
Peer assessment among business students

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Abstract: The large number of students enrolled in an elective course forced us to implement peer assessment even though student-centred teaching is not common in our traditionally taught study programs. Based on the literature review, Slovenia is not an isolated case in Europe. The aim of our paper is to show how to introduce new teaching modalities and to encourage subject and teacher-centred higher education environments to move toward student-centred teaching. In the research that supports our experiment, we found that 70.2% of students did not have any peer assessment experience. Peer assessment improved learning and teaching – students became more aware of what they needed to learn, how to organise their time and what the teacher expected them to learn. The teacher needed to prepare clear and detailed assignments and assessment criteria. Students were found to be accurate peer reviewers, especially those who took their study seriously – as evidenced by asking a teacher for additional explanation and support and printing study materials that helped them study deeply. Students in traditional study programs would like to have more online study experiences; these experiences motivate them to participate more in MOOCs that they were unaware of before their online study experience.

Keywords: peer assessment; feedback; business students; higher education; Moodle Workshop; Slovenia.

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Biographical notes: Viktorija Florjančič obtained her Doctoral thesis at the University of Primorska, Faculty of Management. In her Doctoral thesis, she researched the factors of effective blended learning. E-learning, the usage of information-communication technology (ICT) in education, is her research area since 1999. She has been researching different aspects of implementing ICT in the processes of acquiring knowledge, as well as many other aspects of ICT usage in enterprises, organisations, and society. The results of her research work have been presented at different international conferences and are published in national and international journals.

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1 Introduction

Transforming European economies into knowledge economies calls for citizens who are able to participate in new circumstances. Adequate knowledge and skills might be developed through higher education. New knowledge that is created at universities needs to be shared, but the old methods of sharing knowledge are no longer appropriate. Changes in teaching and learning are encouraged by the implementation of the Bologna process in all European higher education systems (EHEA, n.d.). Despite commitment to improvements in teaching, there are still many differences among higher education systems (Pleschová et al., 2012). Some European countries have already recognised the importance of implementing appropriate student-centred teaching methods, while others still rely on subject and teacher-centred approaches (ibidem). Unfortunately, Slovenia is in the latter category. In our country, the learner-centred pedagogical approach is more often seen at the primary and secondary levels of education rather than at higher education. Slovenian higher education teaching, as in some other countries (Pleschová et al., 2012), too often relies on teachers' own experience as students when teaching, even if there is awareness of pedagogical training (Aškerc and Kočar, 2015). Similarly, Cvetek (2015) reported that public universities in Slovenia deliver study programs mostly by using traditional modes of teaching. The reasons for not following trends that have been growing since 1995 (Barr and Tagg, 1995) might be found in existing legislation (national and institutional). Teachers are much more motivated to give traditional lectures in larger groups than to use more active teaching methods in smaller groups. This way of teaching is supported by institutional facilities through their amphitheatres and halls with inflexible furniture that easily support transmission modes of teaching and present obstacles to active methods of teaching. The impact of the design of teaching rooms and learning spaces on teaching was also exposed at the European Learning & Teaching Forum (Vettori and Warm, 2019).

If there are constraints on innovative methods of teaching being implemented in traditional delivery courses, then the obstacles in the online learning environment are easily overcome. The online learning environment, where different information and communication technologies (ICT) are used, offers many possibilities limited only by the teachers' creativity and skills. In this article, we would like to present how some new teaching modalities, supported by ICT, were used at a traditional public university where a student-centred pedagogical approach is not encouraged at the institutional level. The previously unused peer assessment was first implemented in an elective course. Peer collaboration in assessment has been implemented to overcome challenges related to the unexpected larger number of students and to maintain the existent instructional course design that fits a smaller group of students. The aim of the paper is to show that implementation of a new teaching modality can be done using existing technology and to encourage subject and teacher-centred higher education environments to move toward student-centred teaching.

2 Theoretical background

2.1 *Assessment in higher education*

Assessment is an activity that helps a teacher or instructor to see whether learning has taken place (Jarvis et al., 2003). Various techniques for how to do it have been developed. Assessments are not only used to check the results of learning, but also for other purposes too, such as to motivate learners, to allocate them into different groups, to accept (or reject) applications to schools or jobs, etc. (Jarvis et al., 2003).

In the mid-‘90s, a shift from an instruction to a learning paradigm occurred in the USA (Barr and Tagg, 1995). Transferring knowledge was replaced with environments that permitted students to discover and construct knowledge themselves. This shift impacted traditional methods of assessing knowledge and skills too. Boud (2016, p.24) defines three functions of assessments – certifying students’ outcomes (summative assessment), providing information about learning during the course (formative assessment) and building students’ awareness of learning. Unfortunately, assessment and evaluation in higher education are too often focused only on the final results – by which an institution measures a student’s achievement (summative assessment) – and less on the processes of acquiring knowledge and developing skills. The learning process is more important than knowledge expressed at a time and place. More important than receiving feedback on learning outcomes and achievement at the end of the course is receiving constant feedback about learning during the course, known as formative assessment. Formative assessment with in-time feedback accelerates students’ learning [Irons, (2007), p.7] and helps students to become more confident in their learning. Thus, students achieve autonomy and control over their learning. This occurs especially in cases when students are included in the assessment process (Planas Lladó et al., 2014). The third function of assessment [Boud, (2016), p.24] is to raise students’ awareness and increase their capability to reflect on their own learning. Students need to be able to recognise what they know and can do, as well as what they do not and cannot (ibidem). These abilities sustain learning over time and help a person to become a life-long learner and to successfully adapt to different circumstances in a constantly changing economy. Assessment that supports learning beyond time spent studying is known as sustainable assessment (Boud and Soler, 2016). It is indisputable that evaluation in higher education affects learning more than just teaching, as it attracts the attention of students who know what needs to be done and how (Boud and Falchikov, 2007). The chosen assessment system helps to recognise the education system itself (Rowntree, 1987).

The differences between following the learning process and learning outcomes are also highlighted by the Quality Assurance Agency for Higher Education (QAA, 2013), with particular emphasis on evaluations that have to be focused more on the learning process. Students learn from assessment activities and from their interactions with their evaluators (i.e., teachers and other staff participating in the evaluation process) (QAA, 2013). Sadler (1998) pointed out that students often do not understand, or do not know, the teacher’s expectations and assessment criteria. The problem of unclear standards of knowledge is also recognised by the QAA (2013), and therefore it has recommended that students be included in the assessment process. Students can be involved through self-assessment or peer assessment. These approaches help students to recognise the teacher’s expectations and the level of knowledge that they have to achieve (QAA, 2013). Students’ assessment skills are known as assessment literacy.

An important part of assessment is feedback on student performance, which helps students to learn (Sadler, 2010; QAA, 2013; Anson and Goodman, 2014). Rich, meaningful and prompt feedback presents assessments for learning instead of assessments of learning (Jackel et al., 2017). With the implementation of assessments for learning, students can learn more efficiently and effectively. Orsmond (Jackel et al., 2017) presented a model of ‘new feedback’ that encourages dialogue and for students to be more active. Feedback in the ‘new feedback’ model presented by Orsmond (ibidem) is process – rather than product-oriented, and assessment in this model involves peers. Feedback on process and formative feedback by peers may encourage students to improve, and as such they could be understood as feed-forward assignments. An example of a feed-forward assignment is peer assignment (Jackel et al., 2017). Peer review/evaluation/assessment is understood as a process of reviewing or evaluating student tasks (Ching-Wen et al., 2010) that has many positive effects. Research has shown (Todd and Hudson, 2007) that peer evaluation has a positive impact on the learning experience. In this way, peer assessment helps students to become more familiar with the content and learning methods. Peer assessment also has a positive impact on the development of critical thinking, reading and writing skills, and it promotes a partnership between student and teacher (Todd and Hudson, 2007). Through peer assessment, students can better understand basic concepts and theory (ibidem). In addition, exposing students to different assessment methods helps them to become more autonomous learners (Tiew, 2010; Planas Lladó et al., 2014). Improved student achievements by using peer evaluation methods were also reported by Mulder et al. (2014).

Fu et al. (2019) reviewed 70 empirical studies on technology-supported peer assessment published from 2007 to 2016. All studied publications were published in seven important journals from the field: *Computer & Education* (28 papers), *British Journal of Education Technology* (12), *Educational Technology and Society* (9), *Interactive Learning Environments* (8), *Journal of Computer Assisted Learning* (6), *Educational Technology Research and Development* (4) and *Innovations in Education and Teaching International* (3). One third of the papers (31.4%) studied peer assessment in higher education. The majority of studies come from the domains of social science (34.3%), engineering or computers (20.0%), languages (15.7%) and science (14.2%). Only two studies came from the business and management field. The last two studies came from the period 2007–2011 (ibidem).

2.2 *Technology for peer assessment*

The study done by Fu et al. (2019) investigated different dimensions of the technology-supported peer assessment studies. ‘Learning environments’ was one of the investigated dimensions. They distinguished between classroom (including a computer room), real-world environment, learning online and other environments (Fu et al., 2019). Based on collected data, most peer assessment activities happened online (48.6%) or in classrooms (41.4%). Interestingly, peer assessment activities conducted online (after class) decreased in the period 2012–2016 compared to 2007–2011 (ibidem).

Table 1 Peer assessment online tools

<i>Name</i>	<i>Country</i>	<i>URL</i>	<i>Pricing</i>
Aropá	UK	https://aropa.gla.ac.uk/aropa/aropa.php	Free
Calibrated Peer Review	USA	http://cpr.molsci.ucla.edu/Home	Based on number of students – from \$750 for fewer than 100 students to \$9,000 for an unlimited number of students.
Crowdgrader	USA	https://www.crowdgrader.org/	Price based on number of students and assignments. Free for up to 10 students/assignments. Unlimited students: \$13.98.
Peerceptiv	USA	https://www.peerceptiv.com/	Different pricing for instructor, department and students.
Peergrade	Denmark	https://www.peergrade.io/	Free for file size limit of 50 MB; basic: up to 500 MB, \$2/per student; pro: file size limit of 2 GB, \$5/student.
peerScholar	Canada	https://vision.peerscholar.com/	Different price policies for different levels of education. For universities, price model based on student rate.
PeerWise	New Zealand	https://peerwise.es.auckland.ac.nz/	Free
PeerMark	USA	https://help.turnitin.com/feedback-studio/turnitin-web-site/instructor/peermark/about-peermark-assignments.htm	A part of Turnitin
Teamates	Singapore	http://teammatesv4.appspot.com/	Free for non-profit use
WebPA	UK	http://webpaproject.lboro.ac.uk/	Open-sourced

The European University Association (EUA) (Gaebel and Zhang, 2018) reported results from the Trends 2018 Survey, which 303 institutions from different higher education systems participated in. Respondents were asked what the main trends regarding digital learning in the last three years were (*ibidem*). More than half of them (52%) answered ‘improved general acceptance of digital learning’ (an additional 41% to some extent); 49% answered ‘digital learning is becoming part of the institutional strategy’ (an additional 36% to some extent); 44% answered ‘digital learning use is more strategical’ (an additional 43% to some extent); and 43% answered ‘innovating learning and teaching’ (an additional 50% to some extent) [Gaebel and Zhang, (2018), p.50]. Because digital learning is taking place mostly online, we use the keyword ‘online peer assessment tools’ to search peer assessment tools on Google (March 31, 2019). We went through all the findings and eliminated tools for journal peer reviewing systems and resources that did not link to online peer assessment tools. Some of them are presented in Table 1. Based on data found on the web pages, the price of the tools mostly depends on the number of students and/or the number of assignments. Some of them can be used free of charge (Aropä, PeerWise, Teammates and WebPA).

There are tools that are used only by a particular university; SparkPlus (<https://spark.uts.edu.au/login.php>) is used only at the University of Technology Sydney. Massive open online course (MOOC) platforms, like Coursera and edX, use Calibrated Peer Review (Abrache et al., 2018). Other learning management systems (LMS) widely used at universities have peer assessment tools integrated in LMS. A ‘self and peer assessment’ is integrated in blackboard (Keppell et al., 2006), and there is a ‘peer review assignment’ in Canvas (n.d.). A ‘workshop’ activity, presented later on in the paper, supports peer assignments in Moodle [Cooch, (2011), p.112]. Moodle, an open-source LMS, has been used by our faculty since 2005, so teachers and students are familiar with it. In addition, Moodle is localised in the Slovene language, while the peer assessment tools presented in Table 1 are not. Localisation and familiarisation are the two basic reasons why we used the Moodle Workshop activity for the peer assignment.

3 From theory to practice

3.1 Motivation for peer assessment implementation

We would like to move closer to global trends in higher education, but up until 2016 there had been no shift to motivate us to do so. In 2016–2017, we faced more than double the usual number of students in the e-learning course. This motivated us to consider adapting the assessment techniques used in smaller groups to a larger group of students. We wanted to keep the dynamic course design – weekly student activities with regular teacher feedback. We did not know how to manage such a large group of students and maintain the same learner-centred course design. We know that MOOCs deal with larger groups of students from the very beginning. In these courses, either machine (automated) or peer grading is used (Duhring, 2013; Sandeen, 2013). Automated grading is simple, and it is easily integrated into content. Students go through their study materials (text, audio, video or animations) and solve different quizzes or do assignments that are assessed automatically. We are aware that automated assessment is very objective, but machine assessment is impersonal and therefore does not fit our course design. Peer grading is much more suitable even though it is not frequently used in higher education in

our country (Cvetek, 2015) and we had no previous experience with it. We were also aware that paper-based peer grading might be very time-consuming, even though it has several positive impacts on learning, students' behaviour and their achievements (Anson and Goodman, 2014).

Although peer assignment is widely used at different higher education institutions (Falchikov, 1995; Freeman and McKenzie, 2002; Keppell et al., 2006; Irons, 2007; Pearce et al., 2009; Planas Lladó et al., 2014; Carless, 2016; Herzog and Katzlinger, 2017; Sridharan et al., 2018), these assessment methods are not often used in Slovenia (Cvetek, 2015). Therefore, there is very little research in this area at the national level. The lack of research and the confrontation with a large number of students have led us to experimentally introduce peer assessment as a formative assessment in an elective business course. We tried to find out how the peer assessment approach would be accepted among the students and if students would be able to assess others' work accurately. The last concern is the greatest obstacle to using peer review and peer assessment more often.

3.2 Peer assessment through Moodle Workshop activity

We have been using Moodle intensively for more than 15 years, and we had tried to use the workshop activity several times before. But the workshop activity seemed to be too complicated, which Cooch (2011, p.112) and Vogel (2015) agree with. The activity has many settings that need to be set correctly and at the right time, and there are many pitfalls that need to be avoided. The learning curve of the workshop activity is much longer than for other activities in Moodle, and its usage is time-consuming, which might discourage teachers from using it (Vogel, 2015).

The Moodle Workshop activity is performed in several successive phases. Firstly, we need to prepare the assignment and the whole scenario about how the assignment will be conducted – when, what and how. The assignment preparation is done on paper, out of Moodle. The advance planning is crucial for the whole peer grading process (Watkins, 2015).

Before the peer assessment activity starts, a teacher has to setup the basic parameters of the workshop activity ('setup phase' in Figure 1). Setup parameters are based on the aforementioned assignment's planning. The most important parameter is the grading strategy ('edit assessment form' under 'setup phase' in Figure 1), which is the method used to score student submissions. The accumulative grading strategy was used with many of the assignment's aspects defined to evaluate. Each aspect of grading was formulated in detail – what to check and how to evaluate the particular assignment's aspect. The aspect's comment and overall feedback were anticipated too. In the evaluation phase, we used Moodle plugin 'participation credit', which allows receiving of credits (points) for peer reviews done without comparing assessment grades given by other students. The final grade of the workshop activity is compounded from both grades – the grade for the submission and the grade for the evaluation. The ratio between two grades can be setup in many ways. We used the ratio 80% (grade for submission) to 20% (grade for peer assignment evaluation) in all workshop activities. When the 'setup phase' is done, a teacher needs to switch the workshop activity to the next phase – the 'submission phase'.

Figure 1 Moodle Workshop assignment (see online version for colours)

Setup phase Switch to the setup phase		Submission phase Switch to the submission phase		Assessment phase Switch to the assessment phase		Grading evaluation phase Switch to the evaluation phase		Closed Current phase	
✓	Set the workshop description	✓	Provide instructions for assessment	1	Open for assessment from Monday, 13 March 2017, 12:00 AM (751 days ago)	✗	Calculate submission grades expected: 120 calculated: 108		
✓	Provide instructions for submission	✓	Allocate submissions expected: 120 submitted: 0	1	Assessment deadline: Tuesday, 14 March 2017, 5:00 PM (750 days ago)	✗	Calculate assessment grades expected: 120 calculated: 104		
✓	Edit assessment form	1	There is at least one author who has not yet submitted their work	1	Time restrictions do not apply to you	✗	Provide a conclusion of the activity		
		1	Open for submissions from Monday, 6 March 2017, 12:00 PM (758 days ago)						
		1	Submissions deadline: Sunday, 12 March 2017, 11:55 PM (751 days ago)						
		1	Time restrictions do not apply to you						

The peer assessment activity in Moodle Workshop actually starts with the ‘submission phase’, where students are invited to submit their assignments. In our case, they had seven days to prepare and submit the assignment. After the submission deadline, the ‘assessment phase’ starts. This switch can be done manually or automatically. The latter was used in our case. The system allocated in advance the planned and defined number of assignments to the students. In our case, students who submitted their assignment received between four and six classmate assignments for evaluation. An assignment’s allocation can be done manually or automatically (randomly). We setup the workshop activity randomly using Moodle and excluded the possibility that students who were working in the same group would receive their group members’ assignments in the evaluation process. The whole evaluation process was anonymised. Using these two parameters helped us to eliminate the possibility of biased evaluation.

Students had two days to check and evaluate their allocated assignments. After that, the system automatically moved the workshop activity to the next phase (‘grading evaluation phase’ in Figure 1) where the final workshop grade was calculated. Grades were published in the Moodle gradebook and seen by the students once the workshop activity was closed. The switch to the last phase (‘closed’ in Figure 1) was done manually.

3.3 Research questions

The experimentation with peer assessment was followed with a study that will help us find answers to the four research questions:

- We were aware that digital technologies are widely used by young people, but how likely is it that students at a traditional university have had an online study experience?
- Based on the literature review, we predicted that students did not often have previous experience with peer assessment, but do we know to what extent?
- How does peer assessment improve learning and teaching?
- Are the students able to evaluate peer assignments correctly? What are the variables that impact accuracy of peer assignments?

4 Method design

4.1 Course design presentation

E-learning is an elective course in the undergraduate academic and professional study program of management. While the academic study program is delivered only at the faculty headquarters, the professional study program is delivered in two other study centres. The e-learning course can be selected by students of both programs in their second or third year. Even if the study program is performed in a traditional manner, the e-learning course is delivered entirely online. The online delivery method enables students from different study centres to be enrolled in the same course at the same time. Students learn about e-learning from their own experiences of doing study activities online.

To complete their course obligations, students have to do different weekly activities and assignments. Some of them are done individually, but most of them demand coordinated group work. The assignments are regularly evaluated and assessed by points, and students receive weekly feedback from the teacher. The assignment points are used to calculate the final grade, which is compounded of two groups of assignments – weekly assignments (50%) and the final project (50%). For the final project, students prepare e-content that can be used for study or training purposes. The presentation of the e-content is a part of the final project grade as well. All courses of the study program are delivered quarterly. A quarter lasts eight weeks; the whole pedagogical process is organised in seven weeks; and the eighth week is dedicated to the examinations. For the e-learning course, students worked intensively for seven weeks; in the eighth week, the grades are calculated based on the points gained from the weekly activities and for the final project. In the previous academic years, there were 20 to 60 students enrolled in this course. In 2016–2017, the number of students increased dramatically. There were 124 students (21.0% of all undergraduate students studied at the faculty) who wanted to participate in the course. Students came from different study centres, two different study programs and two different study years. The heterogeneity of the group is presented in Table 2.

Table 2 E-learning course students

Centre year/program	Centre 1		Centre 2		Centre 3		Total	%
	2	3	2	3	2	3		
Professional	6	27	18	14	12	29	106	85.5%
	33		32		41			
Academic			12	6			18	14.5%
			18					
Total	33	26.6%	50	40.3%	41	33.1%	124	100.0%

The course was taught by one teacher who prepared and conducted the whole course from the beginning to the end. The students were invited to enrol in the course before the course actually started. Four students did not start the course, so the course was delivered to 120 students. Of those 120 students, 110 successfully accomplished the study obligations (91.7%). Among the ten students who did not succeed, four of them dropped out in the first week, and six of them dropped out in the second or third week. The course was delivered between February 20 and April 14, 2017.

4.2 Data collections

With the aim to improve the course, an e-survey was launched at the end of the course. We collected data about the activities that were implemented and about the students' study attitude (how they study and how intensively, do they print the study materials, how they collaborate with peers, etc.). All students were invited to fulfil the survey. We received 94 fully answered questionnaires (78.3% response). The survey was prepared by Google Forms. Collected data were organised in MS Excel and then imported to IBM SPSS ver. 25, where analyses were performed.

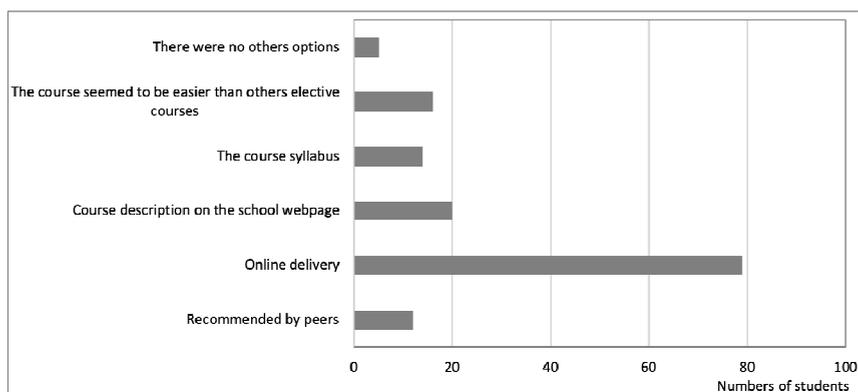
To collect data about student activity, we used Moodle statistics. Data were exported from Moodle, organised and analysed in MS Excel. MS Excel was used to prepare the charts.

5 Data analyses

5.1 RQ1: how likely are the students at a traditional university to have had an online study experience?

Inclination toward online study is important for our experiment of peer assessment implementation that had been done online. Two questions covered their willingness to have an online experience. Firstly, we asked students why they selected the e-learning course. Before the academic year started, students in their second and third years have to choose some elective courses. E-learning is the only course that is delivered online. All other courses are delivered traditionally or with a combination of in-class lectures and seminars. We asked them why they chose the e-learning course. They were able to select more than one reason that influenced their course selection. As we can see from Figure 2, students selected the e-learning course primarily due to the course delivery method.

Figure 2 Reasons for course selection

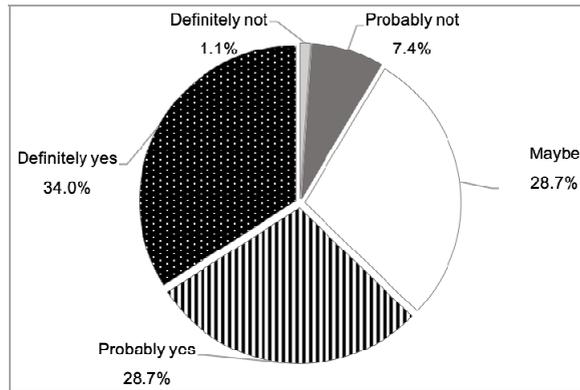


At the end of the survey, students were asked if they would like studying online. Students expressed their opinions on a five-degree scale (from 1 – definitely not to 5 – definitely yes). Less than 10% of students would not like studying online (definitely and probably not), while 62.7% answered probably and definitely yes (Figure 3). We calculated the average for all students ($M = 3.87$, $SD = 1.0$) and for both study programs. Students in the academic study program are more likely to study online ($M = 4.23$) than students enrolled in the professional study program ($M = 3.81$), but the differences are not statistically significant ($Sig. > 0.05$).

Students who participated in the survey are enrolled in the study program that is delivered traditionally. Students attend lectures and seminars and do some work at home. Moodle is used to support their study, mostly for assignment submissions. There are a few courses in which Moodle is used to support group work and collaboration online. And there is only one course (e-learning) that is delivered totally online. As can be seen

from Figure 2, the online delivery method was one reason to select the course (80% of students). After this first online study experience, 62.7% students said that they would like (probably and definitely yes) to study online.

Figure 3 Would like to study online



Students are invited to add comments at the end of the survey. Here are some of those comments (translated from Slovenian to English):

“More courses online, if it is possible.”

“I hope that online delivery would be a practice for other courses too.”

“All students should participate in this course.”

The objective of the e-learning course is that students become familiar with all aspects of e-learning. That is why we include searching MOOCs and share basic information about them with peers. From the e-survey done at the end of the course, we learned that before enrolment in our course, 66.0% of the students did not know what a MOOC is. An additional 22.3% had heard of them but did not know what they are. Only one student had previously participated in one of them, but that student did not finish the course. One tenth of the students had heard of MOOCs but had never tried to enrol in one. After the online experience with our course, only 22.7% of students have no intention to participate in another MOOC. One third of students (33.0%) would like to participate in a MOOC if it was offered in the Slovenian language; others had no language preference.

5.2 RQ2: to what extent do students have peer assessment experience?

Based on the literature review, we predicted that students probably did not have a lot of peer assessment experience. This means that most of them were totally assessment illiterate. Implementing a peer grading method demanded assessment-literate students, which is why we started with peer grading gradually. In the first week, students had to research a MOOC market and choose three MOOCs that they were interested in. After that, they shared basic information about MOOCs with peers using Moodle Workshop. With such a simple assignment, we tested how the Moodle Workshop works in real life and prepared students for the next, more complex assignments. At the end of the first week, we collected students' feedback (Moodle plugins feedback was used), which was

very positive – not only regarding the topic (MOOCs) but how the whole process was done. At the beginning of the second week, through video conferences, students suggested the inclusion of assessment criteria in the assignment’s guidelines to help them to prepare more accurate assignments.

Data collected at the end of the course showed that for 70.2% of respondents, this was their first experience ever with peer assessment. For one fifth of them (19.1%), it was the second time, and for 5.3% the third time (or more) to have the opportunity to evaluate their classmates’ work.

Based on this data, our prediction about students’ limited experience with peer assessment was correct, as was the decision to start with peer grading gradually with a simpler assessment as a warmup activity. The ‘warmup’ activity was not only helpful to students in improving their assessment literacy, but also to a teacher who developed her skills and was able to make her guidelines clearer and much more understandable than they were in the first week.

5.3 *RQ3: how does peer assessment improve learning and teaching?*

After the peer assessment test in the first week, the course continued with weekly assignments that were submitted through Moodle Workshop and evaluated by peers. Students commented on a workshop activity in an open question. The Google Highlight Tool was used to analyse the answers.

Students who responded to an open question (96.8% of respondents) described the workshop activities as a positive experience (77.7%). Peer grading was interesting, flexible and helped them to recognise their faults and study expectations and to learn more.

Some of their comments about workshop activities:

“Excellent..., very interesting..., funny..., mostly ok..., very good..., I liked it..., impressive..., I didn’t expect that it is possible to do it..., I hope that it was not the last time we have this opportunity..., I enjoy assessing others’ assignments..., surprised....”

Surprisingly, there were only a few answers with negative feedback. Only 13.8% of respondents reported trouble understanding guidelines as a consequence of superficial reading. Superficiality of reading is becoming a real issue in higher education, but this was not a subject of our research. Students with a negative experience also reported that peer grading was time-consuming. Two students exposed some technical problems.

We followed answers connected to learning. Students reported:

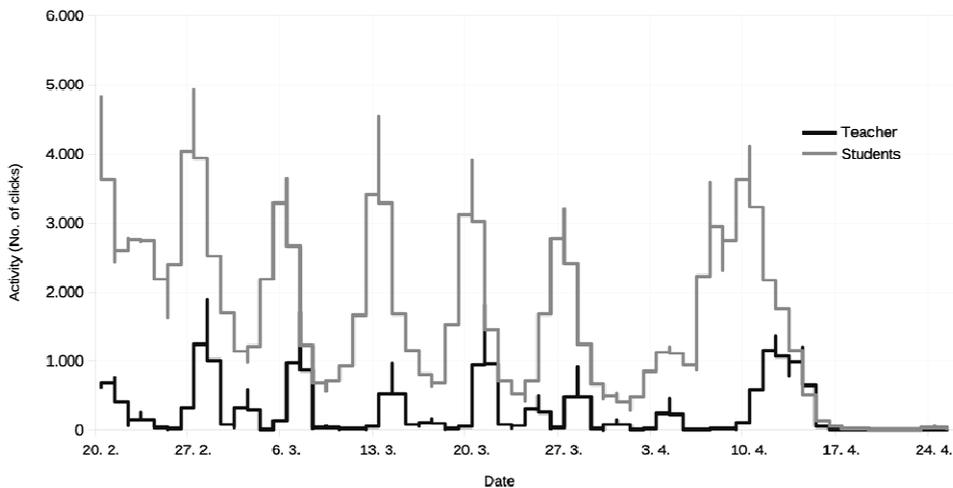
“Learnt more than in other courses..., acquired a lot of knowledge..., learnt a lot of new things..., I learnt how to organise my time..., I need to read (assignments) guidelines more carefully....”

As we expected, peer grading leads to deeper and more qualitative learning. The teacher’s support and her prompt response were highlighted as helpful and welcome in students’ feedback as well.

Based on survey data, the students in this course, on average, studied for 17.1% more hours than in an average classical course. There were some differences between answers. One third of students (34.0%) studied the same amount of time or less, 35.1% of them studied up to 30% more, and 18.1% reported studying even 40% or 50% more.

The Moodle statistics offer a slightly different overview on students' activity in the course. Activity data presents students' clicks in the Moodle course – posts, content views, forum activities, assignment uploads, etc. The student activity line (Figure 4) is a collection of activities for all 120 students, while the teacher activity line presents only the activity of the single teacher who led the whole course. It needs to be mentioned that Moodle activity is only part of the activity that has been done online, but this activity is connected to peer assessment and therefore it is relevant to our study.

Figure 4 Participants' activity dynamics



As mentioned, students had to accomplish different weekly defined activities. The students' activities were more intensive at the beginning of the week when students were reading the weekly guidelines and when they were submitting their assignments from the previous week (from the second week on). All these assignments would be, in normal circumstances, evaluated by a teacher, which would be impossible to deal with for such a large group of students. A teacher could check the assignments of all 120 students, but it would take time to give students feedback. Time-delayed feedback is worthless and will not help students to learn. Therefore, a peer assessment strategy was implemented. Students submitted their assignments in the Moodle Workshop activity at the end of the week, which can be seen from the increased activity in the second part of the week (Figure 4). After the submission deadline, the system delivered, ahead of time, the defined number of assignments to each student who submitted the assignment. Students had to evaluate their colleagues' assignments, mostly anonymously, within two days. Even if the criteria for the assignments were defined in detail, some students complained about the grades they received from their classmates. Based on these complaints, the teacher had to check if the peer evaluation of those assignments had been done correctly. These teacher interventions are evident from more intensive teacher activity – the line peaks in the 'teacher' line a day after the 'students' line peaks (after students finished their evaluation process) in Figure 4. It was planned that students would work on the final project from the fifth week to the end of the course, which explains the lower student activity at the end of the sixth week and the increase in activity at the end of the course (Figure 4).

The teacher's role in online learning has changed. In a traditional course, a teacher has to do lectures, seminars and labs. Their activity is usually evenly distributed through the whole course. In an online course, the major part of a teacher's activity is done before the course even starts. The course materials – all the guidelines, activities, etc. – are prepared in advance. When the course starts, the teacher has to follow the students' progress, motivate them, explain if something is unclear, etc. The teacher's role in online learning is more collaborative, connective and guideline oriented. Transmission of knowledge has no place in online learning. At the end of the course, the students' work has to be evaluated independently of how the course was performed (traditionally or online). Implementing peer assessment demands well planned and detailed, defined assignments that help the teacher to think about his/her teaching and improve it.

As shown in the results above, peer grading contributes to active learning and increased studying time, and therefore it needs to be used in higher education more frequently.

5.4 *RQ4: are the students able to evaluate peer assignments correctly? What are the variables that impact evaluation of peer assignments?*

In the survey, the students were asked to evaluate their reviewer's traits. Three quarters of them (76.6%) thought they were 'critical, but not too rigorous' or 'correct and fair' (Table 3). Only 8.5% students can be defined as friendly and generous student reviewers.

Table 3 Student reviewer's traits

<i>Traits</i>	<i>f_x</i>	<i>f_x%</i>
Rigorous and critical	14	14.9
Critical, but not too rigorous	36	38.3
Correct and fair	36	38.3
Generous	8	8.5

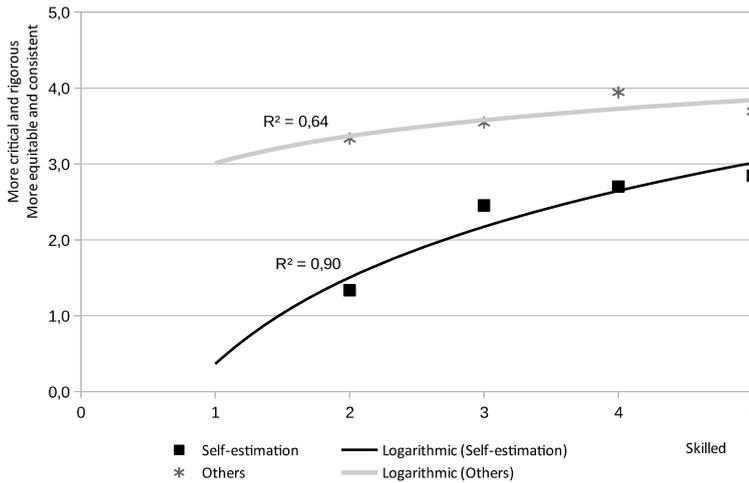
Students were asked about their peer grading¹ skills and how seriously they participated in peer assessment procedures² ($M = 4.41$). Based on the means, they took the peer assessment very seriously ($M = 4.41$), even if they were slightly skilled above average ($M = 3.78$). The correlation between these two variables is positive and statistically significant ($r_s = 0.39$, $p < 0.01$). For peer assessment, more skilled students are seen to have taken their peer review mission more seriously.

Finally, we would like to compare students' opinions about their abilities for peer grading (self-estimation) and their opinions about classmates' review attitude (others). Students who estimated themselves as not skilled are presented at the bottom, and those who were very skilled, critical and rigorous are on the top of the y-axis. Their classmates (others in Figure 5) were estimated from inconsistent at the bottom to equitable and consistent reviewers on the top of the y-axis.

As can be seen from Figure 5, students who were more critical and stricter had a more positive opinion about their reviewers (more equitable and consistent) than friendly and generous student reviewers. Students less skilled at peer grading were more critical towards their classmates. This was also noticed after the conclusion of each week, when the less-skilled students complained about their received peer grades. Based on these

complaints, the teacher checked the disputed assignments again and usually found that assignments had been evaluated correctly and consistently.

Figure 5 Students' opinions about peer grading preparation



At the end of the course, students prepared a group project that was assessed by the teacher and peers. The idea about peer assessment of the final project developed during the course because we wished to evaluate the students' abilities for peer assessment. Each student received three other group projects to evaluate. Students evaluated the other group projects on a 10-degree scale, while the teacher used a 20-degree measurement scale (higher grades for projects that met expectations) (Figure 6). Assessment criteria were almost the same, but the scales were not. As mentioned, peer assessment for the final project was not predicted at the beginning of the course when the points for final grades (teacher's given points) were stated and with the other assessment's points incorporated in the course grade.

Figure 6 Students' and teacher's grade comparison

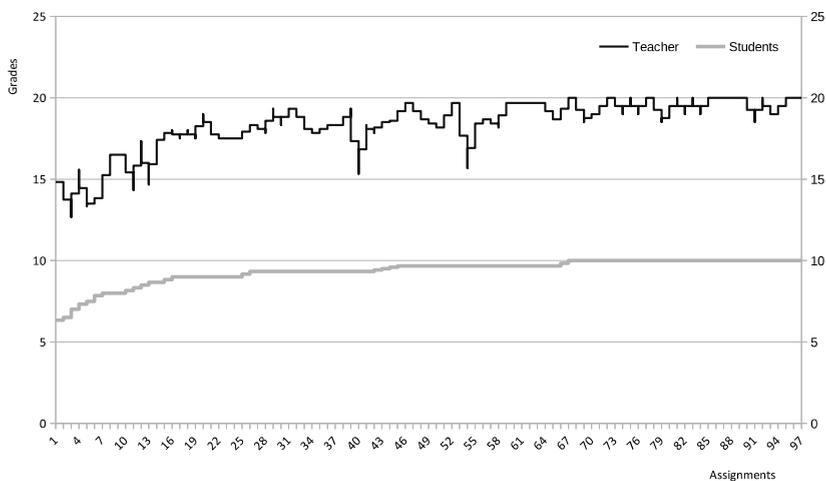


Table 4 Correlations matrix

<i>Variables</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1 Peer assessment taken seriously														
2 Final grade	.36**													
3 Weekly students' workload	.35**													
4 Printed guidelines	.27**	.29*	.30**											
5 Printed study materials	.34**	.56**												
6 The course was better than expected	.37**	.24*	.24*											
7 The assignments were extended	.25*													
8 The assignments were demanding		.25*	.25*				.77**							
9 The assignments could be easily done						.36**	-.35**	-.31**						
10 Received practical/useful knowledge	.32**		.30**	.64**	.30**	.64**	.21*	.21*	.30**					
11 Improve ICT skills in general	.33**	.25*	.31**	.57**	.20*	.57**	.34**	.34**	.21*	.79**				
12 Increased awareness about possibilities of ICT usage in everyday life	.32**	.26*	.26*	.63**	.21*	.63**	.21*	.31**	.31**	.73**	.85**			
13 Increased awareness about threats of ICT usage	.25*	.24*	.25*	.45**	.24*	.45**	.24*	.24*	.24*	.52**	.64**	.70**		
14 Better relationship with peers	.39*	.34**	.34**	.32**	.32**	.32**	.32*	.32*	.31**	.22*	.30**	.28**	.38**	
15 Better teacher support	.40**	.21*	.42**	.42**	.42**	.42**	.42**	.42**	.31**	.30**	.37**	.36**	.37**	.46**

Notes: *Correlation is significant at the 0.05 level (two-tailed).

**Correlation is significant at the 0.01 level (two-tailed).

In comparing both grades (Figure 6), we can see some partial deviations, but the data is statistically significantly correlated ($r_s = 0.60$, $p < 0.01$). We tried to understand which students took peer assessment seriously. Firstly, they are the students who are more committed to their studies; they finished the course with higher grades ($r_s = 0.36$). Compared to their peers who did not take the peer assessment as seriously, they printed more study guidelines ($r_s = 0.27$) and more study materials ($r_s = 0.34$). These students meant that the average performance in the course was better than expected ($r_s = 0.37$). They agree more that they received more practical and useful knowledge ($r_s = 0.32$), improved ICT skills in general ($r_s = 0.33$) and increased awareness about the possibilities of ICT usage in everyday life ($r_s = 0.32$). These students agree more with the statement that they increased the awareness about threats when using the internet and working online ($r_s = 0.25$). They collaborated more and better with their peers ($r_s = 0.39$) than they normally would during classically delivered courses. During the e-learning course, they appreciated teacher support more ($r_s = 0.40$). The last finding supports our statement about their commitment to studying. Even if some correlations are not high, they are all statistically significant (Table 4).

The variables from Table 4 correlate with ‘peer assessment taken seriously’, with $r_s > 0.30$ (grade was excluded) included in the regression analysis (stepwise method) (Table 5).

Table 5 Linear regressions analysis (dependent variables: peer assessment taken seriously)

<i>Included variables</i>	<i>B</i>	<i>SE</i>	<i>b</i>	<i>t</i>	<i>Sig.</i>
Constant	2.99	0.26		11.52	0.00
Better teacher support	0.29	0.06	0.41	4.51	0.00
Printed study materials	0.21	0.08	0.26	2.85	0.01

Notes: Adjusted $R^2 = 0.25$. Excluded variables: the course was better than expected, received practical/useful knowledge, improved ICT skills in general, increased awareness about possibilities of ICT usage in everyday life, better relationship with peers.

As can be seen from Table 5, 25% (adjusted R^2) seriousness of peer assessment is explained by teacher support and study from printed study materials. We can conclude that students who took their study seriously – by ask a teacher for additional explanation, starting to work as soon as they received weekly assessment guidelines (during working days a teacher checked the students’ progress work in Google Docs and helped them to follow the guidelines) and studying from printed study materials (they received all study materials through Moodle) – approached peer assessment more seriously.

6 Conclusions

In Slovenian higher education, traditional methods of teaching and learning are still prevalent. Although the national legislation and institutional rules are not yet favourable towards implementing modern modes of teaching and learning, teachers are autonomous enough to use active methods of teaching, especially if a part of the course or the whole course is delivered online.

As predicted, usage of prevalent traditional methods can be seen from the data analysis. Even though more than half (61.3%) of course students were third year students, 70.2% of all course students did not have any experience with peer grading. This means that most of them were totally assessment illiterate. Implementing a peer grading method demanded assessment-literate students, which is why we started with peer grading gradually. In the first week, we had a test peer grading activity, and after that we implemented more demanding tasks. Students reported that it would be easier for them if they were aware of the evaluation criteria from the very beginning, in the process of assignment preparation. Therefore, we improved assessment guidelines and made the criteria clearer and more detailed. From the second assignment on, the evaluation criteria were implemented into weekly activities, which was well-accepted among students. During this experiment with peer grading, not only did the students develop their assessment literacy, but the teacher also developed her skills, which led to her guidelines becoming clearer and much more understandable. Students became aware of what they had to do only when they evaluated other assignments. This confirmed the claims (Boud and Falchikov, 2007; Cvetek, 2015) that peer grading helps students to learn. Peer grading has to be used more than once, as it works better as a formative and not only as a summative practice (Anson and Goodman, 2014). Peer grading really impacted not only the students, but also the teachers who have to clarify the whole assessment process (Tiew, 2010).

The research presented in this paper was done among students participating in a learner-centred course, which is not regular practice for our faculty. Students had to be active through the entire course. There was a lot of interaction and communication among members of each group and between groups. It is not surprising that the students reported that they had to do more work in this course versus other traditional courses. Even though the course design predicts a very active student role, the peer assessment (or self-assessment) was used solely for oral presentations and not for other activities/assignments; nor was it used throughout the duration of the whole course. We were aware that there are many positive aspects of peer assessment, but we were also concerned with the time we needed to spend on it and about the students' assessment ability, because students tend to overrate themselves or their classmates. Until the first experiment, we did not have enough experience with how to manage a large group of students without any additional help. Taking all these factors into account encouraged us to become more familiar with the Moodle Workshop activity and to experiment with it. Managing a larger group of students was supported by different Moodle reports and statistics, which helped us to intervene when needed. It is very important that inactive students and those who had met obstacles were identified in time and motivated to accomplish their obligations. The course activity dynamics are very explicit in Figure 4, where the shapes of both graph lines are very similar. Even though the teacher's role in online learning has changed, that does not mean that the teacher is not needed anymore. Online learning does not mean that we only upload different (multimedia) learning content and prepare quizzes that help us to check the learning results. Quality online learning courses have to be well-prepared, with structured course design, and also well-supported by a teacher or tutor who is present in real time. Tutor support is crucial, which was confirmed by the low dropout rate in our course. Almost all students (91.7%) finished the course successfully. Half of them (52%) finished the course with the highest grades (9 or 10), and only 8% passed with a lower grade (6) ($M = 8.6$).

We were concerned about potential grade overrating in the peer grading process. We tested students' assessment literacy with a comparison assessment of the final project. As presented in Figure 6, the good projects were recognised as such and vice versa. Thus, the data for the teacher's and the students' grades are statistically and significantly correlated ($r_s = 0.39$, $p < 0.01$). Students' assessment literacy was recognised as appropriate, as was their peer assessment. Data analysis showed that students who viewed themselves as critical and rigorous reviewers estimated their reviewers as critical and consistent (Figure 5), and as such are skilled at peer assessment.

Students finished the course with an overall positive peer assessment experience. They reported that peer assessment was interesting, flexible and they learned more because of it. Through peer grading, they became more aware of their teacher's expectations.

Peer grading really supports learning and teaching. Through peer grading, students in our study became more aware of what they were doing and their progress in the course. The whole process of assessment needs to be prepared in advance, clearly defined and clearly delivered. It is obvious that "peer assessments can lead teachers to scrutinise and clarify assessment objectives and purpose" (Tiew, 2010), which is why the peer grading positively impacts not only students, but also teachers.

6.1 Future work

Constant learning feedback impacts students' learning, and therefore we need to think about a mechanism that motivates students to give written feedback. Until now, students expected feedback only from their teacher. Our students did not develop, or maybe they were not encouraged to develop, awareness about their learning and capability to reflect on their learning. Unfortunately, reflection on learning is not a common practice in our study programs. As Boud and Soler (2016) suggest, we need to develop sustainable assessment that would support learning outside of formal studies.

It would be interesting to find out which students write extensive feedback and how this feedback is connected to the grades they received for the assignments. What are the consequences of not writing feedback comments? Are missing feedback comments somehow related to extensive usage of mobile devices that are easily used to write bullet points but not long comments?

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Notes

- 1 We use five-degree scale: 1 – totally unprepared and unskilled and 5 – totally prepared and well skilled.
- 2 Five-degree scale was used: 1 – totally unserious and 5 – very serious.