

# Supporting Teachers in Higher Education for Didactic Use of the Learning Environment Moodle

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## Abstract

Technology is becoming an important element of the pedagogical process at all levels of education. Regardless of its prevalence, many teachers are not able to take advantage of all the opportunities offered by technology. Knowledge of functionalities available in online learning environments and of their proper didactic use is vital for the launch to the pedagogical process. Within the project "Digital UL - With Innovative Use of ICT to Excellence", we launched two online courses, where university teachers and colleagues became acquainted with the possibilities, activities, and plug-ins that are part of the learning environment Moodle, which is the most widely adopted tool for sharing learning materials with the support for collaboration. The first online course was intended for participants with little or no experiences with the use of Moodle, and the other for participants who already had some experience with this online environment and wanted to learn about advanced activities in Moodle. The paper presents findings of the research after the completion of the online course. In the research we analyzed the use of Moodle in the pedagogical process among the higher education teachers and colleagues of the University of Ljubljana. We obtained the results with a questionnaire and an analysis of the reports of updated study activities with Moodle that the participants created at the end of the courses. We were interested if the content in the online course was meaningfully prepared and what kind of contribution they had for participants' professional development. We also asked the participants if content fulfilled their expectations regarding the objectives of the course and if they were enabled to gain new experience, ideas, and knowledge about using Moodle in the pedagogical process. The results showed that through the course, higher education teachers found numerous opportunities for working in an online classroom, which they had not been familiar with before. Also, received feedback has shown that participants support the online way of conducting training because they can adjust their time and pace according to their pedagogical obligations. In the future, we will repeat a series of courses and improve future performance with feedback.

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## 1 Introduction

Along with the continuous development of the Internet and its applications, the role of computer-based instruments in the learning process has been increasing. Thus educational institutions have a growing need to add virtual learning environments (VLE) to the traditional teaching-learning-assessment process. This results in the introduction of a series of applications that have the role to in enabling the integrated management of the online learning process together with the blended learning applications[KDN16, Opr15].

These platforms have three roles: they enable content management (courses, homework), ensure synchronized and non-synchronized collaboration (by chat, videoconferences or forum, messages, blog) and can also be used in managing the courses and their participants[Wel07].

### 1.1 Moodle

Moodle is one of the most popular open source systems for learning management (LMS), also often called a course management system (CMS) or a virtual learning environment (VLE)[BBC12]. It supports both small and large deployments and includes various course management tools, many different Web 2.0 technologies, online assessments, integration with plagiarism detection tools, integration with repositories and electronic portfolio software, and numerous other features. As Xhafa, Caballé, Rustarazo, and Barolli [XCRB10] argue, “Moodle distinguishes for easy configuration and maintenance as well as content course creation. A great advantage of using Moodle is the easiness of content creation, including forum, questionnaires, tasks, wikis, chats, etc.” (p. 207). According to Moodle Statistics, Moodle is present in 229 countries, at 108.273 sites, hosting 18.461.741 courses, and 152.666.222 users (<https://moodle.net/sites/>).

However, despite the massive use of LMS platforms, many researches indicate there is no evidence of a change in pedagogical practice, where teachers would practice more developing, inventing and creating knowledge instead of just transmitting it [Bro08, BJW06, Kin12, CAD19]. Many teachers only use a minimum of LMS’s possibilities [JBW10, RT12]. LMSs are mainly used for tasks related to uploading the course syllabus, publishing materials, delivering notes, and requesting and collecting homework [BP17]. For this reason, it is essential to reconsider teacher-centred teaching approaches and direct them towards a student-centred approaches, and to search for new ways and approaches to carry it out [CAD19].

### 1.2 Didactic Use Of Moodle Environment

Collaborative activities and their successful integration into the teaching-learning process can be carried out with the use of the platforms under teaching assets. The Moodle platform has easily configurable characteristics that allow the creation of student assessment processes (questionnaires and online tests) and the management of their tasks [CAT12]. An automated and adaptive educational assessment can also enrich the learning process [CJB05]. These platforms allow the development of new strategies for participation that are focused on students for easier learning and for strengthening their autonomy. Therefore, a more democratic conception of networking was created on the basis of interaction, feedback, debate and collaborative work [CAT12, SX16].

Although containing all these advantages, Moodle is still mostly used merely as a repository for materials and information [CAT12], and the development of its pedagogical use is still limited [Par17, RGL14]. In order to promote the didactic use of Moodle in the teaching and learning process, Digital Competence Framework for Educators [Red17] was developed as the basis for the development of activities on the learning environment. The Framework defines six areas of competence with a total of twenty-two basic competencies. They must be acquired by teachers in order to be able to use information and communication technology meaningfully.

Central Educators’ pedagogic competences, which include knowledge and skills in the field of learning and teaching, are key to the pedagogical process. Educators’ professional competences focus on the professional environment of teachers, which includes organization, communication, professional cooperation, and quality reflection or self-evaluation of the work performed. In the context of pedagogical work, higher education teachers indirectly take care of facilitating students’ digital competences, including information literacy, the ability to communicate with digital tools and services, knowledge for creating digital materials, responsible use of digital

resources and critical participation in the public digital sphere, and solving problems using information and communication technologies [Red17].

Educators' pedagogic competences include four sets related to the planning and delivery of lessons and assessment of knowledge [Red17].

The first set Digital resources focuses on the competences for working with digital resources, i.e. competences that are necessary for efficient and responsible use of available resources, creation of new, and exchange of current resources and learning materials, considering the copyright and program protection rules for publishing materials. The concept of an online classroom allows teachers to share different resources with a certain amount of protection, as it is a closed collaborative environment. There are many activities in the online classroom that support working with digital resources. In Moodle, in particular, we can promote the development of competences for creating and changing digital resources, as teachers can create resources through activities such as page, book, lesson, and URL. With the help of options like labels and folders, the created materials can be organized so that we facilitate students' access and conceptualization of knowledge.

The second set Teaching and Learning consists of the competences for the use of digital technologies for the launch of the learning process, including the support to learners for quality learning, where they emphasize independent, self-regulated and collaborative learning. The online classroom also enables different activities in this set. Teachers can establish a chat, forum, create a collaborative dictionary, and wiki with the purpose of collaboration.

The third area Assessment consists of competences related to the processes of examining and assessing knowledge using ICT. In this respect, important strategies are to enable both the qualitative formative assessment of knowledge and the monitoring of students throughout the learning process, as well as a quality summative assessment of knowledge. These activities, in particular on-line, formative knowledge testing and student monitoring, can be supported by analyzing a large amount of data that can be collected with ICT.

The online classroom allows teachers to have different ways of evaluating the active work of students. Activities that support web-based evaluation of online learning are assignment where students can submit their products, a quiz that allows the launch of different types of questions, survey which enables filling out the already prepared standardized questionnaires, choice, with which teachers can quickly obtain the opinion of students, and course, where teachers can acquire student products through various stages and promote peer evaluation. In addition to examining knowledge of the students, teachers can analyze different forms of student involvement in the online classroom. Besides Gradebook and Log files, teachers can create reports which show active participation for each student and obtain data on the success of solving for each individual activity.

The fourth competence set Empowering Learners is focused on empowering students for effective learning by providing accessibility, by inclusion, taking into account the didactic principle of individualization, which includes both learning differentiation and personalization of learning, and with other forms of actively engaging learners. Most activities, which we have already mentioned, also support the field of empowering students. In connection with empowerment, it is also worth mentioning various plug-ins in the online classroom, which enable us to personalize, differentiate, and actively include students. Plug-ins that can be used in an online classroom and support the active involvement of students include Game, Quizventure, H5P.

### **1.3 Online Course As A Tool For Encouraging Didactic Use Of Moodle Environment**

Based on the the results of the analysis of the state of didactic use of ICT in the "Digitalna UL" (Digital UL) project, we found out that Moodle is one of the most commonly used online collaborative environments in higher education at the University of Ljubljana. Nonetheless, it turns out in our internal analysis that Moodle is most often used as a digital resource repository, and not as much as a tool to promote the active involvement of students. For this purpose, we developed two online courses with the option of a face-to-face meeting, presenting the possibilities of didactic use of the online learning environment Moodle. The goal of the courses is to provide basic knowledge about the didactic use of Moodle environment in teaching and learning process, the courses explain concepts related to the use of Moodle environment to support organization of work and study, collaborative learning, assessment of knowledge, gamification, and learning analytics.

The courses entitled Moodle in education include different kinds of materials:

- 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 activities in Moodle environment.
- 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 are presented to learners at the end of each unit and at the end of the course.
- Learning materials in pdf format.

While constructing the online course Moodle in education, we were considering the elements of effective learning, as proposed by different authors [GMS13]. For each element, we implemented different activities on the online course.

Table 1: The Elements of effective learning and Activities on online course Moodle in education

The Elements of effective learning	Activities on online course
Learner Empowerment	In the presented online course, we ensured learners' empowerment with interactive resources, quizzes, creating an assignment and conditional progress between different learning units
Learning plan and clear orientations	In the presented online course, we ensured a clear learning plan with an introduction into 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 in each moment knew how far were they from completing the specific milestone. Until they reached the goal of one unit the next unit was closed for them.
Collaborative learning	In the presented online course, we included some of the Moodle activities that supported collaboration - Forum.
Interactive learning	In the presented online course, the interactive learning was assured with interactive learning resources.
Individual learning	In the presented online course, 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 gained through each of the presented learning units.

## 2 Materials And Methods

### 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 European Social Fund, in the operation Strengthening employment and mobility—opening pathways to work—encouraging flexible forms of learning. Our paper presents the results of the project where we trained higher education teachers for the didactic use of learning environment Moodle within online courses Moodle in education 1 (basic version) and Moodle in education 2 (advanced version). Our main goal was to introduce higher education teachers with different functionalities of learning environment Moodle and the possibilities of their didactic use in education.

In the following table, we are presenting the main topics and activities that were presented to participants of the online courses. All activities were first represented with didactical purposes and then with step-by-step instructions on how to use specific activity. The participants first had to view tutorials and resources. Then there was recommended participation in the discussion on specific topic. At the end there was a mandatory assignment and a short quiz, which were a prerequisite for opening the following topic.

### 2.2 Research Questions

All activities and resources within the online course were oriented towards the thoughtful use of Moodle environment in order to support teachers in higher education in developing skills and knowledge of didactic use of Moodle. 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 show what were the advantages and disadvantages of the didactic use of ICT through the eyes of higher education teachers. We addressed the following research questions:

Table 2: 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 evaluate the understanding, a short quiz was prepared, which was a prerequisite for opening the following topic.
Organization of work and learning on Moodle	In this part, participants had the opportunity to learn about the basic and advanced activities in Moodle, which can be used as support for working with digital resources and organizing them in an online classroom. Activities that were presented to teachers within the basic version were: navigation through Moodle site, Administration of the course, adding label, map, files, URL, Book, Page, and embedding content on a page. Within the advanced version of the course the following activities were presented: adding Booking option, enabling conditional formatting and integrating competencies model into course and course activities.
Collaboration on Moodle	In this part, the participants had the opportunity to learn about the basic and advanced activities in the Moodle that can be used for collaborative learning. Activities that were presented to teachers within the basic version were: Forum, Chat, Glossary, Wiki. Within the advanced version activity as Workshop and Group mode on Moodle were presented.
Knowledge evaluation on Moodle	Within this topic, participants had the opportunity to learn about the basic and advanced activities that can be used as a support in evaluating students' knowledge. Activities that were presented to teachers within the basic version were: Assignment, Quiz, Survey, Choice. Within the advanced version of the course the activity Lesson was presented and more complex types of questions in the quiz.
Gamification on Moodle	Within this topic, the participants got acquainted with the basic and advanced activities that can be used as enhancing learning process with games. Activities that were presented to teachers within the basic version were: Plugin Game and Quizventure. Activities that were presented within the advanced version were: Plugin H5P, Treasure Hunt and Moodle Badges.
Learning analytics on Moodle	This topic was only available in the advanced version of the online course and the participants had a chance to find out what Moodle allows us to do in the field of student learning analytics and student activity in the online classroom. Activities that were presented to teachers were: how to use/create different reports (Gradebook, Logs, Activity, Activity Completion, Live logs, (Quiz) Statistics, (Course) Participation, Course Overview, Events list), and different blocks (Course-completion status, Progress Bar, Activity results block, Configurable reports).
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.

RQ1: What is the added value of the content, presented within online course Moodle in education, for use in ICT-supported teaching according to higher education teachers?

RQ2: How did the higher education teachers imagine using the Moodle environment to achieve the specific objectives of a study process?

RQ3: What are the key advantages and disadvantages that higher education teachers have highlighted regarding the didactic use of the learning environment Moodle?

### 2.3 Research Sample

The launch of the research included higher education teachers who work at the members of University of Ljubljana. It was included 125 higher education teachers from 17 different members of UL in the basic and advanced versions of the online course Moodle in education. Within the basic version of the online course Moodle in edu-

cation 68 higher education teachers participated and within the advanced version of the online course Moodle in education 57 higher education teachers participated. The participants were variously active in the online course. The research will show the results of those participants who successfully completed all the activities in the online course. There were 24 participants who successfully completed all the activities in the basic version of the online course Moodle in education, and 11 participants in the advanced version of the online course.

The following table represents the number of higher education teachers by members of UL who participated in the online courses Moodle in education and successfully completed all the activities.

Table 3: The number of participants from each member of UL.

Higher education teacher inclusion by members of UL	Basic version	Advanced version
Faculty of Chemistry and Chemical Technology	4	3
Faculty of Arts	7	7
Faculty of Natural Sciences and Technology	5	2
Biotechnical Faculty	21	17
Faculty of Medicine	4	4
Faculty of Computer and Information Science	1	
Faculty of Social work	3	2
Veterinary Faculty	2	3
Faculty of Mechanical Engineering	2	1
Faculty of Maritime Studies and Transport	1	1
Faculty of Public Administration	2	2
Faculty of Pharmacy	3	4
Faculty of Civil and Geodetic Engineering	1	2
Faculty of Education	7	3
Faculty of Sport	1	
Faculty of Social Science	2	2
Faculty of Health Science	2	4
TOTAL	68	57

## 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 were asked to create different learning scenarios regarding didactic use of Moodle learning environment. After submitting the final report, participants had to answer to the online questionnaire regarding added value of completed online course for their own teaching process.

Redefined learning activities with didactic use of Moodle contained two sets of questions. The first set contained basic information: name of a participant, subject, study program, level and the subject-specific content (within which the teachers intended to re-design learning activity). The second set of questions required from the participants to formulate (1) subject-specific learning objectives and (2) re-designed learning activities with didactic use of ICT, which would enable them to achieve the desired learning objective.

The online questionnaire contained 12 questions related to the opinion about the course content, interactive materials, video tutorials, activities and organization of the online course. The questionnaire contained open- and close-ended questions, where participants had to express their agreement with the statements on a five-point Likert scale. At the scale the 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. In this research three questions were included:

- The first question was close-ended. The participants had to decide on 5-point Likert scale if the presented content in the online course Moodle in education (1) 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 Moodle environment.

- The second question was close-ended. The participants had to decide on 5-point Likert scale if the presented content in online course Moodle in education 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.

The discussion forum had 5 different topics, which were the same as the topic of online course: organization of the work and study on Moodle, collaborative learning with Moodle, knowledge evaluation with Moodle, gamification with Moodle and learning analytics with Moodle. Participants had the opportunity to share their thoughts, ideas and experiences regarding main topics while using Moodle in teaching and learning process.

## 2.5 Data Collection

The research proceeded through two launches of online courses. The online course Moodle in education 1 (the basic version) lasted for two weeks, from 5th December 2018 until 19 December 2018. The online course Moodle in education 2 (the advanced version) also went on for two weeks, from 12th December 2018 until 9th January 2019. All participants completed course activities on their own pace. We used a combination of a qualitative and quantitative approach in this 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 [TT11].

To answer the first research question: (1) the quantitative data collected with the first two close-ended questions in the online questionnaire was used; in addition (2) the qualitative data collected with the third open-ended question in the online questionnaire was used. To answer the second research question, we used qualitative data collected from reports with different learning scenarios in which didactic use of Moodle was included. To answer the third research question, we used the qualitative data collected from the discussion forums used by the participants during the online course.

## 2.6 Data Analysis

The research intended to (1) find out what is the added value of the contents presented within online course Moodle in education, (2) find out how the contents supported teacher in creating redefined learning activities using the Moodle environment to achieve subject-specific objectives, and (3) identify advantages and disadvantages of didactic use of Moodle from higher education teachers' point of view.

To answer the first research question, the data collected with close-ended questions in online questionnaire were analysed quantitatively. After that, the answers from the open-ended question in the online questionnaire were analysed qualitatively with descriptive statistics. Participants' answers were coded using the coding table. The coding table was derived from 35 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 Moodle in education includes 3 categories: (1) contents are interesting for them and provided them with new ideas; (2) contents help to improve their pedagogical practice; (3) contents encouraged their thinking about didactic use of Moodle environment.

To answer the second research question, the data collected with the reports with redefined learning activities with didactic use of Moodle were analysed qualitatively. Participants' documents took inductive qualitative content analysis, where data was coded using a coding table. The coding table was derived from 35 documents. Also in this case, reliability of coding was ensured by independent coding by two researchers as well. Coding table regarding redefined learning activities with didactic use of Moodle to achieve subject-specific learning objective includes 4 categories: (1) Activities in support of organization of work and study on Moodle, (2) Activities in support of collaborative learning on Moodle, (3) Activities in support of knowledge evaluation on Moodle, and (4) Activities in support of gamification on Moodle.

To answer the third question data collected with the discussion forum was analysed qualitatively. In this example, participants' answers were coded using coding table and the reliability was assured by independent coding by two researchers as well.

### 3 Results

#### 3.1 Added Value Of The Content, Presented Within Online Course Moodle In Education, 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 Moodle in education, for use in ICT supported teaching and learning according to higher education teachers.

The results presented in Graph 1 and Graph 2 show how much teachers, who participated in the basic (Graph 1) and advanced (Graph 2) online courses agree that the presented content in online course Moodle in education (1) focuses on the questions that are interesting for them; (2) are important for their field of work; (3) help to improve their pedagogical practice; (4) are strongly connected with their pedagogical practice; (5) are sufficiently professional; (6) encouraged their thinking about didactic use of Moodle environment.

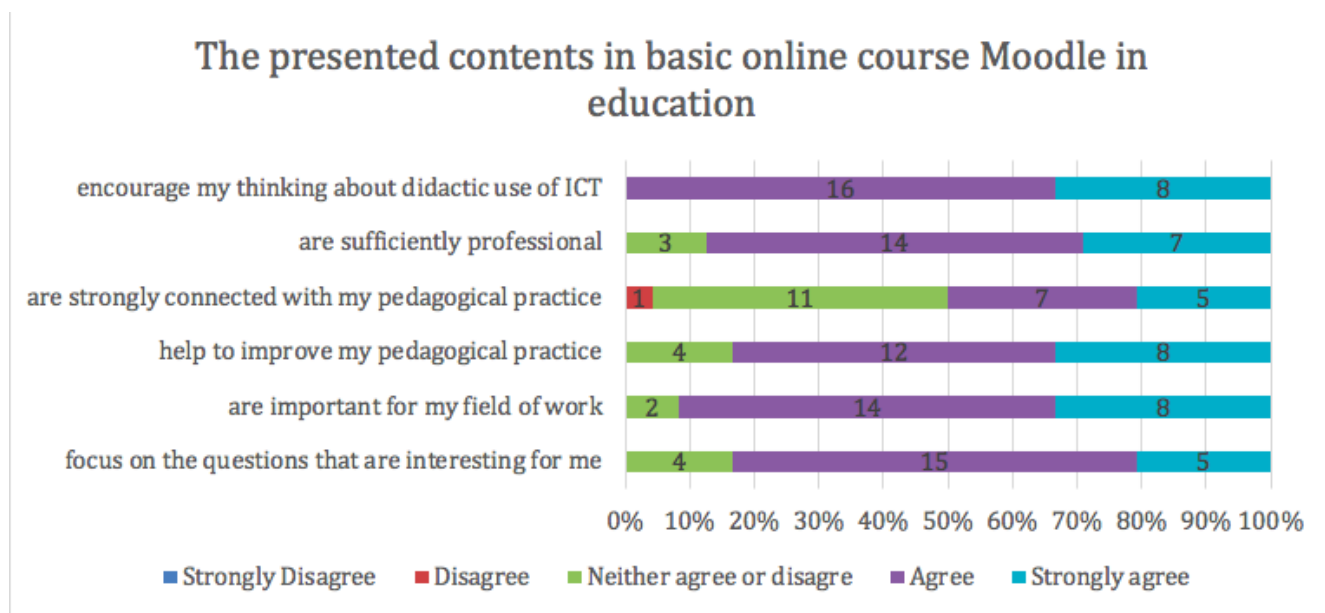


Figure 1: Basic online course Moodle in education: The presented contents in this online course (n = 24)

Results show that the participants of the basic online course Moodle in education 1 agreed the most with the statement that the presented contents encouraged their thinking regarding didactic use of ICT (M = 4,33) and that the presented topics are important for their work field (M = 4,25). Participants agreed the least with the statement that the contents presented in the online course focused on the questions that are interesting for them (M = 4,04) and that the presented topics were strongly connected with their pedagogical practice (M = 3,67).

Results show that the participants of the advanced online course Moodle in education 2 agreed the most with the statement that the presented contents encouraged their thinking regarding didactic use of ICT (M = 4,33), the are strongly connected with their pedagogical practice (M = 4,25), were sufficiently professional (M = 4,25), and that the presented topics were important for their work field (M = 4,25). Participants agreed the least with the statement that the presented topics were strongly connected with their pedagogical practice (M = 4,08).

The results presented in Graph 3 and Graph 4 show how much participants agreed with statements that presented content in online course Moodle in education enabled them to gain: (1) new experiences for the work ICT; (2) new ideas in the field of innovative teaching supported with ICT; (3) new knowledge in the field of innovative teaching.

Results show that the participants of the online course Moodle in education 1 agreed the most with the statement that the presented contents enabled them new experiences for the work with ICT (M = 4,50). Participants agreed the least with the statement that the contents presented in the online course enabled them to gain new ideas in the field of innovative teaching supported with ICT (M = 4,21) and that contents enabled them to gain new knowledge in the field of innovative teaching (M = 4,17).

Results show that the participants of the advanced online course Moodle in education 2 agreed the most with



## The presented contents in advance online course Moodle in education

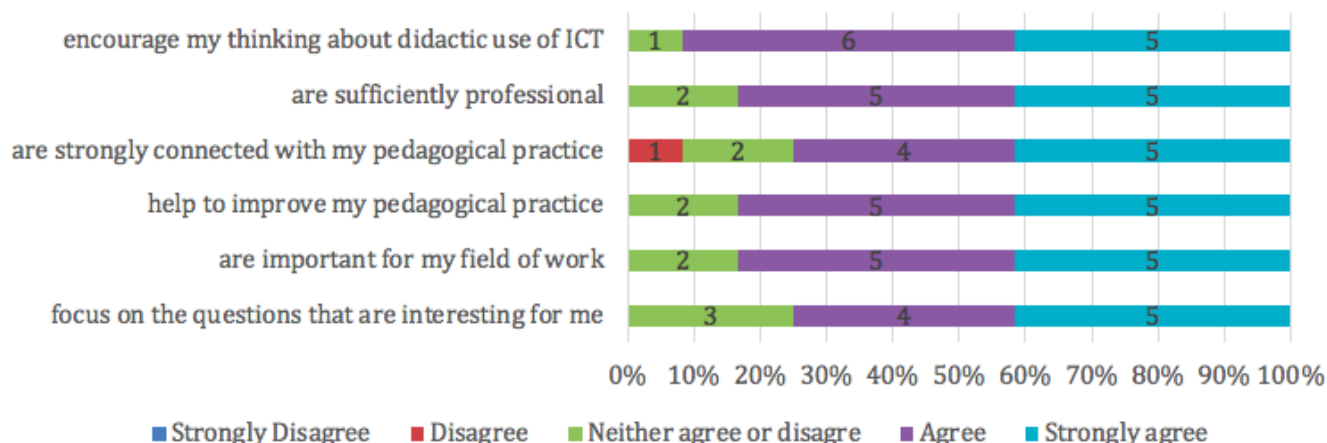


Figure 2: Advance online course Moodle in education: The presented contents in this online course (n = 12)

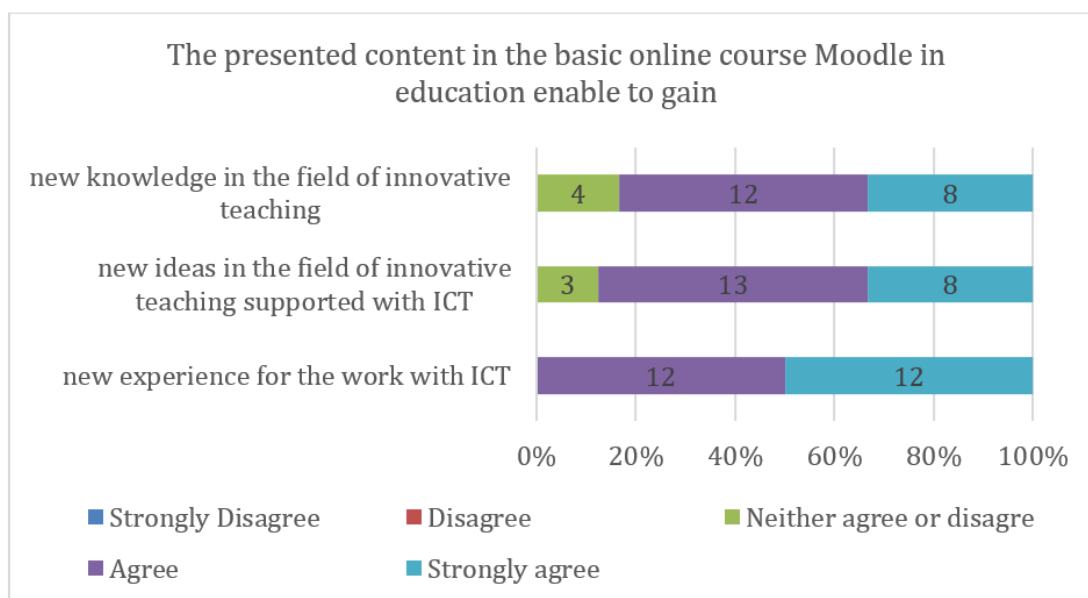


Figure 3: Advance online course Moodle in education: The presented contents in the basic online course Moodle in education enable to gain (n=12)

the statement that the presented contents enabled them to gain new experience for the work with ICT ( $M = 4,58$ ). Participants agreed the least with the statement that the contents presented in the online course enabled them to gain new knowledge in the field of innovative teaching ( $M = 4,25$ ).

Results from open-ended question regarding added value of online courses Moodle in education 1 and 2 shows that teachers found presented contents interesting for them and stated that they were provided with new ideas within the online course. They were surprised how many different activities Moodle enables and how they could be used in the classroom with the students. They also emphasized that contents helped them to improve their pedagogical practice since they already implemented some of the presented activities in their courses and students liked them. They also said that contents encouraged their thinking about didactic use of Moodle environment

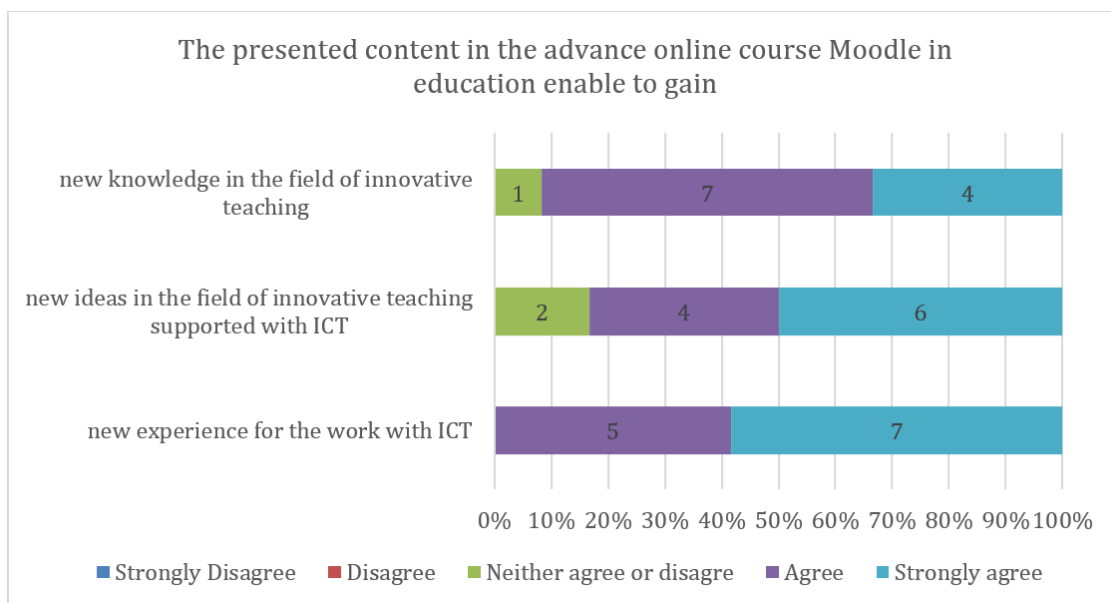


Figure 4: Advance online course Moodle in education: The presented contents in the basic online course Moodle in education enable to gain (n=12)

since they used Moodle as a repository and for student assignments.

### 3.2 Redefining Learning Activities With The Didactic Use Of The Moodle Environment To Achieve The Subject-Specific Objectives

With the second research question, we wanted to find out in what way the teachers redefined learning activities with the didactic use of Moodle to achieve the subject-specific objectives. This was also an indicator of what knowledge and skills higher education teachers gained through online courses and used in the process of redefining learning activities with didactic use of Moodle.

The results show that in most cases teachers used Moodle for knowledge evaluation (in 74 activities). The activities that were used the most in both courses were Quiz and Assignment. The selected activities in support of knowledge evaluation teachers were used in different purposes. For example:

- Assignment: Participants indicated that this activity would be used to deliver students' products that would later be evaluated or given feedback in the form of comments. Within this activity, the Turnitin tool, which verifies plagiarism, also highlighted.
- Quiz: The participants mostly stated that this activity would be used to evaluate and evaluate students' knowledge with different types of questions.
- Choice: Participants indicated that they would use this activity to select the desired terms or topics for the seminar work.
- Lesson: Participants indicated that this activity would be used to add tasks of a different type (more interactive, diverse content).

The results show that teachers in many cases used Moodle for organization of work and study (in 71 activities). The activities that were used the most are adding different files and maps. Some examples of how teachers use different resources on Moodle are:

- File: Teachers planned to publish different materials and instructions as files for student's work. A lot of teachers predict the use of files in support of flipped learning or as additional resource.
- Map: Participants indicated that through this resource they would publish a plurality of files that cover the same themes. The map would be used to increase the organization of the subject in the online classroom. They would also load the products of students into the folder so that they would be visible to all students.
- Label: Participants indicated that the label was designed with the aim of more transparency over the added materials in the online classroom. Teachers would use it as a dividing line between different themes.
- URL: Participants indicated that they would use URL for adding useful content located on another website.

Table 4: Redefined learning activities with the didactic use of Moodle

Code	Activity or resource on Moodle	Moodle in Education 1 (Basic)	Moodle in Education 2 (Advanced)	TOTAL
Organization of work and study	Map	15	1	16
	Label	9		9
	URL	8	4	12
	File	24	1	34
	*Page	/		
	*Conditional progress	/		
	*Booking	/	4	12
	*Competencies framework	/		
Multimedia		56	15	71
Collaborative learning	Forum	26	4	30
	Chat	7	1	8
	Glossary	11	2	13
	Wiki	1	2	3
	Workshop	2	7	9
	Group mode	/		
SUBTOTAL		47	16	69
Knowledge evaluation	Assignment	23	10	33
	Quiz	24	11	35
	Survey			
	Choice	4	1	5
	*Lesson	/	1	1
SUBTOTAL		51	23	74
Gamification	Plugin Game	18	4	22
	Plugin Quizventure	2	2	4
	* Plugin H5P	/1	5	6
	* Plugin Treasure Hunt	/		
	* Moodle Badges	/	1	
SUBTOTAL		21	12	33
TOTAL		175	66	241

- Conditional progress: Teachers planned to organize activities with conditional progress. They would enable access to different activities only after students fulfil certain required obligations.

Less frequently teachers in their redefined activities stated that they would use Moodle in support of collaborative learning. Among the chosen activities, the most representative were Forum and Glossary. Teachers defined different purposes of redefined activities:

- Forum: Participants indicated that they would use the forum for mutual communication and exchange of experience. On the forum, students can ask content-related questions to each other and / or teacher (open discussion).
- Chat: Participants have indicated that this activity would be used to communicate with students interactively – in real time. In this way, they would check their real understanding of content. It would also be used to actively engage students in open issues in the study field.
- Glossary: Participants indicated that this activity would be used to learn languages (students build a dictionary). They would also use it to encourage students to learn new words when dealing with new content.
- Wiki: Participants planned this activity to actively involve students. During lectures they would discuss the content together. Students would then review literature at home and submit their analysis and their thinking in the Wiki.
- Workshop: Participants indicated that the activity would be used for peer evaluation. Students would

submit products through this activity (according to instructions), and then evaluate each other's work.

The least frequently teachers in their redefined activities included gamification (33 activities). Among chosen activities the most representative was the plug-in Game. Some of the purposes of redefined activities are:

- Plugin Game: Participants indicated that the activity would be used to enrich the lesson. They would use the crossword, the hangman and the millionaire game.
- Plugin Quizventure: Participants indicated that the activity would be used to enrich the lesson.
- Plugin H5P: Participants indicated that they would use the activity to add interactive content. They would, for example, create and use interactive video, flashcards, Drag Drop, etc.
- Moodle Badges: Participants stated that they would use Badges to motivate students to perform some activity. When they perform an activity, they get a badge.

### **3.3 Advantages And Disadvantages Of Didactic Use Of The Learning Environment**

With the third research question we wanted to find out what were the key advantages and disadvantages that higher education teachers highlighted regarding the didactic use of ICT in learning and teaching process. During the online course teachers had the opportunity to participate in a discussion forum which had in total 5 different topics: (1) Moodle in support of organization of work and study, (2) Moodle in support of collaborative learning, (3) Moodle in support of knowledge evaluation, (4) Moodle in support of gamification, (5) Moodle in support of learning analytics. Teachers gave their opinion on each topic. First, we will look at the benefits that were highlighted in each topic.

Within the topic Organization of work and study in the Online forum, the participants actively participated and gave their opinion on the recommendations that teachers should take into consideration when organizing work and study in the online classroom. They also justified the value of the resources that were presented in this section and shared their experiences. The participants stated that it is important for the organization of work and study in the online classroom that the content is prepared in an attractive and understandable way. They must be presented in such order that they are gradually upgraded. As an advantage of the online classroom they point out that one topic can be presented at several levels of difficulty. Students who want to gain more knowledge can have additional activities available. In addition, the online classroom allows multimedia interlacing, which means a lot to today's students.

Within the topic Collaborative Learning in the Online Classroom, the participants actively participated and made their views on the activities that promote and support collaborative learning. Participants shared their experience of using Moodle for this purpose. Participants highlighted that all the activities that were presented in this section (Forum, Chat, Glossary and Wiki) were very useful. The activities should be used primarily for the mobilization of discussions and collaborative learning for the purposes of introducing concepts (Glossary), exchange of experience, opinions on prior knowledge, comments on products prepared by colleagues in the group (Forum) and project learning (Wiki).

As part of the Evaluation of Knowledge in the Online Classroom, the participants gave their opinions and experiences regarding the use of activities that enable the evaluation of knowledge. They highlighted the applicability of the quiz, and its' possibility of real-time student assessment (for example, after each lecture or before the lecture to get students ready). Activity Assignment was stated as very useful in the delivery of seminar work, project assignments, etc.

Within the Gamification of the Online Classroom, the participants shared their feedback and experience in gamification of the Moodle online classroom. Participants listed gamification as an excellent tool for learning the content that require a lot of learning by heart (e.g. Japanese script). They believe that content can be diversified and more interesting if it enables playing the game. The participants also stated that the use of the elements of gamification (e.g. crossword, puzzles, hangman, etc.) seems to be useful at the end of the lecture or during the repetition stage, or at the beginning of the lesson as a motivational tool.

In most cases, teachers did not emphasize any disadvantages regarding didactic use of ICT. The main disadvantage, which was highlighted by one of the participants who already use the learning environment in Moodle, is low motivation among students for work and study with Moodle. The participant stated that students found resources quicker on different familiar websites (with one search) than on online classroom (where they first have to login, find the right Course and then find the right resource and downloading it). Also the participant pointed out that the students still prefer to print resources and make notes rather than using digitized material.

## **4 Discussion And Conclusion**

### **4.1 Supporting Higher Education Teachers For Didactic Use Of Moodle**

The results of the conducted research showed that online courses Moodle in education 1 and 2 influenced the innovations and improvements in the use of Moodle in education among the participants of the online course. Among the presented topics in the online course, the emphasis was on promoting the use of Moodle to carry out active lessons, and not just as a repository for the disposal of study material. We wanted to promote the use of Moodle for collaborative learning, gamification and evaluation of knowledge with the presented content. The participants were also acquainted with the possibility of organizing work and content in the online classroom. The online course was accepted positively among higher education teachers. All participants stated they liked the implementation of the online courses because they were not tied to space and time, and they resolved the activities in the online course when other obligations allowed them to. We found out that the presented content contributed to their professional development. The results obtained after the completion of both online courses showed that the presented content encouraged teachers to think about the didactic use of Moodle, that they found the presented contents important for their work field and that they helped them to improve their practice. Also, the results show that the presented content enabled them to gain new experience for working with Moodle and to gain new ideas in the field of innovative teaching using Moodle.

Participants actively participated in learning about the content in the online courses, and at the end, they wrote a report with redefined learning activities with the didactic use of Moodle in order to achieve specific learning objectives for students. From the submitted reports, we received information about the activities they plan to use in their further pedagogical practice. For organizing work and study in the online classroom, the participants planned activities, which enable the preparation of the structure of the online classroom. They highlighted the use of files, folders, labels, and URLs. They also tend to use conditional progress, as that enables them to present content on more difficult levels. For the purpose of collaborative learning at the online classroom, the participants planned to use activities and resources that enable cooperation and communication among students, exchanges of experience, opinions about previous knowledge, comments on products prepared by students in the group and project work. They highlighted the use of the Forum, Chat, Glossary, and Wiki. For evaluating knowledge at the online classroom, the participants planned to use the activities that enable the evaluation of knowledge. They highlighted the use of Quiz and Assignment. For the purpose of gamification in the online classroom, the participants planned to use activities and resources that enable the integration of elements of the game, thus enriching the lectures and actively involving students in the pedagogical process. They highlighted the Game, H5P, and Quizventure plug-ins.

In general, participants were very enthusiastic about how the online courses were implemented and also about the topics presented in them. Moodle, the world's most widely used free and open source collaborative environment, is also used at the University of Ljubljana. Most members of UL encourage their teachers to use Moodle to communicate with students. Many teachers use Moodle as a repository for study materials, but do not know the other functionalities that Moodle offers. With these online courses, participants gained new ideas, knowledge, and skills to use Moodle in the teaching process. New knowledge will enable them to involve students in the pedagogical process actively, use innovative learning approaches using Moodle, and more easily and quickly monitor the work and progress of students.

### **4.2 Limitations**

It is necessary to consider 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 launches of the courses Moodle in Education. We will upgrade the courses with additional contents that were not presented in the first launch (SCORM, control list, different blocks). Teachers who participated in the online courses will incorporate new knowledge in their courses and evaluate the effect of didactic use of Moodle within their pedagogical practice. With that, they will ensure the sustainability of the results and will encourage teachers at the University of Ljubljana for didactic use of ICT.

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