information. It was followed by ICT for finding and identifying facts. At the level of understanding, the participants indicated ICT that allows interpreting links between information, summarizing facts and ideas, and giving examples. At the level of using, teachers emphasized ICT that enables the use of ideas and knowledge in new situations and for experimentation. At the level of analyzing, teachers emphasized ICT that allows separation of facts from hypotheses, identification of essential information and observation of structures in data. At the evaluating level, the participants planned to use ICT that enables critical commenting, evaluation of procedures and verification of the likelihood of results. At the level of creating, the participants most often listed ICT that enabled the creation of ideas and solutions.

Participants placed their redefined activities for students with didactic use of ICT on different levels according to the SAMR model. At the substitution level, participants planned activities as studying material, searching for photos and information, and describing the things learned. In order to support the pedagogical process, teachers highlighted the use of ICT that enables the production of interactive materials, the publication of literature, the listing of information, and the description of basic definitions. At the augmentation level, the participants planned activities such as group discussions, interpreting content readings, creating various simple products with regard to the topic, quiz solving, commenting on the given information, and viewing videos. In order to support the pedagogical process, they identified ICT that enables communication and collaborative work, formative assessment of the study process, making quizzes, viewing recordings, and creating interactive presentations. At the stage of modification, the participants planned activities such as peer collaboration and assessment, group discussions, presenting, comparing, distinguishing, and analyzing the learned content. In order

to support the pedagogical process, teachers chose ICT which enables communication and collaborative work, simulation, formative assessment of the study process, preparation of various quizzes, creating presentations, and constructive ICT, which enables creating products for subject-specific fields. At the stage of redefinition, the participants planned activities such as the production of project tasks and products, preparing exhibitions, role-playing, programming, creating videos, designing and developing animations, and making games. To support the pedagogical process, the teachers suggest the use of ICT to provide feedback, product preparation, writing ideas, reflecting the work, creating materials, designing plans, collaborating and communicating online, creating ideas, and making games.

From the results we can conclude that with the online course Didactic use of ICT in the process of teaching and learning we encouraged teachers for didactic use of ICT with the aim of achieving the higher cognitive processes among students.

4.2 Limitations

It is necessary to take into account that the research covered a relatively small number of higher education teachers.

4.3 Implications For Practice And Further Research

Based on the evaluation of the conducted online course, we will continue with new implementations of the course Didactic use of ICT in the process of teaching and learning. Teachers who participated in the online courses will incorporate new knowledge in their courses and evaluate the effect of didactic use of ICT within their pedagogical practice. With that, they will ensure the sustainability of the results that may encourage different teachers at University of Ljubljana for the didactic use of ICT.

4.4 Acknowledgments

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