

Approaches to learning in a blended learning environment: preliminary results

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Abstract - The effectiveness and success of blended learning is an intriguing topic to researchers; the use of technology has transformed the traditional ways of teaching in higher education and has played an important role in achieving a scalable, inclusive, and cost-effective education. In the same time, approaches to learning and the perception of teaching-learning environment have been an interest of authors looking to understand the ways that students go around learning and achieve their study goals. Influenced by multiple factors, students adopt deep, surface, or strategic approach to learning. This research is focused on bringing the two research areas together using an original research instrument, developed to understand the students' approaches to learning in a blended learning environment. The survey has been conducted on a sample of students in two Croatian universities. Relationships between gender, student status, year and area of study, use of MOOCs and/or educational videos, experience with e-learning, learner control, specific use of learning management system, perceptions of teaching-learning environment and the approaches to learning have been explored. This paper covers the instrument's validity and reliability assessment and the preliminary results of the research, along with recommendations for conducting further research in this field.

Keywords - approaches to learning, blended learning, e-learning

I. INTRODUCTION

Technology has changed teaching and learning, as many other activities in our lives [1]. An example of integration of technology in teaching and learning is blended learning, that can be defined as “thoughtful integration of classroom face-to-face learning experiences with online learning experiences” [2]. Series of authors have researched the effectiveness of blended learning and found generally positive experiences of students on different levels [3]–[7]. With advantages such as easy content delivery, studying (and teaching) anytime, anywhere, personalized learning plans, and general convenience and support in achieving learning outcomes, it comes as no wonder that blended learning is well accepted in higher education systems. [8] sum it well: “one of the main outcomes of the increased uptake of e-learning, particularly in predominantly campus based universities, is the creation of student learning experiences that flow back and forth between face to face and online (or at least technologically supported) situations.” Naturally, there are reasons why new technologies might not be fully embedded into a traditionally taught course: cultural challenges, lack of time, resources, knowledge or

inclination from a teacher, or infrastructure not being ready to support the technologies [8]. Similarly, challenges can come from the students' side, where understanding the motivation of students is important for personalising their education, which is a challenging task in online and blended learning environments [9]. With that, the idea of expanding research on student learning in blended learning environment comes naturally. One of the theories on student learning is the one on approaches to learning. Approaches to learning have been the subject of work of Ference Marton and Roger Säljö [10], [11], Entwistle and Ramsden [12], Biggs [13], [14], and many other authors who have published their findings. Authors have identified three main approaches to learning: deep, surface, and strategic. Deep approach is characterized by an intention to understand ideas and by seeking meaning by relating ideas to previous knowledge and experience, while surface approach is characterized by the intention to cope with course requirements and reproducing knowledge by treating the course as unrelated bits of knowledge [15, p. 36]. Finally, strategic approach is related with activities of students who are focused on achieving the highest possible grade [16]. Some research highlights organised approach as an alternative to strategic approach [17], [18]. A student can adopt a different approach to learning and it is important to know what factors influence approaches to learning. There has been a number of findings in this area, and some of the factors that influence adopted approach to learning are learning environment factors (such as teaching, workload, assessment and choice in learning) [19], motivation and anxiety, emotions [20], social identity [21], teacher approach to teaching [22] [23]. With the above in mind, the question arises: what approaches to learning do students adopt in blended learning environment, how can we evaluate them, and what is the connection between embedding technology in teaching and learning and adopted approaches to learning?

A. MOOCs and use of educational videos

There have been multiple studies addressing a blended learning environment that includes Massive Open Online Courses (MOOCs) [4], [24]–[29]. Although there are challenges with leveraging this type of content, the potential that MOOCs have is indisputable. Constructive alignment is needed to create a sustainable learning environment [24]. Educational videos have been used to complement traditional teaching either through a well-known flipped classroom model where students watch the videos as a pre-assignment, or the videos are watched together during classroom teaching time. Students favor

self-learning as well as offering flexibility while supplementing traditional methodologies with video [30]. To embed an educational video created specifically to enrich a certain course unit, teachers have to invest a certain amount of time in planning and delivering the product. Benefits include targeted content, verified narrative, and good connection to course content and expected course outcomes.

B. Experience with e-learning

To evaluate the component of e-learning in the learner experience, the author decided to use a subscale from the research of [31], who were developing a scale for “determining the quality of the student e-learning experience at the degree level when the student learning context is predominately a campus-based experience.” With the idea of evaluating blended learning environment created around traditionally taught courses, this approach was logical. Interestingly, [31] have written about the limitations of their research, also mentioning that future studies might take approaches to studying in consideration. The author argues that the experience with e-learning is related to the adopted approaches to learning

C. Learner control

The on-demand nature of blended learning is often mentioned as its advantage and the ability to go back to content they need is even highlighted by students as one of the key elements they appreciate about having an e-resource in addition to the traditional teaching-learning time. Still, learning online is different than learning from traditional textbooks. [32] developed a scale for evaluating learner readiness for online learning, a subscale of which is learner control; the authors have highlighted the importance of learner control and the ability of students to direct their learning progress. The ability for each learner to keep the control of their learning when it comes to the online element is an important part of the success of blended learning environment; control might be connected with the approach to learning that students may adopt in these environments.

D. Use of Learning Management System

Using a learning management system (LMS) to facilitate teaching and learning, as well as organizing a course is very common. In the groups of students where this questionnaire was planned to be distributed, LMS is used in specific parts of the teaching processes, leveraging various functionalities of the system. In Croatia, where the research was conducted, there has been a classification of blended learning courses, categorizing them in basic, middle, or advanced level, also based on technologies used. In this research, the author is looking to establish a relationship between the use of the system in particular parts of classes, such as for communication or discussion and approaches to learning, as well as between the use of specific functionalities with the approaches.

E. Approaches to learning and teaching

Teaching affects approaches to learning. However, it is “the students’ perceptions of the teaching and assessment procedures, rather than the methods themselves, that affect

student learning most directly” [33]. Based on this, the ground for this research is Shortened Experiences of Teaching and Learning Questionnaire (SETLQ), one of the results of the project “*Enhancing Teaching-Learning Environments in Undergraduate Courses*”. In one of the project reports, a concept map of some influences on student understanding was published; the concept map included influences on personal understanding from student’s perspective (for example current knowledge, perception of the learning environment, comprehension of topics and target, motivation and approach to studying) and teacher’s influences (for example type of formative assessment used, choice of teaching method, choice of topics and learning materials) on student’s understanding [33]. The perceptions of teaching-learning environment cover the experience of, among others, aims, teaching and learning, set work and feedback, all of which are relevant in constructing a blended learning environment. The purpose of this paper is to present the preliminary results of the study on the approaches to learning in a blended learning environment. This is a pilot research, with the aim of developing and verifying a questionnaire and observing potential improvements for the main research. Only a part of the results is included in this paper.

Main research questions in this paper therefore are:

RQ1: Can the developed questionnaire be used to evaluate approaches to learning in a blended learning environment?

RQ2: Is there a difference in adopted approaches to learning based on gender, course unit, experience with e-learning, and the use of LMS?

RQ3: Are gender, course unit, use of MOOCs, use of instructional videos, experience with e-learning and use of LMS correlated with approaches to learning?

II. METHOD

A. Sample

The data was collected at two Croatian faculties. At one of them, the data was collected at two courses, one in undergraduate and one in vocational programme. At the other faculty, the data was collected at a graduate course. Only complete set of responses to all scale items were included in analysis. The final sample comprised 392 students, 126 male and 266 female. 59.7% respondents came from the undergraduate course, 15.1% from the graduate course, and 25.3% from the vocational course.

B. Instrument

The instrument used in this research was based on an existing questionnaire, the Shortened Experiences of Teaching and Learning [18], specifically sections three and four: approaches to learning and experiences with teaching-learning environment. These were expanded by adding concepts through which the use of online learning is studied in the blended learning environment: use of MOOCs and educational videos, experience with e-learning, learner control, use of LMS as well as gender and student status. The final questionnaire consisted of 6 sections. The first section included general characteristic

questions: gender and student status (full-time/part-time). Different response collectors were used for each of the three course units, so students were not asked to share the name of the course unit they are participating in; the author added this information after finalizing the collection of responses. It is important to note that participating in a specific course, also means a different year of study. In this section, experience with using videos was also evaluated through yes and no questions on: previous use of MOOCs, impact of MOOCs to student's final grade, and use of custom educational videos in class. The second section included five items that evaluated students' experience with e-learning, based on the work of the e-Learning scale (E-LS) measuring experience with e-learning. The second section consisted of five items, which were adapted to fit this research, particularly by removing the reference to the specific university the authors were doing their study at [31]. Overall satisfaction with the course unit was also evaluated in this section. The third section consisted of 17 items based on the third section of the SETLQ questionnaire; the approaches to learning and studying. The fourth section consisted of 26 items based on the fourth section of the SETLQ questionnaire, covering experiences with teaching and learning [33]. The fifth section covered learner control in 3 items, based on earlier research [32]. The sixth section evaluated the use of learning management system, questioning whether LMS was used in particular parts of teaching and learning, as per classification in [34], as well as which particular functionalities of the LMS were used. All faculties included in this study use Moodle as their LMS. Questions from all sections, apart from the first one and part of the sixth one when the use of functionalities was reported on a yes/no basis, were graded on a 5-point Likert scale: "Strongly Disagree", "Disagree", "Neutral", "Agree" and "Strongly Agree" or "Never", "Rarely", "Sometimes", "Often", "Almost always" in the use of LMS scale.

C. Procedure and data analysis

The chosen elements of the SETLQ questionnaire and the added sections were translated from English by the author. The translation was reviewed by a translator and amendments were made so that the translated questionnaire fits Croatian language well. The questionnaire was created using the tool SurveyMonkey and the link to it was distributed via Moodle. Students at the undergraduate and vocational courses filled the questionnaire during classroom time and students at the graduate course did it on their own time. Participation was on a voluntary basis and students were assured that their data is confidential and anonymous. Descriptive statistics and Cronbach alpha for each scale were reviewed at the very beginning to help screen the data. For every scale, the scale total was produced by creating a new variable by summing the items [18]. Factor analysis followed. Several studies on approaches to learning have included factor analysis to analyze the types of learning the students adopted [16], [35]–[37]. In this study, as in [35], factor analysis was used to "test the theoretical structure of the instrument and assure that the

items are associated with the respective scales". In extracting the factors, principal component method and direct oblimin rotation were used. Data was analyzed in SPSS 23.

III. RESULTS AND DISCUSSION

Table 1 shows scales (number of items in the scale in brackets), mean, standard deviation, skewness and kurtosis, as well as Cronbach alpha, compared, where available, with the result in the original research (in brackets). Cronbach alpha was calculated to test the internal reliability of the scales. The alpha values for the main scales range from 0.704 and 0.891, showing high level of internal consistency. One scale that showed alpha smaller than 0.7 is learner control (0.59). The reason for lower alpha can be smaller number of items (3).

TABLE I. DESCRIPTIVE STATISTICS AND CRONBACH ALPHA FOR SCALES

Scale (items)	Mean	SD	Skewness	Kurtosis	Cronbach alpha (in original research)
Deep approach (9) [18]	30.09	5.45	0.282	0.347	0.84 (0.75)
Surface approach (4) [18]	12.37	3.08	0.204	-0.003	0.70 (0.67)
Organised approach (4) [18]	13.90	2.98	-0.303	0.194	0.77 (0.75)
Aims and congruence (5) [18]	18.47	3.79	-0.299	0.169	0.88 (0.75)
Choice allowed (2) [18]	7.05	1.85	-0.505	0.154	0.76 (0.60)
Teaching for understanding (5) [18]	16.62	3.98	0.037	0.092	0.89 (0.74)
Set work and feedback (5) [18]	17.20	4.10	-0.236	0.226	0.89 (0.79)
Assessing understanding (2) [18]	7.19	1.71	-0.486	0.450	0.74 (0.55)
Staff enthusiasm and support (2) [18]	7.18	1.74	-0.440	0.323	0.79 (0.66)
Student support (2) [18]	7.50	1.75	-0.378	-0.096	0.81 (0.73)
Interest and enjoyment (2) [18]	6.69	1.94	-0.314	-0.072	0.83 (0.83)
Learner control (3) [32]	10.68	2.11	-0.043	-0.012	0.59
Use of LMS in class (7) [34]	24.58	4.96	0.298	-0.236	0.80
Exper. with e-learning (5) [31]	19.20	3.60	-0.676	0.968	0.83 (0.81)

TABLE II. PATTERN MATRIX ITEMS DESCRIBING APPROACHES TO LEARNING

Items	Component		
	1	2	3
When I've been communicating ideas, I've thought over how well I've got my points		0.830	

across.	
I've looked at evidence carefully to reach my own conclusion about what I'm studying.	0.803
Ideas I've come across in my academic reading often set me off on long chains of thought.	0.778
It has been important for me to follow the argument, or to see the reasons behind things.	0.604
If I've not understood things well enough when studying, I've tried a different approach.	0.602
In making sense of new ideas, I have often related them to practical or real life contexts.	0.545
I've been over the work I've done to check my reasoning and see that it makes sense.	0.505
I've tried to find better ways of tracking down relevant information in this subject	0.496
In reading for this course, I've tried to find out for myself exactly what the author means.	0.454
Much of what I've learned seems no more than lots of unrelated bits and pieces in my mind.	0.830
I've often had trouble in making sense of the things I have to remember.	0.768
I've just been going through the motions of studying without seeing where I'm going.	0.764
I've tended to take what we've been taught at face value without questioning it much.	0.501
I have generally put a lot of effort into my studying.	-0.864
I've organised my study time carefully to make the best use of it.	-0.819
On the whole, I've been quite systematic and organised in my studying.	-0.668
Concentration has not usually been a problem for me, unless I've been really tired.	-0.435

Exploratory factor analysis was performed to explore the factorial structure of the sample. It is justifiable to assume that “items describing approaches to learning and perceptions of the teaching–learning environment correlate with each other [17], [38].” For approaches to learning, Bartlett test value was significant, and the Kaiser-Meyer-Olkin value was 0.857, meaning that the data is suitable for factor analysis. For principal component analysis, Kaiser criterion was taken into consideration, as well as the scree plot. The initial factor structure consisted of four components with eigenvalue above 1. The scree plot though showed inflexion after the third component. Four factors using SETLQ were also extracted in [17]. The first three factors were deep, surface, and organized approach to learning. In addition to these three factors, expected from previous research, the fourth factor loaded and consisted of three items describing deep approach to learning and one describing surface approach. According to expectations based on previous research, the author decided to move forward with the three factor structure, i.e. to extract a fixed number of factors, three. It was expected that the items from the fourth factor will load on one of the three expected factors. The results are shown in Table 2. The final structure explained 51.498% variance and the three factors are theoretically expected and can be defined as deep, surface, and organised approach to learning. Small

coefficients of items were suppressed and only absolute values above 0.30 were included in the interpretation. Correlations between factors were also aligned with theoretical assumptions, with deep and surface approach being negatively correlated and with a moderate correlation between deep and organised approach.

TABLE III. COMPONENT CORRELATION MATRIX

Component	1	2	3
1	1.000	0.109	-0.504
2	0.109	1.000	-0.124
3	-0.504	-0.124	1.000

The same procedure was followed to evaluate the factorial structure of scales evaluating teaching-learning environment, with Bartlett test value being significant and Kaiser-Meyer-Olkin value of 0.944, finally resulting in eight factors, aligned with theoretical expectations: aims and congruence, choice allowed, teaching for understanding, set work and feedback, assessing understanding, staff enthusiasm and support, student support, and interest and enjoyment.

To determine whether to use parametric or non-parametric tests for analyzing differences in adopted approaches to learning (RQ2), normality of distribution was tested. This was done using the Kolmogorov-Smirnov and Shapiro-Wilk tests. Both tests confirmed that the distribution is not normal ($p=0.05$) meaning that non-parametric tests should be used. To evaluate whether there are significant differences between groups of students and their approaches to learning, based on specific factors, Kruskal-Wallis test was performed. Table 4 summarizes the results of this test. Based on the analysis, there was no statistically significant difference in adopted approaches to learning between male and female students; however, there was a statistically significant difference in the adopted approaches to learning (deep and surface) based on the course unit the students were participating in. To analyze the difference in approaches to learning based on experience with e-learning and particular use of LMS, the two variables were recoded to three level variables. The findings show that there is a statistically significant difference in deep and organised approach to learning based on experience with e-learning. The outcomes are the same when observing deep and organised approach with the specific use of LMS; the difference is statistically significant.

TABLE IV. DISTRIBUTION OF RESULTS ACROSS GENDER AND SCHOOL, SHOWING SIGNIFICANT DIFFERENCES BETWEEN GROUPS

Scale	Course unit	Use of LMS	Experience with e-learning
Deep approach (9) [18]	0.023	0.000	0.000
Surface approach (4) [18]	0.000		
Organised approach (4) [18]		0.000	0.000

To determine the details of the differences in distributions between samples, a non-parametric version of a post-hoc test was used. Table 5 shows means of approaches to learning in different groups (course unit, use of LMS, and experience with e-learning). Pairwise comparisons between groups were used to determine where the statistical difference between groups is coming from. The pairs between which there is a significant difference in means are marked with “*” in table 5.

TABLE V. COMPARING MEANS BETWEEN GROUPS

		Deep approach (9) [18]	Surface approach (4) [18]	Organised approach (4) [18]
Course unit	Undergraduate	29.12	10.90	-
	Graduate	30.68*	12.62*	-
	Vocational	29.27*	12.65*	-
Use of LMS	Low	23.82*	-	9.82*
	Medium	28.66*	-	13.25*
	High	32.82*	-	15.23*
Experience with e-learning	Bad	28.00	-	13.8
	Average	26.84*	-	12.39*
	Good	31.04*	-	14.33*

To explore the correlation between scales (RQ3), Spearman's coefficient of correlation was used, since the distribution is not normal. Table 6 shows the correlations between the selected scales and approaches to learning. Statistically significant correlations at the 0.01 level are marked with “*”. Findings show that there is a small, statistically significant positive correlation between surface approach and course unit as well as the use of educational videos. This could be because the educational videos were only used in one course unit. Statistically significant, medium positive correlation is observed between deep approach and use of LMS and experience with e-learning, as well as between organised approach and experience with e-learning [39].

TABLE VI. CORRELATIONS BETWEEN APPROACHES TO LEARNING AND SELECTED SCALES

Scale (items)	Deep approach	Surface approach	Organised approach
Gender	-0.046	0.002	-0.012
	0.368	0.969	0.818
Course unit (school)	-0.042	0.161*	-0.060
	0.405	0.001	0.234
Use of MOOCs	0.075	0.038	0.018
	0.136	0.448	0.716
Use of educational videos	0.070	0.152*	0.042
	0.167	0.003	0.406
Use of LMS in class (7) [34]	0.465*	0.081	0.410
	0.000	0.108	0.000
Experience with e-learning (5) [31]	0.430*	-0.087	0.356*
	0.000	0.084	0.000

IV. DISCUSSION

The aim of this study was to explore approaches to learning in a blended learning environment and evaluate

the new instrument created for the purpose of the research. Research questions have been answered:

RQ1: Can the developed questionnaire be used to evaluate approaches to learning in a blended learning environment?

Based on the validity and reliability analysis, the questionnaire can be used to evaluate approaches to learning in a blended learning environment.

RQ2: Is there a difference in adopted approaches to learning based on gender, course unit, experience with e-learning, and the use of LMS?

Based on the findings, there is no significant difference in adopted approaches to learning based on gender. There is a significant difference in adopted approaches to learning between students with different experience with e-learning and different use of LMS. Students with good experience with e-learning have higher scores on the deep and organized approach scales, i.e. they adopt a deeper and a more organised approach to learning than students with average experience with e-learning. Similarly, students with high use of LMS in specific parts of class, scored higher on deep and organised approach scales, than the students who had low use of LMS in specific parts of class. Finally, students from the graduate program demonstrated higher scores on both deep and surface approach scales than students in vocational programme.

RQ3: Are gender, course unit, use of MOOCs, use of instructional videos, experience with e-learning and use of LMS correlated with approaches to learning?

The results indicate that there is a positive correlation between deep approach and use of LMS in class and experience with e-learning. Surface approach is positively correlated with course unit and use of educational videos. Finally, organised approach is positively correlated with experience with e-learning. The results indicate that the correlation between scales related to the use of LMS and experience with e-learning with deep (and partially organised) approach to learning might be a valuable insight into how blended learning environment could be structured to support deep approach to learning.

This is a pilot research; there are several areas in which improvements can be made. The distribution of the data is not normal; given the sample structure and size, it is expected that some responses are skewed [35]. However, normal distribution would ensure the use of parametric tests for additional valuable insights. Cronbach alpha of the construct “learner control” was 0.59. For the main research, learner control construct should be expanded by adding more items to ensure higher alpha (preferably above 0.7). This will ensure that learner control can be studied in relation to approaches to learning in a blended learning environment. This study resulted in a new, reliable and valid instrument for evaluating approaches to learning in a blended learning environment. Although there are limitations that need to be addressed in further research, the author believes that this is a step forward in understanding students' learning and creating successful blended learning environments.

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